WIKI ON ACCESSIBILITY
Completion report
March 2010

By
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Programme Manager
Centre for Internet and Society

Project Title: Wiki on "Accessibility, Disability and the Internet in India"

REPORT

Accessibility wiki: accessibility.cis-india.org

The wiki project was envisaged and funded by the National Internet Exchange of India (www.nixi.in) and has been executed by the Centre for Internet and Society
(www.cis-india.org), Bangalore.

Project Start date: May 2009
End date: February 2010.

Background

India has a large percentage of disabled persons in its population— estimated to be over seven per cent as per the Census of 2001. Even this figure is believed to be a gross under representation of the total number of disabled persons residing in this large and diverse country. Taken in figures, this amounts to roughly 70-100 million persons with disabilities in the territory of India. Out of this number, a mere two per cent residing in urban areas have access to information and assistive technologies which enable them to function in society and enhance their performance. There are several reasons for this, one of them being that there is a deplorable lack of awareness which exists on the kinds of disabilities and about ways in which one can provide information and services to disabled persons. Parents, teachers, government authorities and society at large are all equally unaware about the options which exist in technology today to enable persons with disabilities to carry on independent and productive lives. Barring a few exceptions, India is still trapped in an era where a white cane and a Braille slate symbolises the future for blind people, while the world has progressed to newer forms of enabling technology such as screen readers, daisy players, the Kindle and so on. The same is the situation in the case of other disabilities. This wiki hence, aims to become a resource for disabled persons, their parents, care-givers, family and friends, teachers, employers, technical developers, non- governmental organisations and policy makers on different kinds of disabilities, assistive technologies, computer software and hardware, alternate platforms for access, as well as legislations and policies which would help to create an accessible environment for persons with disabilities.

Objective

The wiki is intended to spread awareness about disability and the needs of disabled persons with respect to accessing information. It strives to emphasise that persons with disabilities can function independently and productively if they are given access to the right kind of assistive infrastructure. The wiki also serves to raise awareness about the need for designing the Internet and IT and electronic products on the principles of universal design so that they can be accessed by all persons, irrespective of disability. Finally, the wiki gives examples of accessibility legislations in a few countries to serve as a guide to policy makers for integrating ICT accessibility within mainstream activities.

Project implementation

All the articles in the wiki (except for the section on policies for nations) have been written by persons with disabilities who are themselves users of assistive technologies. The articles have been written over a period of ten months beginning from May 2009. However, some of the articles which were there in the initial proposal have not been carried in this report due to non-availability of writers willing to right on those topics and instead additional articles have been filed. So at present we have a total of 125 articles as against the proposed 120 articles initially presented in the project proposal. The details regarding the same have been enclosed as a separate entry in Annexure B of this report.

The list of contributors is given in Annexure A. There are a total of 125 articles which have been divided into the following sections:

- Background
- Accessibility for users
- Accessibility for developers
- Accessibility for the organisation
- Developments in India
- Accessibility for Nations

The list of articles with the word count and urls is given in Annexure B.

The expense statement for the project is given in Annexure C.

The articles are reproduced in Annexure D.

About the organizations

National Internet Exchange of India (NIXI)

NIXI is a not for profit organization under section 25 of the Companies Act 1956, and was registered on 19 July 2003. NIXI was set up for peering of ISPs among themselves for the purpose of routing the domestic traffic within the country itself, thereby resulting in better quality of service (reduced latency) and reduced bandwidth charges for ISPs by saving on international bandwidth. NIXI is managed and operated on a neutral basis, in line with the best practices for such initiatives globally. It is managed by a Board of Directors. The Directors are drawn from the Department of Information Technology, from the academic communities at various institutions (such as the IITs and ISPAI), and from among the peering ISPs.

The Centre for Internet and Society (CIS)

Founded in 2008, CIS is a Bangalore based independent, non-profit, research and advocacy organisation which is involved in research on the emerging field of the Internet and its relationship to the society. CIS brings together scholars, academics, students, programmers and scientists to engage in a large variety of Internet issues like governance, privacy, and freedom of expression, etc.

CIS works in the areas of histories of the Internet, digital natives, and a reader on the Wikipedia, enhancing higher education for the downtrodden, and accessibility for the disabled, openness, telecom and Internet governance.

Log on to our website at www.cis-india.org to learn more about our work. Please also visit http://www.cis-india.org/events/workshop-for-web-developers-on-web-accessibility.

Project Coordinator:

Nirmita Narasimhan

Annexure A
List of Contributors

Sr No	Name	E mail
1	Mukesh Sharma	mrmukeshsharma@gmail.com
2	Namrata Mehta	namratamehta10@gmail.com
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5	Prashant Ranjan Verma	prashant.rv@gmail.com
6	Preetam Pereira	preetampereira@yahoo.com
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8	Saurabh Malav	saurabhmalav@yahoo.com
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13	Neeti	neeti@prologixsoft.com
The designing and layout of the Wiki page has been done by Rahul Gonsalves, Independent Researcher.		

Annexure B
List of articles

Sr No	Article title	Words	Url
1.	Accessibility – An Overview	554	http://accessibility.cis-india.org/index.php/Accessibility_-_An_Overview
2.	Disability and the Family	495	http://accessibility.cis-india.org/index.php/Disability_and_the_Family
3.	The Need for Alternative Solutions: Hardware and Software Solutions and Alternate Formats	755	http://accessibility.cis-india.org/index.php/The_need_for_alternative_solutions:_hardware_and_software_solutions_and_alternate_formats
4.	Disabilities and the Internet	2650	http://accessibility.cis-india.org/index.php/Accessibility_for_Users
Assistive Technologies			
5.	Overview	1487	http://accessibility.cis-india.org/index.php/Assistive_Technologies_Overview
6.	Alternative Input Devices	1047	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Alternative_Input_Devices
7.	Electronic Pointing Devices	816	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Electronic_Pointing_Devices
8.	Sip- and- puff Systems	368	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Sip-and-puff_Systems
9.	Wands and Sticks	289	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Wands_and_Sticks
10.	Joy Sticks	206	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Joysticks

11.	Trackballs	317	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Trackballs
12.	Touchscreen	420	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Touchscreens
13.	Making Text Based Materials Accessible	949	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Making_Text-based_Materials_Accessible
14.	Vaachak	6132	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Vaachak
15.	Refreshable Braille Displays	362	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Refreshable_Braille_Displays
16.	Screen Enlargers	946	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Screen_Enlargers
17.	Screen Readers	234	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Screen_Readers
18.	Free Screen Readers	268	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Free_Screen_Readers
19.	Braille Embossers	1586	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Braille_Embossers
20.	Keyboard Filters	88	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Keyboard_Filters
21.	Speech Recognition Software	668	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Speech_Recognition_Software
22.	Speech Recognition Software and Productivity	866	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Speech_Recognition_Software_and_Productivity
23.	Text to Speech Synthesisers	833	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Text-to-

			speech_Synthesizers
24.	Talking and Large Print Word Processors	497	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Talking_and_Large-print_Word_Processors
25.	TTY and TTD conversion modems	329	http://accessibility.cis-india.org/index.php/Assistive_Technologies:TTY_and_TTD_conversion_modems
26.	Braille Devices	603	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Braille_Devices
27.	DAISY	825	http://accessibility.cis-india.org/index.php/Assistive_Technologies:DAISY
28.	The Buddy Player	303	http://accessibility.cis-india.org/index.php/Assistive_Technologies:The_Buddy_Player
29.	Keyboard Use	178	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Keyboard_Use
30.	Ergonomics of Keyboard and Mouse	394	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Ergonomics_of_Keyboard_and_Mouse
31.	Headphones	471	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Headphones
32.	Seeing with Sound	1058	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Seeing_with_sound
33.	Speech Synthesizers	312	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Speech_Synthesizers
34.	Dexterity Problems	299	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Dexterity_Problems
35.	Mouse Adapters for People with Hand Tremors	206	http://accessibility.cis-india.org/index.php/Assistive_Technologies:Mouse_Adapters_for_People_with_Hand_Tremors
36.	OCR Softwares	1948	http://accessibility.cis-

			india.org/index.php/Assistive_Technologies:OCR_Softwares
37.	OCR and Mathematics Challenges	414	http://accessibility.cis-india.org/index.php/Assistive_Technologies:OCR_and_Mathematics_Challenges
38.	Accessibility in Windows	629	http://accessibility.cis-india.org/index.php/Accessibility_in_Windows
39.	Accessibility in Mackintosh	827	http://accessibility.cis-india.org/index.php/Accessibility_in_Mackintosh
40.	Accessibility in Linux	574	http://accessibility.cis-india.org/index.php/Accessibility_in_Linux
Assessibility of Mobile Devices and Assistive Technologies for Mobile Devices			
41.	Screen Readers for Cellphones	909	http://accessibility.cis-india.org/index.php/Mobiles_Devices:Screen_Readers_for_Cellphones
42.	Blackberry and iPhone	819	http://accessibility.cis-india.org/index.php/Mobiles_Devices:Blackberry_and_iPhone
43.	Accessibility of Internet on Mobile Devices		http://accessibility.cis-india.org/index.php/Mobiles_Devices:Accessibility_of_internet_on_mobile_devices
44.	GPS Products	1905	http://accessibility.cis-india.org/index.php/Mobiles_Devices:GPS_products
45.	Other Technologies on Mobile Platform	479	http://accessibility.cis-india.org/index.php/Mobiles_Devices:Other_technologies_on_mobile_platform
Accessible Resources			
46.	Access to Books	870	http://accessibility.cis-india.org/index.php/Accessible_Resources:Access_to_Books
Accessibility for Developers			
47.	Building Accessible Websites	891	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Building_accessible_websites
48.	WAI and WCAG 2.0	1845	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:WAI_and_WCAG_

			2.0
49.	Accessibility and Open Source Technologies	336	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Accessibility_and_open_source_technologies
50.	Mozilla and Firefox	417	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Mozilla_and_Firefox
51.	Accessible Browser Technologies	493	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Accessible_browser_technologies
52.	Accessible Widgets	1171	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Accessible_widgets
53.	DHTML and Java Script Web Applications	348	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:DHTML_and_Javascript_web_applications
54.	The Possibilities and Limitations of HTML	507	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:The_possibilities_and_limitations_of_HTML
55.	Mouse over Menus	426	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Mouse_over_menus
56.	Calendars	200	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Calendars
57.	Expandable List Items	255	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Expandable_list_items
58.	Simulated Widgets	505	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Simulated_widgets
59.	Accessibility in Dynamic Content on the Web	988	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Accessibility_in_dynamic_content_on_the_web

60.	AJAX	305	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:AJAX
61.	Web 2.0 Mashups	1067	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Web_2.0_mashups
62.	Accessibility in Wikis	245	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Accessibility_in_wikis
63.	Application Development with XUL	484	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Application_development_with_XUL
64.	Accessibility for X Forms	489	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Accessibility_for_X Forms
65.	Screen Reader IT Interoparability	592	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Screen_Reader_IT_Interoperability
66.	Personalization	199	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Personalization
67.	Semantic Triage	359	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Semantic_triage
68.	Accessible Java Script Toolkit	613	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Accessible_javascript_toolkit
69.	Eclipse	914	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Eclipse
70.	Reflexive User Interface Builder	204	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Reflexive_User_Interface_Builder.
71.	Java 2	136	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Java_2

72.	Writing Accessible Accessibility Tools	494	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Writing_accessible_accessibility_tools
73.	Developing Accessible Software for Data Visualisation	315	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Developing_accessible_software_for_data_visualization
74.	Customizable Cross-platform Look and Feel	433	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:customizable_cross-platform_look_and_feel
75.	AIX	644	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:AIX
76.	Palm	608	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Palm3.
77.	Structured HTML and CSS	398	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Structured_HTML_andCSS
78.	Portals and Portlets	200	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Portals_and_portlets
79.	Programming for the Blind	121	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Programming_for_the_blind
80.	MSAA and UIA	231	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:MSAA_and_UIA
81.	IAccessible2API	359	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:IAccessible2API
82.	ARIA	414	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:ARIA
83.	ASXJAX	153	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:AXSJAX
84.	DOJO	209	http://accessibility.cis-

			india.org/index.php/Accessibility_for_Developers:DOJO
85.	Flash and Flex	459	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Flash_and_Flex
86.	Silverlight	348	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Silverlight
87.	Moonlight	91	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Moonlight
88.	DAISY and Math ML	1695	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:DAISY_and_Math ML
89.	Vector Graphics	1050	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Vector_graphics
90.	Making PDF Accessible	1448	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Making_PDF_Accessible
91.	Usable Access	308	http://accessibility.cis-india.org/index.php/Accessibility_for_Developers:Usable_Access
Accessibility for the Organisation			
92.	Disability and the Law	681	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:Disability_and_the_Law
93.	The Issue of Copyright for Books	512	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:The_issue_of_copyright_for_books
94.	The Issue of Copyright for Software	934	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:The_issue_of_copyright_for_software
95.	Proprietory and Open Source Softwares	624	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:Proprietory_and_open_source_softwares

96.	Access to Educational Materials	947	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:Access_to_educational_materials
97.	Access to Educational Institutions	543	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:Access_to_educational_institutions
98.	10 Simple Things You Can Do To Make Your Office More Accessible	944	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:10_simple_things_you_can_do_to_make_your_office_more_accessible
99.	Making Documents Accessible	1337	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:Making_documents_accessible
100.	Business Case	1118	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:Business_case
101.	Accessibility versus Usability	353	http://accessibility.cis-india.org/index.php/Accessibility_for_Organisation:Accessibility_versus_Usability
Accessibility for Nations			
Policy and Legislation			
102.	United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)	306	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:UNCRPD
103.	Biwako Millennium Framework	395	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Biwako_Millennium_Framework
Accessibility Policies and Frameworks in Different Countries			
104.	USA	620	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:USA
105.	European Union	446	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:EU

106.	United Kingdom	1013	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:UK
107.	Canada	1528	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Canada
108.	South Africa	437	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:South_Africa
109.	Japan	889	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Japan
110.	New Zealand	584	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:New_Zealand
111.	Australia	1056	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Australia
112.	India	1211	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:India
113.	Ireland	1465	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Ireland
114.	Italy	1182	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Italy
115.	Germany	464	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Germany
116.	Korea	766	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Korea
117.	Philippines	598	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Philippines
118.	Singapore	260	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Singapore
119.	Sri Lanka	254	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Sri_Lanka
120.	Thailand	273	http://accessibility.cis-india.org/index.php/Accessibility_for_Nations:Thaiand

Accessibility Policy Strategies by Sector			
121.	Business Websites	873	http://accessibility.cis-india.org/index.php/Accessibility_Policy_Strategies_by_Sector:_Business_Websites
122.	Self Service Terminals	1380	http://accessibility.cis-india.org/index.php/Accessibility_Policy_Strategies_by_Sector:_Self_Service_Terminals
123.	Computer Hardware / Software	155	http://accessibility.cis-india.org/index.php/Accessibility_Policy_Strategies_by_Sector:_Computer_Hardware/Software
124.	Assistive Technology	238	http://accessibility.cis-india.org/index.php/Accessibility_Policy_Strategies_by_Sector:_Assistive_Technology
125.	Horizontal or non-sector-specific legislation	1525	http://accessibility.cis-india.org/index.php/Accessibility_Policy_Strategies_by_Sector:_Horizontal_or_non-sector-specific_legislation
Total words of all articles = 87422			
List of Missing / Altered Articles			
1	Types of Disability and Access Problems	Rahul Gonsalves has written an article on this. The title has changed.	
2	Rendering Complex Screen Layouts in an Accessible form		
3	Problems with Web sites	This article is covered in Web accessibility	
4	Different platforms for assistive technologies	Covered in article on mobile and computers	
5	Physical access and virtual access		
6	Access to libraries	This is covered in Access to books	
7	How does accessibility benefit other		

	employees and customers		
8	Evaluating solutions for accessibility	This is covered in the articles	
Additional articles covered			
1	Accessibility – an overview		
2	South Africa		
3	Japan		
4	Ireland		
5	Italy		
6	Germany		
7	Korea		
8	Philippines		
9	Singapore		
10	Sri Lanka		
11	Thailand		
12	Biwako Millennium Framework		

Annexure C
Expenses

WIKI Project - NIXI					
Expenditure	**Budgeted Amount (To receive)**	**Amount Received**	**Budgeted Amount (Expenditure)**	**Amount Spent**	**Remarks**
Grant	200,000.00	100,000.00			
Articles			109,500.00	104,658.00	Some of the articles were written in-house, so the amount spent is less than the budgeted one including the editing expenses, the break-up of which is given below.
Technical Consultant			8,000.00	-	The technical consultancy was done voluntarily and hence this amount was not utilised.
CIS Consultancy			52,500.00	-	Yet to be paid
One Day workshop			30,000.00	-	Yet to be conducted
Total	**200,000.00**	**100,000.00**	**200,000.00**	**104,658.00**	

Editing Charges		
Date	**Amount Paid to**	**Amount**
9/18/2009	Preetam Pereria	13,852.00
5/10/2009	Prasant Ranjan Verma	20,100.00
10/26/2009	Sanchia	28,080.00
12/14/2009	Preetam Pereria	14,289.00
2/15/2010	Sanchia	1,498.00
3/2/2010	Prasant Ranjan Verma	26,839.00
Total		**104,658.00**

Annexure D
Articles

Accessibility - An Overview

What is Accessibility?

The word ‘Access’ literally means having access to, or an entry to something. In the context of Information Society, it broadly refers to being able to access information, technologies and services which are made available over the Internet. This includes the ability to surf websites and reading information and documents available, filling up forms and questionnaires, participating on discussion boards, mailing lists and social networking sites, checking mails, shopping, completing banking and e-governance transactions and pursuing recreation and leisure on the Internet.

Why is accessibility important?

The Internet today is increasingly becoming the preferred medium for carrying out all transactions ranging from administration and business to pleasure and social engagements. It connects people around the world and has enabled the free flow of information across different cultures, thus rendering geographical boundaries relatively insignificant. However, the complete power of the Internet to transform people’s lives is not fully utilised because it is excluding a large section of persons from participating in the information process. A very large number of people around the world have disabilities which make it difficult for them to perceive information on the Internet on their own and have to use assistive technologies like screen readers, track balls, head pointers, et cetera (depending upon their disability) to access information. However, if websites are not created keeping in mind the principles of universal access and design like the Web Content Accessibility Guidelines (WCAG) of the W3C, or if the documents are inaccessible image files then they cannot be navigated effectively by persons using these technologies. So, it is important that all websites and the information displayed on them are created in a manner which makes it accessible to all persons, regardless of their disabilities.

Action points

• Raise awareness about the need for accessibility on the Internet both in the public as well as the private spheres. • Create awareness about different accessibility standards. • Encourage and participate in the evolution of new standards which keeps pace with technological developments and requirements. • Conduct capacity building training workshops for web developers and web designers, as well as for heads of business houses, academic institutions and so on to raise awareness about the need for making this mandatory for their organisations. • Develop curricula which take into account principles of universal access and design. • Encourage and invest in research and development in the area of accessibility. • Become an accessibility evangelist.

Why this Wiki?

This wiki is created with a view to raise awareness on the issue of accessibility on the Internet for persons with disabilities. It caters to a wide variety of readers, ranging from persons having little or no knowledge about accessibility, to persons having advanced technical knowledge on accessibility matters. It contains articles with general information, information on assistive technologies, software and programmes, legislations and so on. All the contributors to the wiki are persons with disabilities residing in India. It is hoped that this wiki becomes a starting point of reference for persons with disabilities and their care givers and friends and organisations to learn about accessibility, share resources and take forward the message of accessibility to all the places where they go.

We welcome readers to contribute vastly by adding articles or editing to make this a rich and vibrant resource.

Disability and the Family

A newborn’s immediate family is almost the entire world to him. Family is the first and the most important social institution on which an individual totally depends in her/his early years. At any point when the family members become aware that their child who has special needs or is differentially abled, it is no doubt a very difficult situation for them.

A family with a differently abled member, first, should understand the kind of disability he/she has and how to tackle it. The parents of the child should understand that their child is different, which does not mean that he/she should be discriminated from his other siblings. He/she should neither be neglected nor be over protected. It is crucial for both the parents not to think of the disability as a curse and accept their child the way he is, which would help them to come out of that stressful situation; they would also be able to motivate the child and encourage him/her to live his/her life in a normal way. For this, the parents should have an optimistic approach

towards the problem. They should let the siblings of the child with disability know about his/her problem and how to deal with him/her.

A child with disability should not only be limited to his/her family. Socialisation is also an important factor for her/him, as it helps to develop self confidence. The family members should not hide the problem from the neighbours or their relatives. In fact, they should talk about it in a positive way and impart knowledge about it. However, it cannot be denied that it is a difficult situation and has many limitations, but if it is perceived as a problem which can be overcome by making some efforts, it will make things easier. If the family members accept the child along with his/her disability, they also start acknowledging his/her ability and learn to appreciate the same. The child should not be taught to be dependent on the other members of the family for each and every task that he/she has to perform. Such children tend to do their work at a slow pace, so it is very important for the family members to be patient and learn not to interfere. Moreover, they should not do tasks for the child; it may lead him to question his abilities. On the other hand, it is also important to understand that there are certain tasks which he/she would not be able to carry out without assistance. At that time he/she should be provided with full support, as he/she may feel neglected and not cared for. Such children should be not compared with their siblings. It should not be ever forgotten that the child is somewhat different and so his/her way of carrying out activities would obviously differ. A little awareness, receptivity and acceptance of the family/parents will make a huge difference in the life of the child with special needs.

The need for alternative solutions: hardware and software solutions and alternate formats

The importance of Internet is increasing day by day. So making it available to a diverse and wide audience is the need of the hour. Web developers who ignore or refuse to comply with the growing demand for accessibility will become unable to reach out to a sizable number of users. What alternatives do we have to make our websites universally accessible?

Accessibility means freedom of entrance or the facility to access a particular product, environment, or device for every single individual of a community regardless of any cultural, physical or other difference. The term accessibility has gradually come to mean the rights of people with disabilities. More and more individuals and organizations have started responding to the growing demand for accessibility for their products or devices. Many features are added and modifications are made and many by-products are manufactured to ensure that almost all the popular products/devices are more user-friendly or accessible.

When we discuss accessibility, quite naturally, our attention turns towards the IT sector. The reason is the growing importance of the internet as a source of knowledge or a medium of communication. This article tries to analyze the need for alternative formats and solutions to make computers, “our obedient, submissive companions,” more accessible and user-friendly.

First, we will try to study how a website can be more accessible. The transformation from an ordinary website to a universal website is not costly. Just providing some alternative solutions or modifications is sufficient. If you design your website so that it conforms to the accessibility rules and regulations, not only people with disabilities but all who are concerned about the content you offer will be satisfied. Calculations show that the majority of people who are over 40 years of age are in under the category of those who use some kind of assistive technology, like magnifiers, screen readers and so on. So, conformity with WAI (Web Accessibility Initiative) means more online business and more traffic to your website.

The following is a suggested list of alternatives from which you can select keeping in mind your targeted audience.

1. Flash header: Give a background to the div which holds your image. Even if the users fail to see your animated images, they will be able to see a static image.

2. Flash menu: Include aan HTML version of your menu. It won’t be displayed if it stays between the <object></object> tags and it can help SEO also.

3. Images: To solve the problem of images, you just have to fill out the "Alt attributes" field. This will give a visually impaired person who surfs your website an idea of what the image represents.

4. Provide alternative HTML script where JAVA is used: By doing this you will be able to make sure that your website can be explored with the help of any screen reader.

Websites like Solona, Webvisum, and so on are great attempts in this direction. These give disabled users independence to fill out online applications or create an account on their own on a particular website.

When we talk about accessibility of computers or any other digital devices, we can say that software like screen readers or the features like magnifiers have done a lot to make these media accessible. In addition to this, there are formats like DAISY (Digital Accessible Information System), which puts books or web content into text and audio formats.

Many large corporations like IBM, Microsoft, and Mac have their own official "Accessibility policies". They have included many features, like on-screen keyboards, filter keys, magnifiers, in-built screen readers, and so on in their devices. They have also included many accessibility features, like display options for the hearing impaired and all other disabled users.

In terms of hardware solutions, devices like talking thermometers, color identifiers, talking calculators, and so on are great steps forward in the attempts to include the sizable population of persons with disabilities in the mainstream community.

Even though we have come a long way in our attempts to make products/environments more accessible and user-friendly, we have to go a long way further. It is important to understand that with minor modification of keys with Braille/tactile labels we can make hardware much more efficient and accessible to the visually impaired. The design of hardware for comfortable use with one hand or in such a way that it can be used by a motor disability person, will make it accessible to a large number of users.

Assistive Technologies Overview

Assistive technology is defined formally as any item, piece of equipment or product system, whether obtained commercially, off the step modified or customized that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.
In practical terms, this means anything that is used to improve an individual's ability to function while living with a disability. This equipment can be high or low tech, or simply a strategy for dealing with an obstacle. It works around learning problems, instead of trying to solve them. It can be hardware or software or a piece of equipment. It shouldn't be confused with educational or instructive hardware.

Assistive technology is redefining what is possible for people with a wide range of cognitive and physical disabilities. In the home, class room, workplace, and community, assistive technology is enabling individuals with disabilities to be more independent, self-confident, productive, and better integrated into the main stream.

Assistive technology can mean anything from simple, homemade devices to highly sophisticated environmental control systems. It can be adapted toys, computers, powered mobility, augmentative communication devices, special switches, and thousands of commercially available or adapted tools to assist an individual with learning, working, and living their life independently.

Assistive technology has the potential to expand abilities and bypass or balance barriers that disabilities create. For children with

disabilities in public school class rooms, assistive technologies are tools to extend their physical, social and communicative abilities. They also provide the means for academic and cooperative inclusion.

Terms interchangeable with "assistive technology" include "assistive devices," "rehabilitation equipment/technology," "adaptive materials" or "adaptive technologies." When we apply AT to facilitate the use of class room technologies and materials by students with disabilities in today's class rooms, AT includes both access and adaptive technologies. Access Technologies include those applications of technologies that provide a way for students with disabilities to better access class room instructional materials provided as part of the general curriculum. These are devices that adapt the tools or activities used by students in general. These devices can compensate for limitations experienced by students with sensory, cognitive and/or physical disabilities.
People with disabilities today are leading more independent lives than in generations past, frequently with the assistance of devices designed to help them with everyday activities, collectively called assistive technology.

Types of assistive technology

Assistive technology products are designed to provide additional accessibility to individuals who have physical or cognitive difficulties, impairments, and disabilities. When selecting assistive technology products, it is essential to find products that are compatible with the computer operating system and programs on the particular computer being used.

Below are descriptions of the various types of assistive technology products that are currently available on the market today.

Alternative input devices: Allow individuals to control their computers through means other than a standard keyboard or pointing device. Examples include:
Alternative keyboards: Featuring larger or smaller than standard keys or keyboards, alternative key configurations, and keyboards for use with one hand.
Electronic pointing devices: Used to control the cursor on the screen without use of hands. Devices used include ultrasound, infrared beams, eye movements, nerve signals, or brain waves.
Sip and puff systems: Activated by inhaling or exhaling.
Joysticks: Manipulated by hand, feet, chin, etc. And used to control the cursor on screen.
Trackballs: Movable balls on top of a base that can be used to move the cursor on screen.

Touch screens: Allow direct selection or activation of the computer by touching the screen, making it easier to select an option directly rather than through a mouse movement or keyboard. Touch screens are either built into the computer monitor or can be added onto a computer monitor.
Braille embossers: Transfer computer generated text into embossed Braille output. Braille translation programs convert text scanned in or generated via standard word processing programs into Braille, which can be printed on the embosser.
Keyboard filters: Keyboard filters are typing aids such as word prediction utilities and add on spelling checkers that reduce the required number of keystrokes. Keyboard filters enable users to quickly access the letters they need and to avoid unintentionally selecting keys they don't want to use.
Light signaler: Light signaler alerts monitor computer sounds and alert the computer user with light signals. IT is useful when a computer user can not hear computer sounds or is not directly in front of the computer screen. As an example, a light can flash alerting the user when a new e-mail message has arrived or a computer command has completed.
On-screen keyboards: Provide an image of a standard or modified keyboard on the computer screen that allows the user to select keys with a mouse, touch screen, trackball, joystick, switch, or electronic pointing device. On-screen keyboards habitually have a scanning option that highlights individual keys that can be selected by the user. On-screen keyboards are helpful for individuals who are not able to use a standard keyboard due to dexterity or mobility difficulties.
Reading tools and learning disabilities programs: These include software and hardware designed to make text based materials more accessible for people who have difficulty with reading. Options can include scanning, reformatting, navigating, or speaking text out loud. These programs are helpful for those who have difficulty seeing usual print materials. People who are developing new literacy skills or who are learning English as a foreign language and people who comprehend better when they hear and see text highlighted at the same time.
Refreshable Braille displays: Provide tactile output of information represented on the computer screen. A Braille "cell" is composed of a series of dots. The pattern of the dots and various combinations of the cells are used in place of letters. Refreshable Braille displays mechanically lift small rounded plastic or metal pins as needed to form Braille characters. The user reads the Braille letters with his or her fingers, and then, after a line is read, can refresh the display to read the next line.
Screen enlargers, or screen magnifiers: These work like a magnifying glass for the computer by enlarging a portion of the screen which can increase legibility and make it easier to see items on the computer. Some screen enlargers allow a person to zoom in and out on a particular area of the screen.
Screen readers: Screen readers are used to verbalize, or speak everything on the screen including text, graphics, control buttons, and menus into a computerized voice that is spoken clearly In real meaning a screen reader transforms a graphic user interface (gui) into an audio interface. Screen readers are essential for computer users who are blind.

Speech recognition or voice recognition programs: It allows such people who have difficulty in using their hands to give commands and enter data using their voices rather than a mouse or keyboard. Voice recognition systems use a microphone attached to the computer, which can be used to create text documents such as letters or e-mail messages, browse the internet, and navigate among applications and menus by voice.
Text to speech (TTS) or speech synthesizers: These receive information going to the screen in the form of letters, numbers, and punctuation marks, and then speak it in words in a computerized voice. Using speech synthesizers allows computer users who are blind or who have learning difficulties to hear what they are typing and also provide a spoken voice for individuals who can not communicate orally, but can communicate their thoughts through typing.
Access and environmental controls: Devices that allow increased control of the environment or that open up access to things in the environment. This includes electronic controls like switches, special keyboards or mice, and remote controls as well as things that help people get around the community, like ramps, automatic door openers, and Braille signs.
Aids to daily living: Special tools for daily activities, like brushing teeth, dressing or eating. This includes adapted utensils, plates and cups, non skid surfaces, and specially designed toilet seats and shower stalls.
Assistive listening: A support that help a student who is either deaf or has a hearing loss. IT includes hearing aids, amplifiers, captions on TV, and typing telephones.
Augmentative/alternative communication: Supports that allow a child who cannot speak, or whose speech is not understood by others, to communicate. This includes picture boards, voice output communication devices, communication software and computers.
Computer based instruction: A software to help students with learning difficulties in reading, writing, math and other subject areas.
Mobility: Equipment that allows a student with a physical or visual disability to move independently and safely through the community. It includes wheelchairs, walkers, and adapted bicycles.
Positioning: Any support that helps a student with a physical disability remain in a good position for learning without becoming tired. IT includes adjustable chairs, tables, standers, wedges and straps.
Visual aids: Supports that give a student with visual difficulties access to information. It includes large-print books, books on tape, magnifiers, talking computer software, and braillers.

Alternative Input Devices

Alternative Keyboards
Keyboards should be so located as to allow for a comfortable position during use.

A proper keyboard should be placed in front of the seated user at elbow height. It should allow for a neutral keyboarding posture, which means that shoulders are placed back and relaxed; upper arms rest at the side of the body; the elbow is bent at a 90-degree angle; forearms are horizontal, parallel to the floor; and wrists are in line with the forearms with minimal bending, up or down, left or right.

The increase in repetitive motion and awkward postures, attributed to the use of computer keyboards, has resulted in cumulative trauma disorders to workers.

However, because of the rapid increase in computer usage and consequent keyboard injuries, a wide variety of alternative keyboards have been designed to reduce the physical demands on the body, improve posture during use, and increase the level of comfort. Most of the research and design efforts have focused on re-shaping the standard keyboard, making it more adjustable while retaining its basic shape and familiar QWERTY key arrangement.

Split Keyboards
Fixed-split keyboards are the most commonly seen and least expensive of the split keyboards. They have a set horizontal split angle and possibly a raised center for the left hand and right hand key segments.

Acer's Future keyboard is sleekly curved and is built with a uniquely ergonomic design. The Future keyboard splits into two fields to form a roughly triangular shape. A touchpad is embedded in the central area with four arrow keys surrounding it.

The Microsoft Natural keyboard is responsibly designed for maximum comfort. Its split-key sloped keyboard promotes a natural wrist posture. There is a built in palm rest to provide a comfortable resting place for hands while not typing. The keys have been so arranged with a soft tactile action and QWERTY layout as to allow for quick adaptation to the split keyboard. The Natural has a forward tilt, which means it slopes gently towards the typist. There is a wrist leveler to keep wrists straight while typing. A numeric keypad controls and moves the pointer on the screen.

Adjustable Split Keyboards
The horizontal positioning and split can be changed on this keyboard, as well as the horizontal and vertical raising of the center.

The Comfort Keyboard System based on this technology is a three-piece folding keyboard. The layout is like that of a standard keyboard, except that it is divided into three sections. Each section can be independently adjusted to a number of positions, allowing

each individual to type in a natural position. The sections can be re-arranged and can be put together to look like a normal keyboard. The keyboard is also fully programmable.

Contoured Keyboard
This keyboard places the keys in curves that closely match the movement of the fingers, reducing finger travel to the keys. Several of the keys are relocated to be operated by the thumb.

Vertical Keyboard

The vertical keyboard is a keyboard on which the standard keyboard section is placed upright.

Alternative Key Configurations
Dvorak Key Layout

This keyboard has an alternative arrangement of the alphabetic keys in a layout that evenly distributes typing among fingers of both hands. By placing letters and punctuation strategically, the keyboard allows typists to achieve the same output with reduced finger movement. This reduces the strain on hands, wrists and arms.

System and method of keyboard configuration for disabled user access

This system has been registered as US patent 6310608.

In this system, multiple keys are grouped together on a keyboard to form compound keys. The system revolves around the following arrangement: Function keys “F1” through “F4” are grouped together to form a key. Function keys “F5” through “F9” are grouped to form a second key. Similarly “F9” through “F12” are grouped to form a third key. Operating the keys from “F1” through “F4” results in the same input to the operating system or application program.

A compound key can also be programmed to a certain function such as “yes,” “enter,” or “cancel.” In another application, a group of keys could be assigned to a particular alphanumeric character. In this way, alphanumeric keys can be grouped into a reduced number of larger alphanumeric compound keys.

A separate group of keys (the numeric keypad) may be used to switch between different arrangements of these compound keys, so that all characters are accessed and used.

Keyboards for use with one hand

Half QWERTY keyboard

The Half QWERTY keyboard from Matias is a standard desktop keyboard that allows those with limited or no use of one hand to continue typing with the other hand.

Using it, the typist must place the hand where it normally would be if a person were touch typing. That covers that half of the keyboard. To type letters of the other half, a person should hold down the space bar with the thumb and do the same finger movement that he would normally do with the other hand.

The Matias Half keyboard comes with a unique hydra cable and works with both PCs and Macs. The hydracable has 4 connectors ps/2, USB, ADB, and nADB pass through. There is also a 2 port USB HVB for quickly attaching USB peripherals. Other features are easy-to-read key characters and functions and an international layout support.

Frogpad

Frogpad is a portable one handed keyboard. It has 20-key text/numeric data. The full-size keys make it accurate and easy to use for all desktop and mobile computing applications. Frogpad is available in a left hand and hand configuration. USB models can replace any standard USB keyboard, and Bluetooth models use HID drivers and work with Windows, Macintosh, and Linux.

Maltron

The Maltron single-handed keyboard has been developed to meet the needs of those who must use the keyboard with one hand. The shape matches natural hand movements, and the key arrangement minimizes finger movements. The special shape and letter layout have been very carefully planned taking into account the limited number of keys that can be accessed. The fully ergonomic shape provides for freedom from strain. Both left and right hand models are designed for touch typing. The keyboards have push on and push off keys for shift, control and alt functions, important for single-hand typing.

Electronic Pointing Devices

Electronic pointing devices allow the user to control the cursor using ultrasound, infrared beam, eye movements, nerve signals or brain waves. Electronic pointing devices can be used to access the internet and operate the computer.

They require that the user has good head control, eye control, or the ability to control through nerve signals or brainwaves. Depending on the skills of the user and the device used, computer commands can be accessed in a number of ways. Some allow the user to control the cursor through head or eye movements.

Some of the manufacturers of such products are:
1. Madentec Ltd.
2. Prete Romich Inc.
3. RJ Cooper & Associates
4. Brain Activated Technologies
5. Tash Inc.

Tracking Head Movements
Track IR is a mouse replacement system consisting of a little camera that connects to a Windows 98, ME or 2000 PC through the USB port. It finds its applications in situations where a normal pointing device cannot be used. It is also meant for people who are disabled and cannot operate a mouse. The device, made by Spectronics, Australia, consists of a little black camera, one extension cable, a pack of 40 self adhesive reflective dots, a software CD, a manual, and stick-on feet that attach the camera stand to a laptop screen.

The Track EG package has a clear-cased camera, two reflective finger rings, and a breakout cable for the switch port on the side of the camera. This package is meant for full mouse replacement so that a person uses the hand that wears the ring to control the cursor and foot or other separate switches for the buttons; the keyboard is not used at all.
Another package is the Track IR AT (Assistive Technology) package for seriously disabled people, which has a breakout cable and software that can do dwell clicking. The Natural Point package comes with options like switches, reflective dots, extra rings, and a wand with an infra red LED for control from a distance. The Track IR camera looks like a slim webcam and is 2.3 inches wide. To set the Track IR, one has to install the software, then reboot and plug the camera in. The camera stand can be attached to a desk or monitor and has a well-made pan/tilt mount so that it can be pointed as required. The metal box can be bent so as to attach it to various objects: monitor edges, laptop screens, desk edges, etc.

The Track IR works when its Natural Point support application is running. The software can be set to run automatically when the computer boots.

A person sitting a couple of feet from the camera controls the cursor with a dot stuck to his forehead. Corner-to-corner cursor movement can be achieved using the speed doubling “2X” button. The software can configure keyboard keys in order to use them for mouse functions: left click, right click, and double click, plus keys to centre the cursor on the screen, pause and scroll.

Dwell clicking, a feature in this device, is designed for disabled people who cannot work a switch. The dwell action can be a single click, double click, or right click. The user can change the dwell action by using the dwell click function. Dwelling on one of the icons in the small separate dwell clicker utility box will select that icon. This is a slow but sure way to use the computer.

Eye Gaze and Eye Tracking

A mounted camera-like device translates eye movements and eye stares (dwelling) to direct the on-screen mouse. Mouse clicks are done with slow eye blinks. Eye gaze and eye tracking technology enable people with physical disabilities to perform many tasks with their eyes, for which they would otherwise use their hands. By just fixing their gaze, or to put it simply, by just looking at control keys displayed on a computer monitor screen, the user can perform a number of tasks like speech synthesis, environmental control, sending emails, in the Internet, playing games, and controlling most PC & MAC computers. The technology functions when a user sits in front of a monitor. A specialized video camera placed below the monitor observes one of the user’s eyes. Complex image processing software in the system computer continually analyzes the video image of the eye and determines at what on the screen the user is looking. Nothing is attached to the user’s head or body. The user operates the device by looking at rectangular keys that are displayed on the control screen. To activate a key, the user looks at that particular key for a specified time, which is usually a fraction of a second. Once the key is activated it will perform the task it is programmed for.

The system can be used by persons with various like cerebral palsy, spinal cord injury, brain injury, ALS, brainstem stroke, muscular dystrophy, etc.

Sip-and-puff Systems

Sip-and-puff systems are devices meant for use by severely disabled people who are either paraplegics or quadriplegics and have lost the use of their hands or legs and central system.

Sip-and-puff technology operates through the breathing, i.e. inhaling or exhaling of air, of the user. The device used consists of a tube with one end in the mouth of the user and the other connected to an electronic control board, which in turn is connected to the device to be controlled.

By breathing or sipping and puffing, which means inhaling or exhaling air through the tube that is in his mouth, the user can control the device and make it function according to the need that it was built for. The air travels through the tube and to the electronic control board. Each puff is used to activate the control board, which then displays the functions connected to it. Then each sip activates a particular function on display.

Basic stamp electronic module
This device is built using an electronic control board. A mouth tube at one end is connected to two switches and sends a signal to the basic stamp microcontroller. The microcontroller lists a number of household devices attached to it, like lamps, TV, electric door, fan, etc., on an LCD. When the user puffs (exhales) into the tube, the device connected to the microcontroller displays on the screen. The user then sips (inhales) into the tube to activate the device through the second switch. By sipping, devices are turned on or off.

Sip & Puff Wheelchair
This is a wheelchair with sip-and-puff controls for severely disabled quadriplegics. This wheelchair works on air pressure or sip-and-puff control. The sip-and-puff wheelchair has the following 5 controls: hard sip, soft sip, no sip or puff, soft puff, and hard puff.
Using the 5 controls the sip-and-puff control drives the wheelchair through any terrain using the following functions:
1. Continous drive motor up a ramp or down a ramp
2. Multi speed drive motor up a ramp
3. Continous multispeed drive motor up the ramp The wheelchair also has a seat recline and motor incline and features like system fault detection, headrest recline and dynamic braking.

Wands and Sticks

A head wand is a simple device that is strapped to the user's head. It has a stick projecting from it that is used to type keys on a standard or modified keyboard. This is useful to people who have severely impaired limbs but are still able to control the movements of their head.

Head wands are often used along with sticky keys and are available for both Windows and Apple systems.

Quadjoy
A mouth stick that is easy for the disabled to use is Quadjoy. The stick is held in the mouth and the cursor on the screen controlled with the movement of the mouth. Quadjoy is manufactured by SEMCO, an American company. It is an orally adaptable mouse mainly meant for people with permanent hand disability. It can work with Windows 95, 98, SE, ME, 2000 and XP, as well as Mackintosh computers that are OS 8, 9, and X. The company ensures a supply of hygienic sticks.

The Quadjoy does not need any drivers. It can be just plugged in and used. The PS/2 Quadjoy must be plugged in before turning the computer on. The PS/2 Quadjoy has two PS/2 ports and the PS/2 cable should be plugged into the PS/2 port on the right side. The port on the left is for factory programming and repair. The lights or LED on the quadjoy tell the user if the Quadjoy is functioning. If the stem of the stick has broken off the base and does not come out, it should be sent to the company for repair. If any part of the base is broken off, where the stick threads onto the base, it will need to be repaired by SEMCO.

Joysticks

Joysticks can be plugged into the computer's mouse port, and permit users to carry out mouse functions. The device is used to control the cursor on the screen and perform mouse function, including left mouse click, drag and drop, double click, and right mouse click. Joysticks benefit users who need to operate a computer with or without the use of their hands. For example, some people might operate the joystick with their feet or with the use of a cup on top of the joystick that can be manipulated with their chin.
There are a range of joysticks available with different forms of grip, and movement controls, to suit user needs. It is also possible to customise standard joysticks with specially designed grips as appropriate. The responsiveness of the joystick controls may also be customised using the standard OS interface. The usages of joysticks are most commonly among those with dexterity impairments. An example of the device is the Techmatrix joystick, which can be connected to any computer that uses a Mac OS or Windows 98 or later operating systems from Microsoft. Joysticks too have ascending their status as assistive technologies and today are integrated into mainstream technologies, like mobile phones such as the Nokia N73.

Trackballs

Background to Introduction

By the late 80s and early 90s, the mouse market was saturated. Mouse manufacturers began to look for other input devices. Logitech introduced the first trackball mouse, the original Trackman, in 1989. Also, as a mouse could not be used easily with a portable computer, small trackballs built into the laptop keyboard got attention. At this stage Microsoft introduced the Ball Point trackball, along with other manufacturers that introduced devices like the Kensington Expert mouse, Microspeed PC-TRAC, etc. In the last decade, excellent trackballs such as Microsoft Trackball Explorer, Kensington Orbit, Logitech & Trackman have arrived in the market.

Design and Functioning
A trackball, also called a roll ball, is an alternative to a mouse. It consists of a ball enclosed in a unit and moved by fingers. The user does not have to pick up the unit to move the balls as is necessary with a mouse. The ball can be moved easily by the fingers. The trackball can achieve rapid cursor movement with high accuracy.
There are both mechanical and optical trackballs. The trackball can be adjusted with a control display gain so that movement of the ball at slow velocity will enable sensitive control of the cursor and fast movement will allow the ball to move easily for larger cursor movements.

A trackball has the following advantages:
- Flexibility - This means that accurate positioning and rapid movements can be set.
- Comfort - Trackballs can be used for long periods so that the forearm can be well supported.
- Feedback - Direct feedback is given by the balls rotation.
- Space - Only a small fixed space is needed so that it can be placed on a keyboard.

Trackballs are of different designs. Some designs use a small ball for control with the thumb; some other designs allow for a large ball for several fingers to control.

Touchscreens

A touch screen is a computer screen meant for display. It is also an input device. The touch screen works on the principle of pressure. A user touches words or pictures on the screen to activate it. There are three types of technologies that are used to recognize a persons touch. They are resistive, capacitive, and surface acoustic wave technologies. The resistive system is the cheapest and its clarity the lowest of the three. The surface acoustic system is the most expensive.

Resistive

This system consists of a glass panel which is covered by a resistive metallic layer that is also a good conductor. These two layers are separated by spacers and a third scratch resistant layer is placed on the top.

An electrical current passes through the two layers when the monitor is activated. The device is activated when a user touches the screen causing the two layers to make contact at that exact spot. When this happens a change in the electrical field takes place and the coordinates of the point of contact are determined by the computer. Once the coordinates are determined, a special driver processes the touch into something that the operating system can understand. This works in much the same way as a computer mouse driver does to process a mouse movement.

Capacitive

Electrical charge is stored in a layer that is placed on the glass of the monitor. When the monitor is touched by a user a specified amount of charge is transferred to the user. This causes the charge in the capacitive layer to decrease. Circuits located at each corner of the monitor measure the decrease in charge. Then the computer calculates the relative difference in charge at each corner, at the place where the touch event took place and transmits that information to the touch screen driver software.

Surface Acoustic Wave System

On a monitor of such a system are placed two transducers (one receiving & one sending) along the X and Y axes of the monitor's glass plate. Reflectors are placed on the glass. They reflect electrical signals sent from one transducer to the other. The receiving transducer is able to observe if the wave has been disturbed by a touch event at any time and pinpoint its location.

There are no metallic layers on the screen, allowing a 100 per cent light throughput and a clear image. This feature makes the surface acoustic system the best system for displaying graphics. The other two systems have less clarity.

Making Text-based Materials Accessible

At present, there are many softwares and hardwares available in the market that can be helpful for people with learning disabilities. Processing problems are the most common and have the most impact on people who have difficulty in reading to use a computer. These conditions interfere with the learning process. Many students with these impairments are perfectly capable of learning if information is presented to them in a form and at a pace that is individually appropriate to them. Information that is presented in short, discrete units is often easier to understand. In addition, many individuals with learning disabilities learn more efficiently using their visual abilities rather than their auditory skills.

Available hardware and software for people with reading difficulty can perform a number of functions. Some allow text to be read aloud as the user types. Some can predict the word the user is trying to type based on frequency of use and context of the sentence, while others have extensive spell-checking features. Dictionaries, which speak the definitions of highlighted words, break them into syllables, and include thesauruses, are also available. The use of auditory feedback is important in all these aids. Writing aids may be "stand-alone" hardware or may be computer software.

Hardware available to read text-based material
Scanner with text reading software
Stand-alone reading machines usually consist of a scanner and text-reading software that can read out loud. These machines can be as small as a pencil or as large as a desktop. Some popular hardware sWizcom's Quicktionary Reading Pen, Freedom Scientifics' Open Book, Telesensory's Reading Edge, Franklin's Speaking Spelling Ace, and Speaking Homework Wiz.

Mobile Reader
These readers can read books, mail, packages, containers, computer screens, currency, and many other items with a single handheld portable device. The user takes a photo of the print to be read, and the character recognition software in conjunction with high quality text-to-speech will read the contents of the document aloud. At the same time, it can display the print on the phone's built-in screen and highlight each word as it is spoken. Some popular mobile readers are the KNFB Reader, Intel Reader, and Intel Reader capture station.

Softwares available to read text based material
People who have learning difficulties and impairments find these softwares useful.

Word prediction programs
Word prediction programs enable a user to select a desired word from an on-screen list located in the prediction window. The computer generates the word list from the first one or two letters typed by the user. Then the user can select the word from the list and insert it into the text by typing a number, clicking on the word, or scanning with a switch. Many of the talking word processors and word prediction programs have inbuilt dictionaries and thesauruses. These programs help users increase written productivity and accuracy and increase vocabulary skills through word prompting. Popular available softwares are TextHelp's WordSmith and Don Johnston's CoWriter

Reading comprehension programs
These programs focus on establishing or improving reading skills through ready-made activities, stories, exercises, or games. These programs can help users practice letter sound recognition and can increase the understanding of words by adding graphics, sound, and possibly animation.

Reading tools and learning disability programs
These softwares are designed to make text-based materials more accessible for people who struggle with reading. Options can include scanning, reformatting, navigating, or speaking text out loud. These programs help people who have difficulty seeing or manipulating conventional print materials; people who are developing new literacy skills or who are learning English as a foreign language; and people who comprehend better when they hear and see text highlighted simultaneously. Text may be converted to different fonts, sizes, colors, etc. Voice output may be selected, and reading speed may be adjusted. Notes and notation can be added. Popular tools include Freedom Scientifics' WYNN and Lernout & Hauspie/Kurzwiels' Omni 3000.

Speech synthesizers
These softwares are helpful not only for people with visual and language impairments, but also for those with learning impairments. Speech synthesizers (also known as text-to-speech) speak information aloud in a computerized voice. Individuals who have lost the ability to communicate orally can use speech synthesizers to communicate by typing information and letting the speech synthesizer speak it aloud.

Speech recognition systems
These programs, which are also called voice recognition programs, allow people to give commands and enter data using their voices rather than a mouse or keyboard. Nuance's Dragon is a very popular speech recognition program, which is very accurate and also can be used with some popular screen readers.

Talking and large-print word processors
These are software programs that use speech synthesizers to provide auditory feedback of what is typed. Large-print word processors allow the user to view everything in large text without added screen enlargement. Individuals with learning disabilities often use these special featured word processors to assist them with their spelling and grammar and/or to provide the auditory feedback they require to be able to write. Talking word processors are available in both Macintosh and PC formats. Available applications include Don Johnston's Write:OutLoud and IntelliToolsIntelliTalk II.

Writing composition programs
There are some writing composition programs that can help to provide a structured outline for writing composition. One such is Inspiration Software's Kidspiration.

Touch screens
These are devices placed on the computer monitor (or built into it) that allow direct selection or activation of the computer by touching the screen. These devices can benefit users with language disabilities. The ability to touch the computer screen to make a selection is advantageous for people with language and learning disabilities because it is a more simple, direct, and intuitive process than making a selection using a mouse or keyboard.

Vaachak

A Text-To-Speech (TTS) synthesizer is a computer-based system that should be able to read any text aloud this definition still needs some refinements. Systems that simply concatenate isolated words or parts of sentences, denoted as Voice Response Systems, are only applicable when a limited vocabulary is required (typically a few one hundreds of words), and when the sentences to be pronounced respect a very restricted structure, as is the case for the announcement of arrivals in train stations for instance. In the context of TTS synthesis, it is impossible (and luckily useless) to record and store all the words of the language. It is thus more suitable to define Text-To-Speech as the automatic production of speech, through a graphemeto-phoneme transcription of the sentences to utter. It is important to divide the general field into two areas, which are frequently developed separately. The first of these two areas is often referred to as low-level synthesis, i.e. the actual production of the sound, which is to simulate the human acoustic speech signal. Within this area we are concerned with considerations such as the kind of model we want to adopt (spectrum synthesis, Articulatory synthesis or synthesis in the time domain), the size of the units used to concatenate the speech utterance, and the signal processing techniques used in the different methods of generating the speech output. The second area, high-level synthesis, deals with the conversion of written text or a symbolic representation of concepts into an abstract representation of the eventual acoustic signal, suitable for driving the low-level synthesis system. Systems for converting written text are called text-to-speech systems, and systems that generate speech output from concepts are called concept-to-speech systems. The approach followed in both kinds of system is usually referred to as synthesis-by-rule. 1.1 APPLICATION AREAS
Potential applications of High Quality TTS Systems are indeed numerous. Here are some examples:
1.1.1 Telecommunications services
TTS systems make it possible to access textual information over the telephone. Knowing that about 70 % of the telephone calls actually require very little interactivity, such a prospect is worth being considered. Texts might range from simple messages, such as

local cultural events not to miss (cinemas, theatres,), to huge databases, which can hardly be read and stored as digitized speech. Queries to such information retrieval systems could be put through the user's voice (with the help of a speech recognizer), or through the telephone. One could even imagine that our (artificially) intelligent machines could speed up the query when needed, by providing lists of keywords, or even summaries. In this connection, AT&T has recently organized a series of consumer tests for some promising telephone services. They include: Who's Calling (get the spoken name of your caller before being connected and hang up to avoid the call), Integrated Messaging (have your electronic mail or facsimiles being automatically read over the telephone),Telephone Relay Service (have a telephone conversation with speech or hearing impaired persons thanks to ad hoc text-to-voice and voice-to-text conversion), and Automated Caller Copyright © Prologix Software Solutions Name and Address (a computerized version of the "reverse directory"). These applications have proved acceptable, and even popular, provided the intelligibility of the synthetic utterances was high enough. Naturalness was not a major issue in most cases.

1.1.2 Language education

High Quality TTS synthesis can be coupled with a Computer Aided Learning system, and provide a helpful tool to learn a new language. To our knowledge, this has not been done yet,given the relatively poor quality available with commercial systems, as opposed to the critical requirements of such tasks.

1.1.3 Aid to handicapped persons.

Voice handicaps originate in mental or motor/sensation disorders. Machines can be an invaluable support in the latter case: with the help of an especially designed keyboard and a fast sentence assembling program, synthetic speech can be produced in a few seconds to remedy these impediments. Astro-physician Stephen Hawking gives all his lectures in this way. The aforementioned Telephone Relay Service is another example. Blind people also widely benefit from TTS systems, when coupled with Optical Recognition Systems (OCR), which give them access to written information. Mass-market synthesizers bundled with sound cards will soon invade the market for speech synthesis for blind users of personal computers.

1.1.4 Talking books and toys.

The toy market has already been touched by speech synthesis. Many speaking toys have appeared, under the impulse of the innovative 'Magic Spell' from Texas Instruments. The poor quality available inevitably restrains the educational ambition of such products. High Quality synthesis at affordable prices might well change this.

1.1.5 Vocal Monitoring.

In some cases, oral information is more efficient than written messages. The appeal is stronger, while the attention may still focus on other visual sources of information. Hence the idea of incorporating speech synthesizers in measurement or control systems.

1.1.6 Multimedia, man-machine communication. In the long run, the development of high quality TTS systems is a necessary step (as is the enhancement of speech recognizers) towards more complete means of communication between men and computers. Multimedia is a first but promising move in this direction.

1.1.7 Fundamental and applied research.

TTS synthesizers possess a very peculiar feature, which makes them wonderful laboratory tools for linguists: they are completely under control, so that repeated experiences provide identical results (as is hardly the case with human beings). Consequently, they allow investigating the efficiency of intonative and rhythmic models. A particular type of TTS systems,which are based on a description of the vocal tract through its resonant frequencies (its formants)and denoted as formant synthesizers, has also been extensively used by phoneticians to study speech in terms of acoustical rules. In this manner, for instance, Articulatory constraints have been enlightened and formally described.

2. SPEECH PRODUCTION

2.1 NATURE OF SOUND

2.1.1 Sound

Speech sounds are created by vibratory activity in the human vocal tract. Speech is normally transmitted to a listener's ears or to a microphone through the air, where speech and other sounds take on the form of radiating waves of variation in air pressure around an average resting value at sea level of about 100,000 PASCAL’s (Pa). The ideal vibrating string Human ear can perceive audio waves having frequencies ranging from 20Hz-20KHz.

2.1.2 Oscillogram (Waveform)

Physically the speech signal (actually all sound) is a series of pressure changes in the medium between the sound source and the listener. The most common representation of the speech signal is the oscillogram, often called the waveform. In this the time axis is the horizontal axis from left to right and the curve shows how the pressure increases and decreases in the signal. The utterance we have used for demonstration is "phonetician"; the signal has also been segmented, such that each phoneme in the transcription has been aligned with its corresponding sound event. Note that the nine vertical lines are not part of the speech signal, it is the segmentation points. Although we can learn quite a lot by a visual inspection of a speech waveform, it is impossible to detect individual speech sounds from waveforms because of the variability of human speech between individuals, and even in two different pronunciations of a given word by the same person. This brings us to spectrograms, spectrum which represents speech in a manner which is much more invariant to individual differences than the waveform representation Waveform is the representation of signal in "Time domain" while spectrum is representation of "Frequency domain". These are referred to as "inverse domains" of each other. Once we accept the fact that totally different representation describes the same object, we have made the first conceptual breakthrough in the understanding of inverse domains.

2.1.3. Spectrum

Nearly every sound generated in nature has a frequency spectrum. I.e. they are complex signal composed of waves of different amplitude and frequency. Sounds generated by single frequency are very rare like tuning fork produces sound of single frequency. Like wise stringed instruments produces a spectrum of have frequencies in multiple of a particular frequency called Fundamental

frequency. Other sounds in nature have more or less continuous spectrum. According to general theories each periodical waveform may be described as the sum of a number of simple sine waves, each with a particular amplitude, frequency and phase. The spectrum gives a picture of the distribution of frequency and amplitude at a moment in time. Note that this picture does not have a time scale. Instead, the horizontal axis represents frequency, and the vertical axis amplitude. If we want to plot the spectrum as a function of time we need a way of representing a three-dimensional diagram, one such representation is the spectrogram. The picture shows the spectrum 0.15 seconds into the utterance, in the beginning of the "o" vowel.

2.1.4. Spectrogram

In the spectrogram the time axis is the horizontal axis, and frequency is the vertical axis. The third dimension, amplitude, is represented by shades of darkness. Consider the spectrogram to be a number of spectrums in a row, looked upon "from above", and where the highs in the spectra are represented with dark spots in the spectrogram. From the picture it is obvious how different the speech sounds are from a spectral point of view. In the unvoiced fricative sounds,the energy is concentrated high up in the frequency band, and quite disorganized (noise-like) in its appearance. In other unvoiced sounds, e.g. the plosives, much of the speech sound actually consists of silence until strong energy appears at many frequency bands, as an "explosion". The voiced sounds appear more organized. The spectrum highs (dark spots) actually form horizontal bands across the spectrogram. These bands represent frequencies where the shape of the mouth gives resonance to sounds. The bands are called formants, and are numbered from the bottom up as F1, F2, and F3 etc. The positions of the formants are different for different sounds and they can often be predicted for each phoneme.

2.1.5 Digitization

When we speak into a microphone, these changes in pressure are converted to proportional variations in electrical voltage. Computers equipped with the proper hardware can convert the analog voltage variations into digital sound waveforms by a process called analog-to-digital conversion (ADC), which involves two separate components:

1. Sampling - Even though a waveform is usually depicted as a continuous function of time, function is in fact discrete. Sampling means taking a fixed number of pressure value readings at equal time intervals from the continuously varying speech signal. For example, clean speech such as that depicted on this page is sampled 16000 times per second; its sampling frequency is 16 kHz. Telephone speech is sampled at half that rate - 8000 kHz. On the other hand, compact disk recordings have a sampling rate of 44.1 kHz. The higher the sampling rate, the better the sound quality, but the more bits required. According to Nyquist Criteria, there should at least two samples of highest frequency in the signal to prevent distortion.

2. Quantization - Each sampled pressure value is rounded or quantized to the nearest value, which is expressible in a given number of bits. There is a direct relationship between the accuracy of Quantization and the number of bits required. Clean speech such as that depicted here often uses 16 bits, for a total of 65536 possible Quantization levels, while telephone speech is accommodated in 8 bits for a total of 256 Quantization levels.

2.2 THE VOCAL TRACT

The human vocal tract, within which speech sounds are produced, is made up of a number of structures in the head and neck, extending from the lips and nostrils down to the larynx at the top of the trachea. A cross-section of the vocal tract (at the mid-line of the head) is shown in Figure. Though all of the structures in the human vocal tract also appear in the vocal tracts of chimpanzees, other apes, and monkeys, the overall layout and arrangement of these structures, especially at the back of the throat, is strikingly different in humans than it is other primates. These differences appear to be related to the uniquely human capacity for speech.

Figure 2: The human vocal tract

The structures that are used to form speech sounds (principally the tongue, teeth and lips) are called articulators. Some of the more important structures in the vocal tract are described below.

2.2.1 Larynx

The larynx (or voice box) is made mostly of cartilage and sits at the top of the trachea(the wind pipe that connects the nose and mouth with the lungs). The larynx provides a rigid framework within which two bands of muscle, the vocal folds (sometimes called vocal chords)are stretched across the top of the airway to the lungs. Woolen fully tensed and drawn together,the vocal folds can effectively block the flow of air out of the lungs (or provide a last ditch barrier against food or water that threatens to get into the lungs). In a somewhat more relaxed state, the vocal folds vibrate as air from the lungs is forced between them. This process is characteristic of the production of vowel sounds in all the world's languages. The vocal folds can be positioned in a variety of ways that are used to produce different vowel qualities in various languages and sometimes are also used in forming consonant sounds. The vocal folds are drawn fully apart when breathing, especially during heavy exertion. The human larynx, however, can only open to about half the cross-sectional area of the trachea and so always somewhat resists the flow of air into and out of the lungs.

2.2.2 Vocal Cords (glottis)

Air under pressure from the lungs causes the folds of skin known as vocal cords to vibrate at a rate known as fundamental frequency or pitch. The elongated orifice between the vocal chords is called glottis. The effect of the vibrations is to release repeated burst of compressed air into vocal cavities at frequencies that vary with vibration.

2.2.3 Tongue

The tongue, as indicated above, plays a decisive role in forming the constrictions for many consonants and in distinguishing vowels. The tongue is, by far, the most mobile and flexible structure in the vocal tract. It is able to assume a wide variety of complex three dimensional shapes and to touch all the other structures in the mouth from the lips to the back wall of the pharynx. In forming many consonant sounds the tongue plays a key role in making the constriction in the vocal tract that characterizes the consonant. Largely shapes the tongue assumes without significantly constricting the vocal tract determine differences in vowel quality.

2.2.4 Pharynx

The pharynx is the open space at the back of the throat that runs from the back of the nasal cavity down to the larynx. A crucial distinguishing feature of this cavity in humans is that the front wall of the oral pharynx (below the velum) is formed by the back (or root) of the tongue. Mostly because of the flexibility of the tongue this means that the shape and size of the pharynx can vary greatly.

2.2.5. Velum

The velum is the back part of the soft palate, the fleshy part of the roof of your mouth that you can feel with your tongue or finger about half to two-thirds of the way back from your teeth. The velum is a moveable structure that, when pressed up and back, closes the airway from the mouth into the nasal cavity.

2.2.6 Epiglottis

The epiglottis is the small structure that projects backward into the airway just above the larynx and vocal folds. It helps to keep food and water out of the larynx. The human epiglottis cannot touch the velum, but in other mammals the epiglottis and larynx can make a tight closure with the opening into the nasal cavity. This makes it possible for them to drink and breathe at the same time because water (or food) can pass around the larynx into the esophagus without risk of getting into the airway. Adult humans cannot match this feat, though infants can.

2.3 THE CONSTRICTION DIMENSION -- VOWELS VS CONSONANTS

The most basic dimension that organizes speech sounds has to do with the presence of some sort of constriction in the mouth. Some sounds are made with the mouth fully open in a way that allows air to flow freely out. The vowel sounds we produce in the middle of words like kamal, kitaab and kora are like this. If we leave off the consonants at the beginnings and ends of these words we can sing or sustain the vowel sounds by themselves for as long as you have enough breath to continue. Other sounds, however, cannot be sustained at all. The k sound at the beginning of these three words is not sustainable (notice it is the same sound despite its being represented in writing by k in one word and by c in the other two). We also cannot sustain p and t sounds. This fact is illustrated in Figure 1, which shows a recording of the word apple. Notice that there is a silent interval in the middle that coincides with articulation of the (single) p sound in the middle of this word.

Figure 1: Recording of apple.

Thus, the most basic way to organize speech sounds is to separate them into two groups according to whether or not they involve significant constriction of the vocal tract. Vowels are those sounds that have little or no constriction, while consonants are all those that involve some degree of constriction, from total to moderate. If we consider some of the other consonant sounds, we will quickly see that constriction is a matter of degree, not either/or. Producing the s in aspire involves much more constriction of the vocal tract than is found in vowels, but less than occurs in sounds like p, t, and k. Even though the tongue mostly blocks the flow of air while producing an s sound, still the sound can be sustained, which shows that the blockage is not total. Sounds such as the r in raw involve still less constriction, even though this degree of constriction is still greater than that for vowels. In forming constrictions of the vocal tract various parts of the tongue touch or approach several important landmarks along the roof of the mouth. The most important of

these landmarks for describing consonants are the teeth, the alveolar ridge (a slight prominence that we can feel with our tongue, just behind our upper teeth), the hard palate (the bony part of the roof of your mouth), and the velum. These are used to make or shape the constrictions of the vocal tract that characterize many consonants. Different parts of the tongue are used for different consonants, the constriction being produced with the tip of the tongue, the tongue blade (the area just behind the tip), various points along the upper surface of the tongue, or the tongue root.

2.4 DISTINGUISHING CONSONANTS

Consonants can be differentiated in any language by reference to three parameters; place of articulation, manner of articulation, and voicing. Other parameters will also be relevant in some languages.

2.4.1 Place of Articulation

The place of articulation for a consonant is the point in the vocal tract where the constriction for that consonant is formed. For each of the places of articulation listed below, consider what other consonants there might be (other than those used as examples below) that use the same place of articulation.

1. Bilabial A bilabial place of articulation is used for the first sound in words like pin and bin. Notice that in saying these words you begin by bringing your lips together.
2. Labiodentals Words like fin begin with a labiodentals articulation in which the upper teeth contact or approach the lower lip.
3. Dental Dental articulations are those like the first consonant in thin that involve the tongue touching or approaching the back of the teeth.
4. Alveolar The front of the tongue touches or approaches the alveolar ridge in forming consonants such at those at the beginning of tin and den.
5. Palatal Notice that the first sounds in chump and jump also involve the front of the tongue touching the roof of the mouth, but a bit further back than with the alveolar examples above. This more back point of contact is the (hard) palate. Though most palatal sounds use the front of the tongue, there is one in English that uses the back of the tongue; this is the first sound in yet.
6. Velar In the first sounds in cow and gout, the back of the tongue rises high enough to touch the velum, making a closure there.
7. Aspirates Sometimes the vocal folds are drawn close enough together to produce a slight hissing or whispering sound. This is called a glottal place of articulation and occurs in the first sound of words like how and who in English.

2.4.2 Manner of Articulation

Obviously, there must be some further way to differentiate consonants because in English there are two or more consonants that are produced at each of the places of articulation described above (except for glottals). The next basic distinction has to do with how much the flow of air is constricted in the vocal tract. Tack and sack both begin with alveolar sounds, but they are not identical. What distinguishes them is the extent to which a constriction is made at the alveolar ridge in these two cases.

1. Stop Tack begins with what is known as a stop consonant. Stop consonants are those where there is a momentary complete closure of the vocal tract. Notice that while making the first sound in tack we cannot hum or breathe. If we were to start to say tack very slowly and a little loudly and we then were to freeze at the moment when the tongue touches the alveolar ridge, our vocal tract would be completely closed, with no air able to enter or leave through our mouth or nose. We can't hum through stop consonants because humming requires moving air through the vocal folds, which you can't do when the vocal tract is completely blocked higher up. Such a complete blockage is characteristic of consonants that have the stop manner of articulation. The constriction that characterizes the consonant is made by briefly completely stopping the flow of air. In normal fast speech, however, this interruption of the flow of air can be extremely brief, sometimes only a few milliseconds (thousandths of a second).
2. Fricative Another way to interrupt the flow of air out of the mouth occurs in the first sound in sack. Here the tongue approaches the alveolar ridge, but allows a small channel to form between the tongue and the roof of the mouth. Air rushing through this small channel becomes very turbulent and produces the hissing sound that is characteristic of this sort of consonant. Notice that the first sound in sack can be sustained. We can take a deep breath and make the s in ssssssssack last as long as our air holds out.
3. Affricate Affricates combine the stop and fricative manners of articulation into a single new type. In words like chat the first sound begins with a palatal stop, but then very quickly moves into a fricative at the same point of articulation.
4. Nasal The first sound in Macintosh is a nasal, a sound where the flow of air is blocked in the mouth but allowed to flow freely through the nasal cavity. Nasals involve an articulation inside the oral cavity that corresponds to some stop. Thus, the first sounds in Mack and back are both stop consonants in so far as the activity of the lips is concerned (closing off the airstreams altogether). However, we'll notice that we can hum through the first sound in Mack, but not the first sound in back. The reason for this is that we produce nasals by lowering the velum to allow air to pass from the pharynx into the nasal cavity and out the nose.
5. Liquid Liquids are somewhat vowel-like articulations that allow quite free passage of air around an obstruction. The air may flow freely around the sides of the tongue, as in the first sound in lake, or it may flow over a curled back tongue, as in the first sound in rake.
6. Glide The first sounds in we and yes are called glides, which are the most vowel-like of the consonants. In these sounds the airflow is quite free. Notice that the first sound in we is very similar to the first sound in oops, and the first sound in yes is quite similar to the first sound in eat.

2.4.2 Voicing

Overlaid on top of the two dimensions of place of articulation and manner of articulation there is a third dimension, that of voicing. As we'll see, there are pairs of consonants that have the same place and manner of articulation, but different voicing properties. If we were to watch a slow motion video of someone saying sap and zap it would be difficult to impossible to tell which was which without the sound because the motions in the mouth for these two consonants are identical. Nevertheless, we can not only hear but also feel a difference between these two. To make the difference clear, place your fingers on your Adam's apple and produce a long hissing

sound that alternates between being an s or z sound, like this: ssssszzzzzsssssszzzzzsssssszzzzzsssssszzzzz. You should feel a slight buzzing sensation in your fingers on the z sounds (but not on the s sounds). The source of this buzzing sensation is vibration of the vocal folds. During the z articulation, the vocal folds are drawn close together and air is forced between them, which causes them to vibrate. During the s articulations, the folds are held apart and air flows freely through the glottis (the opening between the vocal folds). Thus, we say that zap begins with a voiced consonant while sap begins with a voiceless consonant. This contrast is used widely. In each of the following pairs there are two consonants of the same place and manner of articulation that are distinguished in terms of voicing: pat and bat, fat and vat, thin and then, and cot and got.

2.8 DISTINGUISHING VOWELS

Vowels are voiced and vowel articulations involve little constriction of the vocal tract. Thus, vowels are distinguished by way of different timbres or qualities in the sound that are produced by giving the inside of the mouth different shapes. You may have noticed that if you speak or sing into a large barrel or a length of large-diameter pipe, your voice suddenly sounds very different. In fact, it will sound noticeably different in different diameters and lengths of pipe. The vocal tract takes advantage of the same acoustical principles that produce these differences to produce the acoustical qualities of different vowels. This is achieved largely by shifting the tongue into different postures. By raising the tongue high into the forward part of the mouth (and enlarging the spaces at the back of the mouth) we produce the vowel quality in words like bee and key. By pulling the tongue down and somewhat back toward the back wall of the pharynx we produce sounds like the vowels in cot and pot. The vowels in loot and coot are produced by raising the back of the tongue toward the velum, but not getting it close enough to produce any constriction or noise. These differences in tongue posture can be described in terms of two parameters, those of tongue height and backness. Thus, the vowel in key is a high front vowel, the first one in father is a low back vowel and the one in coot is a high back vowel. Another important factor in the differentiation of vowels is lip rounding. The vowels in keep and coop are different in two respects. The first is high front and the second high back, but you will notice that if you switch back and forth between these vowels, you will purse your lips somewhat on the vowel in coop, but not on the vowel in keep. This drawing together of the lips is called rounding and it plays a role in a number of back vowels.

2.9 CONSONANT CHARTS

The various ways of distinguishing consonants and vowels that we have discussed above are used in the two charts shown below. These charts illustrate how the consonants and vowels can be distinguished by reference to the several parameters we have discussed above. An IPA symbol is given for each sound in each table, along with a common word that uses the sound.

3. SYNTHESIS STRATEGY

First Speech synthesizer Voder of Homer Dudley in 1939, a device for analyzing the speech into slowly varying accoustic parameter that could then derive a synthesizer to reconstruct a approximation to original waveform. Not long after, “the pattern playback synthesizer” was developed in Haskins laboratories, which converted the pattern seen on broadband spectrogram. Voder and pattern

play back were methods for copying the time-varying spectral patterns of speech. Next step in history of speech synthesis was the development of an accoustic theory of speech production.

3.1 FORMANT SYNTHESIS

Formant synthesis use simple set of rules formulated in acoustic domain to synthesize speech at runtime. Parameters such as voiced, time varying amplitudes and phases, fundamental frequency and noise levels are used to create a waveform of synthetic speech. This method is sometimes called rules-based synthesis. Our synthesizer is based on klatt model of formant synthesis. Generally formant synthesis technique generates artificial, robotic-sounding speech. Formant synthesis systems have advantages over concatenative systems, being of not a natural voice. Formant-synthesized speeches have high intelligibility, even at very high speeds, avoiding the acoustic glitches that commonly happen in concatenative systems. High-speed synthesized speech is used by the visually impaired to quickly navigate computers using a screen reader. A formant synthesizer uses rules to synthesize speech so it is smaller than concatenative systems as there is no role of speech database. They can therefore be used in mobile devices or embedded systems. Formant-based systems are rule or parameter based speech synthesis system so, a wide variety of styles and prosodies can be output, as well as a variety of emotions and speaking styles also.

3.2 ARTICULATORY SYNTHESIS

It tries to model the human vocal organs, so it is most difficult. They attempt to model faithfully the mechanical motions of the articulators and resulting distributions of volume velocity and sound pressure in the lungs, larynx, and vocal and nasal tracts .It requires X-ray analysis of speech, but this data is 2-D, so it difficult to optimize 3-D vocal tract.

3.3 HMM-BASED SYNTHESIS

HMM-based synthesis is abbreviated from hidden Markov models, also called Statistical Parametric Synthesis. In this system, the excitation features (logarithm of fundamental frequency (log F0) and its dynamic features), spectrum features (mel cepstral coefficients and its dynamic features), and duration (prosody) of speech are modeled simultaneously by HMMs. Speech waveforms are synthesized from HMMs themselves based on the maximum likelihood criterion. HMM based speech synthesis aims to develop and implement a new algorithm in the area of text-to-speech synthesis (TTS) that will lead to decreases in disk and memory requirements at a relative speech quality level e.g. smaller devices and web applications. Minimization of the amount of voice recordings needed to create a new synthetic voice. Speaker adaptation, emotions, etc can be synthesized by altering the parameters. No need to record multiple times for different speaker and styles as in concatenative synthesis.

3.4 CONCATENATIVE SYNTHESIS

Stored speech segments are concatenated for synthesis. The synthesized output produces a natural sound or speech. Here speech segments such as phrase, word, syllable, diphone or phoneme concatenate with each other to produce synthesized output. They can be combine in any fashion and the sequence depends on the unit’s availability in the voice corpus. A smaller unit such as phoneme may not have the required co-articulation. The preferred order of concatenation is phrase followed by word, syllable, diphone and

phoneme. The continuous speech segment if concatenated gives better synthesized output. For example contenation of syllable “v aa” and “c a k” gives better result than mere concatenation of its phoneme “v” “aa” “c” “a” “k” There are three types of concatenative synthesis namely Unit selection, diphone synthesis, domain specific. In Vaachak Unit selection approach is used for concatenation.

4. VAACHAK TEXT-TO-SPEECH – A CONCATENATIVE SYNTHESIS ENGINE

4.1 BLOCK DIAGRAM OF SPEECH SYNTHESIS IN VAACHAK

4.2 TEXT PROCESSOR

4.2.1 BLOCK DIAGRAM

First, the tags supported by Vaachak, are checked for their proper opening and closing. After the tag validity, paragraph is broken into sentences. Then on each sentence Text Pre Processing (TPP) rules are applied. TPP ensures that all the tokens in a sentence get converted into word. At last Letter To Sound (LTS) and Syllabify rules are applied. LTS and Syllabify rules ensure proper pronunciation.

4.2.2 CONFIGURABLE RULE FILE FOR TPP, LTS AND TRANSLITERATION

TPP, LTS and transliteration rules can be modified easily which are written in text files using regular expressions.

4.3 UNIT PROCESSOR

4.3.1 BLOCK DIAGRAM

Phrase is searched in the voice corpus. If it is not found it then splits one level down to words. For ex if syllabalized word is not found in voice corpus, it will split into syllables. Similarly if syllable is not found in the voice corpus, it breaks up into diphone. If diphone is not found in the voice corpus, it breaks up into phoneme. The units when found in the voice corpus are inserted in the heterogeneous vector.

4.4 SYNTHESIZER

4.4.1 BLOCK DIAGRAM

The units present in heterogeneous list are searched in voice corpus. The similar feature units will then create a cluster. The best candidate is selected from each cluster by applying Viterbi. The best candidate is then windowed joined to generate speech.

4.5 SAPI COMPLIANT

Microsoft Speech API provides standard set of interfaces for speech synthesis that is used within Windows applications. Vaachak has an extension which makes it SAPI compliant.

4.6 TTS RUN AS WIN32 SERVICE

Vaachak can be run as a standard windows service.

4.7 SUPPORT FOR WAVE MANIPULATION USING THIRD PARTY TOOLS

Waveform generated from Vaachak can be manipulated on windows using any third party tool for amplitude, speed etc.

5. FUTURE COURSE

A lot of improvements are planned for enhancement of Vaachak. Few of these are listed.

5.1 DEVELOPMENT OF TTS IN OTHER INDIAN LANGUAGES Most of the Indian languages are phonetic so TTS can be developed using the model for Hindi TTS with variation in LTS module and slight variation in phoneme database. This way we can have a multilingual TTS Engine.

5.2 DEVELOPMENT OF TTS USING HMM

Currently we are using Concatenative synthesis. In future we will work on building HMM based voice through OpenMary for HTS. The HMM voice has a very low foot print.

References

• Alan W. Black, Perfect synthesis for all of the people all of the time. IEEE TTS Workshop 2002. <http://www.cs.cmu.edu/~awb/papers/IEEE2002/allthetime/allthetime.html>

• Alan W. Black, Unit Selection Synthesis, 2002-09-30 <http://www.cs.cmu.edu/~awb/papers/IEEE2002/allthetime/node1.html>

• An efficient unit-selection method for concatenative text-to-speech synthesis systems <http://business.highbeam.com/435985/article-1G1-187909286/efficient-unitselection-methodconcatenative- textspeech>

• A speech synthesizer written entirely in the JavaTM programming language <http://freetts.sourceforge.net/docs/index.php>

External links

• The Indian Language Text to Speech Software (http:/ / www. prologixsoft. com/ vaachak. htm)

• Demonstration of Speech Synthesis (http:/ / vaachak. mla. iitk. ac. in/ VaachakSite/)

• Text-to-Speech (TTS) software for Indian Languages and English (http:/ / contentxchange. in/ producer/ vaachak)

• Microsoft goes vernacular, introduces Vaachak (http:/ / www. expresscomputeronline. com/ 20021028/ indnews1.shtml)

• Indic Language Text-to-speech (http:/ / tdil. mit. gov. in/ vaachaktexttospeechsystemapril03. pdf)

• Building HMM voice through OpenMary (http://mary.dfki.de/)

Refreshable Braille Displays

Information displayed on a computer can be accessed and read in Braille format using a refreshable Braille device. The refreshable Braille device can be connected to a computer like any other hardware device and works along with a screen reader.

The refreshable Braille display displays information using Braille cells. A Braille cell is made up of a series of dots. Information in Braille format is displayed using different combinations of dots. The refreshable Braille display works by electronically raising or lowering small metal or plastic pins to form Braille characters. Users then use their hands to read the Braille characters.

The refreshable Braille display displays one line at a given time. The location of the current cursor determines the information that will be displayed. As soon as the reader completes reading one line he can navigate to the next one.

The number of characters displayed at a given time varies for each display. In general Braille displays can display 40, 70, or 80 characters.

Braille displays are very expensive and their price depends on the number of characters that can be displayed. The larger the number of characters displayed, the higher the price. A Braille display has to be bought along with a screen reader, further hiking up the price. The refreshable Braille display is usually placed below a keyboard. The user can then access the Braille cell along with the keyboard. The Braille display consists of buttons that help users to move their hands quickly between the display and keyboard.

Features and Functioning of a Braille display
1. Single or multiple rows of cursor routing buttons
2. Programmable buttons to assign hotkeys for frequently programmable tasks
3. Scroll by line, sentence, paragraph and pan through the document
4. Capable of taking notes & storing files.

Refreshable Braille displays are used by people who are blind or deaf blind. The users give the input to the computer via the keyboard and access the output in Braille display. Users navigate within an application using command keys, cursor routing keys, and screen reader strokes.

Different types of Braille display are Focus Braille display & ALVA 570 Satellite Braille display.

Screen Enlargers

A screen magnifier is a software that interfaces with a computer's graphical output to present enlarged screen content. It is a type of assistive technology suitable for visually impaired people with some functional vision. Ranges of 1 to 16 times magnification are common with screen magnifiers. The greater the magnification the smaller the part of the original screen content that can be viewed, so users will be likely to use the lowest magnification they can manage.

Screen magnifiers are very useful for people with eyesight problems such as macula degeneration or loss of acuteness. These basic applications allow a customizable magnification bar and limited options. Screen magnification software can enlarge the content displayed on a computer screen. Users can choose the magnification level that best suits their personal needs and ease. These softwares can also display webpage content in black and white or in neutral, which allows high contrast for people who have troubles differentiating between colors.

Types of screen magnifiers
Two years ago there were two types of screen magnifiers: professional and simple. Professional screen magnifiers include features like full screen magnification, full tracking and font smoothing. Simple screen magnifiers only magnify an area around the mouse cursor or in a fixed window on the desktop.

Simple screen magnifiers cannot magnify the full screen, only tracking the mouse cursor and not the input caret and other Windows objects like menus and form elements. Another important difference between professional screen magnifiers and an intermediate screen magnifier is that the intermediate screen magnifier does not magnify while the user interface is active. That means that people with low vision mostly need assistance of a sighted person to configure an intermediate screen magnifier to fulfill their needs.

Features of several magnification systems are discussed below:

1. Desktop Video Magnifiers Desktop video magnifiers with dedicated monitors allow you to magnify any text, such as in a newspaper, book or magazine, to a readable size for different users.
2. Magnifying Video Cameras As using desktop video magnifiers can be a costly solution, magnifying video cameras are also available for connection to a computer monitor, TV screen or through a DVD player to a projection screen. These systems generally include a base with the video camera on a swing arm above it.
3. Portable Video Magnifiers Portable Video Magnifiers are also available. The size of this device is of a paperback books, which can be used in public places, such as in restaurants or in hotels for reading menus.
4. Zoom text v9.1: Zoom text v9.1 does not only zoom and improve all that is on your screen, it can make you hear everything you are doing in all of your applications. It will read for you your documents, Emails and web pages so that you do not have to force your eyes to do it yourself. Zoom text will provide a high definition image of text at any magnification level making it easier then ever to recognize what you are reading. It also comes with built in productivity tools that will make everything quick and easy to find.

All of this can also support dual monitors to further expand your view with two computer screens. You can use the second screen to share a magnified or unmagnified view of your desktop. Special features include:

Dual Monitor Support. Use two monitors to expand your magnified viewing area.
Improved Screen Colors. Innovative color controls improve screen clarity and reduce eyestrain.

Visible Pointers and Cursors. Size and color enhancements make it easy to see the mouse pointer.

Desktop Finder helps you find and launch programs and documents on your desktop, system tray and quick launch bar.

Web Finder helps you find links and controls in any web page, allowing you to navigate the web with faster than ever before.

Vista Logon Support. Provides essential magnification and screen reading support when logging in Windows Vista.

Complete Screen Reading. Zoom Text automatically speaks all program controls, including menus, dialogs, list views and messages.

Automatic Document Reading. Zoom Text's appreader automatically reads documents, web pages and email for you within the parent application.

Full Internet Accessibility. Zoom Text reads any web page in the proper reading order. You can read automatically or manually navigate by word, line, sentence and paragraph.
5. Supernova Reader / Magnifier: Supernova offers magnification, speech and Braille support, giving people with visual impairments the freedom to access Windows in the way that suits them best. It is portable and can be used on any computer through a USB port, for low vision to blind computer users from around the world.

Supernova includes magnification, speech and Braille output to provide for all types of visual impairments. A combined screen reader and magnifier helps to reduce eye strain by allowing users to increase magnification or add speech. It runs on many operating systems, network installations, Terminal Server and Citrix support. Magnification from the point of logon and choice of magnification style with options such as split screen, whole screen and window to suit your needs. Compatible with a range of digital cctvs such as Optelec, Clear note & LVI MLS Student. Customize color schemes on screen to meet your sight requirements and replace problem

colors. Docreader for easier viewing of long documents. Full screen magnifier with features such as variable magnification, multiple screen management styles and a variety of color replacement options. Includes a full screen reader for people who are blind, which can cope with text and Braille input together with speech and Braille output. Fast and accurate multilingual Braille output for text at your fingertips. Access difficult websites with ease by choosing to list links, headings or frames.

Screen Readers

A screen reader is a computer application that helps visually impaired and low vision persons to use a computer for various purposes. A screen reader works like an interpreter. It gathers from the operating system the information on what is displayed on screen. This information pertains to highlighted text/controls, screen layout, key strokes, menu bar, background/foreground colour detection and dialog boxes that can be read out by means of text to speech (TTS). TTS is another computer application that synthesizes a voice; it speaks on the direction of the screen reader.

Screen readers provide commands and tutor messages to the computer. It echoes keystrokes; when users press any key on the keyboard, the screen reader says it. When a user moves focus from one control to another control, it says the focus item. It provides the quick keys navigation facility for web browsers and e-mails clients programs, which makes easy selection and jumping of elements in web pages. It provides virtual buffer, which can virtualize the non standard dialog box, making reading easier. A revolutionary feature of the screen reader is mouse handling by keyboard.

Sometimes a screen reader is better than the display. Screen readers can read what can’t seen by eyes. ASCII codes values, html elements anchors, widgits, link lists in web pages where user can jumps faster than the mouse are all readable using a screen reader.

Free Screen Readers

NVDA

Today, identifying employment opportunities for visually impaired and training them with specific skills is not that difficult as there are plenty of choices. But one of the biggest challenges is to convince employer to procure assistive technology such as screen reader. Most screen readers are expensive, and in general, employers would not be willing to invest a huge amount of money on a single employee.

Non Visual Desk Top Access (NVDA) is the ultimate solution to this problem. NVDA is a free and open source screen reader for Microsoft Windows that enables people with vision impairment to have access to the computer at no greater cost than sighted users.
NVDA can either be installed to a Windows based PC / Laptop or can entirely run on a USB stick / any other portable media without need of installation. Major highlights of NVDA includes support for web browsing with Mozilla Firefox, Internet Explorer, E-mail with Mozilla Thunder bird, Outlook Express, IBM Lotus Symphony, Accessible Java Applications, Adobe Reader, etc.

NVDA supports several international languages among English such as Finnish, French, German, Brazilian Portuguese, etc. Besides offering its interface in several languages, NVDA can also enable the user to read content in any language as long as there's a speech synthesizer that supports that language. NVDA is bundled with eSpeak and supports SAPI4 and SAPI5 speech engines.

NVDA has received recognition, including the Vision Australia Making a difference Award 2009.

NVDA is a useful screen reader for visually impaired users and also for those who would need to test their web application for accessibility.

Braille Embossers

A Braille embosser is a device that embosses Braille on paper.

Braille is a kind of script used by blind and visually challenged people to read and write. It looks like embossed patterns of dots. It contains combination of one to six dots in two columns vertically arrange as three and three. The six dots make up a single cell, which normally depicts a character. By combination of those six dots makes the different character and symbols. This script was invented by Louis Braille.
Embossing means carving or raising a design, dots or any pattern above the normal surface. The embosser is a device that makes production of the Braille books easy; in earlier days, Braille books were produced by means of writing page by page, a tedious and expensive task. When Braille books began to be made by presses, every page had to be first embossed on a metal sheet and every sheet of paper pressed by that sheet. This was also a slow process.

Description of the Device

A Braille embosser is a printer used for producing Braille. It uses the impact printer technology to emboss Braille dots. It works like as a dot-matrix printer but instead of printing on normal paper, it embosses on thick sheets. Although thick sheets are convenient for a long life of dot impressions, their use increases the overhead costs of embossing; this is because making an impact on thick paper requires more power and energy. Braille embossers normally behave like printers and are connected with the computer as peripheral devices, with the help of translation software, which translates the electronic text into combinations of Braille dots that can be embossed on paper. This makes production of Braille books easy and cost-effective.

Braille embossers can be divided into various categories on bases of shape/size. An embosser can be portable (those embossers that are light weight, small in size and easy to carry) or stationary (those that require fixed places for installation), embossing capability, like single-sided (emboss paper sheet only one side at a time) or double sided (embossing both sides simultaneously). Text embossers (embosser that can emboss only Braille text) or tactile graphics embossers (capable of embossing Braille text and tactile graphics also). Another type of embosser is that which can both print and emboss on a single paper that can be read by blind or sighted persons.

Paper specification

Braille cannot be written on normal printing paper. Braille embossers require special paper thicker than print paper, which must be of a particular thickness/weight, between 2 and 5mm per sheet or forty to one twenty pounds per 144 sheets. There are different sorts of embossers that require different types of sheets, like roll paper, cutting sheet, Pam fold sheets. Roll paper is available in bulk and cheap in cost but its handling requires more complex machinery. Cutting sheet are especially designed for Braille embossers, cut to a particular length and width. Pam fold sheets are continuous sheets and perforated at fixed length intervals; both sides of these sheets have holes in a series for embosser tractor, like as telephones bills, railways tickets, etc. which reduce the embosser manufacturing cost.

Embosser Specifications

Single-sided embossers

A Single-sided Braille Embosser is ideal for those who need or want to have the capabilities of producing Braille documents, but on a smaller scale. If space is an issue, single-sided Braille Embossers are compact as well as portable.

Romeo Attaché

It is the desktop-based embosser with print capability. Suitable for class rooms, small offices and home users. The main features are: (1) Regular (12.5 dots per inch) and high-resolution (17 DPI) graphics (2) Dynamic Braille Scaling for different Braille sizes (even within a document) (3) 6 or 8-dot Braille

Romeo Attaché Pro

This is the feature-rich successor of Romeo Attaché. It has a self-speech system so that it can be operated with speech input also. There are several upgraded features: (1) ET Speaks for automatic speech feedback as you use your Romeo Attaché Pro (2) Single Sheet Tractors let you emboss up to 22 lines on 11-inch non-tractor paper (such as letterhead or other special media) by hand-feeding one sheet at a time

Romeo 25

This is a variant of the Romeo series with more power and durability. It has a speed of 25 characters per second with lid support. Important features are: (1) Impact adjustment for heavier or lighter paper (2) Capacity of up to 99 copies of a document

Romeo Pro 50

This is a successor to the Romeo 25, offering double the speed and greater accuracy.

Romeo Pro-LE

This is intended especially for Braille labeling needs comes in two variants. Narrow can emboss 24 Braille character per line and wide can 40 characters. Based on Romeo pro features. : (1) Adjustable vertical label sizes from 0.5 inches to 4.0 inches in 0.25 inch increments (2) Produce approximately 4,500, 1.5 inch by 6 inch labels, in one hour (3) Visual On/Off Line LED Indicator

Thomas

Named in honor of the late William A. Thomas, former board chairman of Enabling Technologies, the 40-character-per-second "Tommy" makes fast, top quality, single-sided Braille inside a noise-muffling desktop case. Thomas' standard features include: • Regular (12.5 dots per inch) and high-resolution (17 DPI) graphics • Dynamic Braille Scaling for different Braille sizes (even within a document) • 6 or 8-dot Braille • Capacity of up to 99 copies of a document

Thomas Pro

The Thomas Pro is the advanced successor to Thomas.

BTec 100

The vendor claims that this is the smallest embosser in the world.

Marathon

The vender claimed that this is the fastest of the single-sided Braille embosser.

Double-sided Braille Embossers

A double-sided Braille Embosser has the capability to emboss Braille on the front and back of each sheet of paper. This reduces the amount of paper used to create a document by half, versus a single-sided Braille Embosser. Double-sided Braille reduces the number of pages and weight of the finished document for those who need to carry their work with them, such as students, and for those who ship their finished document.

Juliet Classic

It is capable of embossing 56 characters per second in double-sided mode.

Juliet Pro

This is a feature-rich version of Juliet Classic. Important features are 1. ET Speaks for automatic speech feedback as you use your Juliet Pro 2. Single Sheet Tractors let you emboss up to 22 lines on 11 inch non tractor paper (such as letterhead or other special media) by hand-feeding one sheet at a time

ET

This is yet another successor to Classic in the interpoint series, with 60 characters per second speed.

Juliet Pro 60

This is a feature-rich version of Juliet Pro.

Basic-D

This is a high-performance double-sided embosser by Index Braille.

Everest

Everest is very flexible as to paper requirements; there is no need for special paper. It is eminently suitable for use in developing countries.

There are several Commercial Production Braille Embossers available in the market:

BookM

This is a desktop double-sided production model that embosses Braille at 80 cps. It can hold 500 pages in its memory with five hours running in a day.

BRLX100

This is a desktop double-sided production model that embosses Braille at 100 cps.

BRLX150

This is a desktop double-sided production model that embosses Braille at 150 cps.

Braille Place

THis is a free-standing double-sided production model that embosses Braille at 300 cps.

PED-30 Plate Embossing Device

This unique production embosser produces Braille on zinc plates that are transferred to modified printing presses for mass production of Braille magazines, books, etc.

Premier and Elite Braille Embossers with speeds up to 80, 100, 150 and 200 cps with 3-d dots are also available:

4X4 PRO

This model is very good for cheap Braille production.

4Waves-PRO

This is a heavy duty four modular embosser with no halt.
Several models are available for embossing Braille and simultaneously printing:
Gemini
This unique embosser produces Braille and print at the same time in the same document.
Emprint Braille Embosser
This model allows for Braille embossing with colour printing on a single sheet of paper. It allows for a speed of 50 cps.
Specific products are available for Braille labelling:

PrestoBraille
This unique product allows you to stamp Braille into plastics to add to signs.
Braille Labeler BL-1000
This is the new Braille Labeler model BL-1000 from KGS Corporation.
Pro Braille Gen II Embosser
This has a speed of 100 cps, with tactile graphics.
Software requirements
Because of the computerized interface of every Braille embosser, drivers and softwares are required. These may come with the device. However, mainstream products like word processors, spread sheets, and web browsers cannot communicate directly with Braille embossers as they do with printers. There is a need for a mediator to translate normal print text into Braille text. Braille translation softwares perform this function:
(1) The Duxbury Braille Translator version 10.7-sr1 is the most popular Braille translator for Windows. It supports many different languages and works with all embossers.
(2) Mega dots Version 2.4 is also product from Duxbury Systems. It is an excellent Braille translator for DOS. It supports all embossers and printers regardless of whether they are specifically made for Windows or not.
(3) Win Braille Version 5 ships free with Index Braille products. It is a driver and translator with basic features; the advanced version has more features and is available for purchase.
(4) Robo Braille is a free Braille translator for DOS developed by the National Federation of the Blind [USA].

Keyboard Filters

Keyboard filters are typing aids such as word prediction utilities and add-on spell-checkers. They can significantly reduce the number of keystrokes required to be made for a person with disabilities. The function of the keyboard filter is to enable users to quickly access

the letters they need and avoid selecting the keys they don’t want. Keyboard filters can also help correct typing errors and make up for slow response times. For most keyboard filters, the behaviour of the different keys can be adapted to suit specific accessibility needs.

Speech Recognition Software

Speech recognition is the functionality of being able to identify and understand speech and convert spoken words to text. The term "voice recognition” is sometimes used to refer to speech recognition. It is also known as automatic speech recognition or computer speech recognition.

History

The first speech recognizer appeared in 1952 and consisted of a device for the recognition of single spoken digits. Another early device was the IBM Shoebox, exhibited at the 1964 New York World's Fair.

Usage and Applications

Health Care

One of the most notable domains for the commercial application of speech recognition has been health care and in particular the work of the medical transcriptionist (MT). However, at first, it was technically deficient and therefore avoided by many people. Additionally, to be used effectively, it required changes to the ways physicians worked and documented clinical encounters, which many if not all were reluctant to make. The situation has changed with improvement in technologies.

Many experts in the field anticipate that with increased use of speech recognition technology, the services provided may be redistributed rather than replaced. It can be implemented in the front end or back end of the medical documentation process. In Front-End SR, the provider dictates into a speech-recognition engine, the recognized words are displayed right after they are spoken, and the dictator is responsible for editing and signing off on the document. In Back-End SR or Deferred SR, the provider dictates into a digital dictation system; the voice is routed through a speech-recognition machine, and the recognized draft document is routed along with the original voice file to the MT/editor, who edits the draft and finalizes the report.

Many Electronic Medical Records (EMR) applications can be more effective and may be performed more easily when deployed in conjunction with a speech-recognition engine. Searches, queries, and form filling may all be faster to perform by voice than by using a keyboard.

The biggest limitation in speech recognition automating transcription, however, is the software. The nature of narrative dictation is highly interpretive and often requires judgment that can be provided by a real human but not yet by an automated system. Another limitation has been the extensive amount of time required by the user and/or system provider to train the software.

Telephony and other domains
ASR in the field of telephony is now commonplace and is becoming more widespread in the field of computer gaming and simulation . The improvement of mobile processor speeds made feasible the speech-enabled Symbian and Windows Mobile Smartphones. However, current speech-to-text programs are too large and require too much CPU power to be practical for the Pocket PC. Speech is used mostly as a part of User Interface, for creating pre-defined or custom speech commands. Leading software vendors in this field are Microsoft Corporation (Microsoft Voice Command), Nuance Communications (Nuance Voice Control), Vito Technology (VITO Voice2Go) and Speereo Software (Speereo Voice Translator). Since these softwares are very costly, not everyone can afford them.

Accessibility
People with disabilities can benefit from speech recognition programs, especially the orthopedically challenged who have difficulty using their hands or disabilities that preclude using conventional computer input devices. In fact, people who used the keyboard a lot may also use it to do their work without difficulties, especially if they have developed repetitive stress injuries.
It can also be used for the hearing impaired in deaf telephony, such as voicemail to text, relay services, and captioned telephone.
Further applications
• Automatic translation • Automotive speech recognition (e.g., Ford Sync) • Telematics (e.g., vehicle Navigation Systems) • Court reporting (Realtime Voice Writing) • Hands-free computing: voice command recognition computer user interface • Home automation • Interactive voice response (IVRS) • Mobile telephony, including mobile email • Multimodal interaction • Pronunciation evaluation in computer-aided language learning applications • Robotics • Video Games, possible expansion into the RTS genre following Tom Clancy's EndWar • Transcription (digital speech-to-text). • Speech-to-text (transcription of speech into mobile text messages) • Air Traffic Control Speech Recognition

Speech Recognition Software and Productivity

Speech recognition used to be the province of computer geeks or those who had no other means of entering data onto the computer. Today, however, more and more people are beginning to use speech recognition for its productivity benefits. Most people can dictate significantly faster than they can type. Dictation can be at over 100 words a minute while typing is almost half that. On top of that, the increase in repetitive stress injury has led to the adoption of speech recognition.

Speech recognition today works best in environments where there is a significant degree of repetition. This includes but is not limited to call centers, doctor's offices and so on. However, there are a number of writers, playwrights and journalists who use speech

recognition every day. The advantage of repetitive text is that it is possible to construct macros around it which would further help automate its entry.

How Speech Recognition Works

Before we look at specific speech recognition options, it is important to understand how it works. Most of today's consumer grade speech recognition software uses probability and statistics. Speech recognition software tracks how frequently words occur by themselves and in the context of other words. Based on this information, it does a number of calculations and finally selects the most appropriate word from its word list. This is why, even though you may dictate the correct word, you'll find a wrong word in the text of your dictation. This, of course, can be corrected by training it in context for that matter, any speech recognition software out as a time of this writing, needs to be corrected continuously. This allows the program to learn your writing style which includes tracking the differing contexts of word usage.

Screen Readers and Speech Recognition

If you were blind, then combining screen readers with speech recognition was almost impossible. However, in the past three years, there have been three notable solutions to help you do this. The first two solutions are by a company called T&T Consultancy. Their flagship product is J-Say which provides a complete set of commands to allow the user to have full control over his computer using speech. A lot of people, however do not need this level of control. They only want to use speech recognition before dictation and then use the keyboard for all of the commands. To cater to this set of audience, T&T Consultancy have released their J-Tools product. Both the programs work with JAWS for Windows from freedom scientific.

If you are not a JAWS user, then there is one other option namely the system access screen reader which is going to be supporting speech recognition on Windows 7.

Using Speech Recognition

Irrespective of what solution you use, there are certain basic things you need to keep in mind when using speech recognition technology.

Appreciating the difference from the keyboard

Speech recognition is a completely different paradigm. We need to find different ways of doing things. For example, issuing repeated keystrokes becomes very challenging; this is why you need to start making your macros.

Counting navigation units

A screen reader only gives information about the current line. Many tasks in speech recognition involved counting the number of words or number of units to navigate. For example, if you want to go write three paragraphs, you will need to tell the program to go write three paragraphs. However, the above illustration presupposes that you know that you navigate forward by three paragraphs. There is no easy way to know when using a screen reader how many units to move. Therefore, you need to do a fair bit of approximation. It is also helpful to use a single command such as "next to" and see how far it takes you. This way, you may get an idea about counting.

Continuous teaching
This has already been covered but continually training speech recognition system in the prescribed manner is absolutely crucial for getting accurate results. You also need to keep updating the system's vocabulary.
Another critical concept to understand is microphone control. If you leave the microphone switched on all the time, you'll enter a situation where there will be a lot of junk data being transcribed into your document. Keep the microphone switched on only when you need to take.

The right hardware
It is crucial that you have hardware that is adequate for speech recognition. Most people are cajoled into purchasing entry-level microphones. These do not help. To get good accuracy, it is important to get the right hardware. This includes not only a good microphone but also a good processor and a sufficient amount of RAM.

Speak like a newscaster
One of the best ways to dictate is to speak like a newscaster. Newscasters are clear and do not use too much prosody. You need to speak the same way in speech recognition.
Math
If you need to dictate math, there is a program called MathTalk that interfaces with Dragon NaturallySpeaking to facilitate the dictation of mathematical expression. A variant of this program is also bundled with Scientific Notebook which also allows the user to produce graphs by voice and write LaTeX.

Text-to-speech Synthesizers

TTS (text to speech) is a technology that originated from speech synthesis. Developed in the 1960s, TTS converts ASCII characters (electronic text) into sound phonemes; the combination of phonemes arranged in proper order produces the vowels/consonants

followed by words, phrases, and then sentences. At first, these vocal stimulations were not so pleasing to hear because they did not sound like human vocalizations but this situation has improved.

This technology was mainly developed for telephone answering machines, weather forecast and later used in a lot of commonly used goods such as toys, talking watches, calculators etc. TTS is very useful for persons with disabilities, especially speech impaired persons. Famous scientist Stephen Hawking, for instance, uses the TTS technology for communication. In conjunction with screen readers, TTS supports visually impaired persons and facilitates blind/low vision people acquiring information about the computer's display in the form of audible sound. This empowers blind persons in a world full of computers, e-mail, internet etc.

In earlier days TTS technology could be implemented only on dedicated hardware. It has only been a couple of years since TTS is being seen as an independent software package regardless of the complex coupling of hardware, firmware, and software. The hardware TTS can only work on wave form signal generation (an electronic mechanism which produce the sound by noise segmentations), whereas software TTS is the base for back hand technology like unit form (it stores a small-sized voice recording of human voice on a very large data base and plays it in concatenation), di phones TTS (it contains only the audible di phones sounds played by intelligent segmentation and indexing techniques) and many more, but not widely used in production of TTS. The wave generation system is very fast and robust and performs on various speed and pitch levels, but the voice output is not as natural as the sound of human narration. It is very useful in conjunction with screen readers and provides high speed, quick response and low memory/processing overheads. Unit forms TTS have very natural voice output, ideal for I.V.R. systems and news casting. Di phones TTS are simple in design and have low processing requirements; they are good for free project development.

Popular hardware/software TTS
Accent family synthesizers are available in various shapes, sizes and hardware platforms. ACCENT-1600, ACCENT-L40, ACCENT-MC, ACCENT-MINI, ACCENT-PC, ACCENT-SX were the internal speech synthesizers connected to modem or to slot of computers and laptops. ACCENT-SA and ACCENT external were the stand alone units those which work on serial interface.
APOLLO/ APOLLO2 are one-pound external speech synthesizers that interface with IBM compatible computers via the serial port; there is a special cable available for parallel interface. It comes with its own screen review program, "HAL," and also works with IBM's screen reader. It is based on digital signal processor synthesis technology.

ARTIC TRANSPORT (MODELS 615 & 611) are portable size synthesizers, less than one pound in weight. They come bundled with their own screen reader program and also work on other screen readers.

Braille and Speak is a Braille embosser and speech synthesizer in single unit product of human ware corporation. It takes over by scientific freedom later. It supports parallel and serial interface or both, clear pronunciations, and customized speech rate, and works with all well known screen readers.
Dectalk express and dectalk USB both have very clear voicing and are highly intelligent multi voicing speech synthesizers. They provide voice inflection, sentence ridum and intonation.
Express has an internal module and USB.
Doubletalk LT is a totally self-contained voice synthesizer. Speaker, headphone jack, volume control, and serial interface are all built into the unit. No special software or drivers of any kind are required; simply plug the unit into any standard RS-232 serial port and send it to the text you would like read, just as if it were a printer.
Naturalistic and feature-rich software based synthesizers have taken the place of many of the devices listed above.
Dectalk Access 32 for Windows and Dectalk RT for Linux are the software variants of the most popular and eldest of Dectalk Express. Low memory foot print, multi voice, quick response, sentence ridden and voice inflection are their main features. It implements their proprietary application program interface (dapi).
Eloquence is another small and powerful TTS engine. It supports multi language speech, is versatile, and has robust speech capabilities. Due to its voice clearance, it is very popular in assistive technology products. Most commercial screen reader venders provide with it default synthesizers free of cost.
Microsoft also provides the TTS with operating system and set the standard for speech application programming interface (sapi) to avoid the compatibility problems amongst different venders.
Some open source TTS have also been developed but are not so good in naturalistic voice response even though eminently for free and low budget projects of individuals and NGOs. Espeak, a cross platform, multi lingual and tiny TTS, and Flite, a Linux-based TTS that runs on Festival speech server, are two examples.

Talking and Large-print Word Processors

Talking Word Processors
The talking word processor is a useful utility tool to build word processing skills. A user can create and edit Microsoft Word documents without having to purchase Microsoft Word. The talking word processor has many of the features that are available in Microsoft Word. It can read virtually any document and a user can cut and paste into it from the internet. There is also a built-in 25,000-word dictionary. The definition of the word will appear by just double-clicking on it.
Several important features are:

(1) Talking grammar check: This includes syntax errors, misused words, number argument, verb tense, abbreviation form and a total of 29 categories.
(2) Language model information summarization (LMIS): This feature lets the user quickly summarize the information in a document. This powerful tool works using language model algorithms. The LMIS lets a user quickly process large volumes of text-based content.
(3) Word prediction: Word prediction is a technology developed to assist people who have difficulty spelling and writing. As a person writes, word prediction displays a list of the most probable words from which the typist can select the appropriate one. The technology can help in reducing the number of keystrokes made.
(4) Talking spell check: This built in spell check will read the words to the user and people will know the right word when they hear it.

The talking word processor employs a wide variety of styles to read text back to the user. These are word repeat, sentence repeat, highlight one word at a time, highlight word and sentence, highlight word and paragraph, change foreground and background, word pause, and word view.

Additional features are talking capabilities, talking grammar check, highlighting and text extraction, adjustable voice rates, an inbuilt thesaurus, sentence repeat, etc.
Large-print Word Processors
A computer screen offers a display medium that presents to the user, among other things, the possibility of control over presentation of text, size, style, and color.
Screen magnification software increases the size of the image displayed on the screen, so only a portion of the original screen can be seen at a time. Screen magnification will automatically follow the focus of attention, so that the area around the cursor, mouse pointer, or highlighted menu item is magnified. The mouse can move the magnifying window to other parts of the original screen image. Some screen magnification programs provide speech output as well. The contents of Word documents, menu items, and icons are usually spoken out.
Some low cost screen magnification products include the following:
(1) iZoom magnifies 1.5 to 16 times. It changes the display colors and has some speech support. It runs on Windows XP. A free download available from Issist.
(2) Bigshot has been developed for users who have computer vision syndrome. There are 20 levels of magnification, which will magnify part of or the whole screen.
(3) Magnus magnifies from 2 to 16 times, with font smoothing and color inversion.

TTY and TTD conversion modems

TTY Modem

When a typical voice-based telephone is used the audible information is converted into electrical information so that it can travel through the lines to the desired destination, where it is converted back into audible information.

With a text based communication system, the user must articulate his or her thoughts in a text format or type them out on the keyboard. The listener reads the message at the other end.

A product that is based on this technology is the 14.4 Kbps TTY modem produced by Nexion.

The features that this modem has are: (1) Integrated phone book, which allows a user to store and dial commonly used numbers at the touch of a button (2) Text editor, which allows a user to save, edit, copy, paste, and print conversations, answering machine messages, or other text (3) Viewing and printing answering machine messages (4) Making and receiving calls easily through on-screen buttons (5) Fax support

TDD Modem

A TDD/VOICE Modem can be connected to a local computer and a telephone line. The TDD/VOICE modem transmits TDD Signals over the telephone line to and from a voice remote device (such as a remote TDD/ITU Modem or telephone). The modem can be used in a network where an indicator on a display screen indicates sound energy received by the modem over the line. The modem system can allow a jump in speed during a call. The modem system has a display screen split into two vertical areas, to display text sent between remote computers. The text sent by one computer is displayed in the right vertical area, while the text sent by the other computer is displayed on the left.

The other features of the modem system are a special provision for 300 BPS connections, voice recognition, typing during a file transfer, and prevention of file transfers or high speed transfers. A local modem can also communicate control information to a remote modem.

Braille Devices

Braille lite 40

Braille lite 40 is a refreshable Braille note taker that has a number of features from a complete word processor to a personal organizer. This Braille display can read documents or even entire electronic books. Two advance bars allow scrolling and 40 cursor routers allow instant movement to any cell on display, for fast and easy editing. The Braille lite 40 can be combined with screen access software like Jaws for Windows.

Versapoint Brailler

The Versapoint is a high quality, reliable, low maintenance Braille embosser. It can economically complete high volume Braille production. Braille can be configured for six dot and eight dot outputs of speeds up to 60 characters per second and 42 characters per line. There is a speech synthesizer option.

P.I.A.F.

Picture in a flash, P.I.A.F, is a controlled heat source for the automatic development of heat sensitive paper. It provides for high quality tactile graphics meant for blind people to be made quickly.

Slate & Stylus

These devices incorporate slates and frames where each dot is embossed downward by a stylus. This calls for writing Braille in mirror image from right to left. Some Braille slates are part of a frame; a two line slate can be stepped down a page to give a whole page of Braille. Plastic slates are lighter than metal ones but the hinges have a lower life expectancy.

Perkins Brailler

Braille is based on six dots. It consists of 63 symbols made up of all possible variations of the dots. 26 of them represent the letters of the alphabet and 10, punctuation marks. They can be used to produce a print copy letter by letter. This is known as grade 1 or uncontracted Braille.

Grade 2 Braille was developed to reduce the size of the books and make reading quicker. Other symbols are used to represent common letter combinations. For example “OW”, “ER”, and words such as “AND” and “FOR”.

Braille ‘n’ Speak

Braille ‘n’ Speak is a compact pocket note-taker that allows Braille users to manage information quickly, quietly, and reliably. It can be easily operated by simple commands entered on a seven-key Braille keyboard. This device can be used as a talking computer terminal, a Braille-to-print transcriber and a word processor, a talking calculator, clock, and calendar. This device has enough memory to remember about two thousand pages of Braille.

Mount Batten Brailler

The MB Pro is a device that has both digitized as well as synthetic speech capability, providing a multi sensory approach to learning Braille. A user can combine typing and touching Braille along with real audio speech. The synthetic speech features enable a user to create an assignment, edit text, modify, delete, block text, and produce a copy of the assignment in Braille.

Wikki Stix

Wikki-stix is used to print letter shapes and three dimensional figures. Wikki stix cling to the paper and can be examined by touch. The Wikki cord can be used again and again. Each package contains 48 cords, eight inches long.

Duxbury Translation

Duxbury Braille translator (DBT) and megadots are used by many of the worlds leading Braille publishers. DBT supports grade 1 and grade 2 translation to English, Spanish, French, Portuguese, Arabic, Malaysian, Swedish, and other languages. DBT can produce contracted and uncontracted Braille, Math's, and technical Braille. DBT can import MS Word files and turn them into Braille. Braille can also be created from any kind of word processor.

Talking scientific calculator

This audio calculator performs 15 scientific functions and speaks the keys as they are pressed. Its features include number editing, trigonometry, and transcendental functions.

DAISY

The original concept of DAISY was developed to address the need for an accessible audio format that could be used by individuals who are unable to read print as easily and efficiently as a sighted person uses a printed book. DAISY provides direct access to specific points, enabling readers to move from heading to heading, page to page, and word to word. DAISY books have synchronized text and images that provide a complete multimedia experience.

DAISY stands for Digital Accessible Information System. It is a digital reading format which can include structured audio, text and graphics in the same production. The key word here is structured, as anything the format be it audio, text, or combined audio and text. DAISY allows the reader to navigate through the book on up to six levels, making it possible to jump to specific sections, subsections, chapters, pages and even phrases. By way of an example, the DAISY TV listings produced weekly by RNIB can be browsed by day, channel, and time of day and programme in less time than it takes to find the remote control. In addition, the reader can insert bookmarks for future reference.

In short, DAISY is a better way to read, allowing books to be interrogated rather than read. The ability to synchronize the full text of a book with the audio tracks has benefits for all readers with any kind of print impairment, including those with dyslexia or learning disabilities, as the text can be read on screen, and highlighted in time with the audio.

Technicalities

The audio is made up of MP3 files, along with tags which allow the book to be indexed and allow the user to navigate the book flexibly. The book is compressed, so that up to twenty five hours can be recorded on a single CD. It deals with all the formats of accessible books including Braille, Talking Book, E-text books and large print books. There are various organizations which provide books to read in accessible format.

Advantages of DAISY

DAISY has many advantages over traditional audio books. The DAISY System is transforming the reading and learning experiences of people who have a print disability in over 50 countries around the world.

DAISY books offer several advantages over books on tape and commercial books on CD: DAISY books give people who are blind or print disabled an improved way to read. With links between text and narration, DAISY books allow a reader to go to directly to specific sections, chapters or pages, and place bookmarks. This ability to move around the book is not available with books on tape or CD. When you finish reading, a digital playback device will remember where you stopped, and resume play at that same place when you start to read again. DAISY books have better sound quality when compared to books on tape. The digital recording decreases the traditional hiss and background noise found on cassette, especially books that have been played many times. This is important to readers who may have some hearing impairment. An entire DAISY book can be contained on one CD, while books on tape can contain on multiple cassettes. One CD reduces the frustration of sorting multiple tapes for low vision readers and prevents the disturbance of missing or damaged parts of a book. Up to 50 hours of audio may be contained on one DAISY CD the equivalent of more than 30 standard cassettes.

Types of DAISY books

1. Audio with navigation 2. Audio and full text with navigation 3. Text with navigation

The type of DAISY book that offers the richest content and best user experience is audio and full text with navigation.

How to play a DAISY book

Daisy books can either be played on a computer using a software Daisy player, or on a range of hardware players. These are available in a variety of shapes and sizes.

How to produce a DAISY book

DAISY books can be produced in a variety of ways, depending on the money available to buy software and hardware, the time available for training, and the time available to produce the book.

The Plextalk PTR2 and Plextalk Recording Software (PRS) are well suited for audio only DAISY recordings, for people who wish to record lectures and seminars.
Easy producer is a simple piece of software which can convert a structured Word document into a digital talking book using a synthetic text to speech engine. This is a great way of quickly making materials accessible such as public information, advertising material, educational materials and even instructions.
Easy publisher is the most comprehensive Daisy production tool, capable of producing full text and audio books, using either human narration or synthetic speech. It is aimed at anyone wishing to produce materials on a large scale, and is used, for example, by the RNIB transcription centres at Tarporley and Ivybridge, who produce various leisure and academic titles each year.

The Buddy Player

DAISY is a revolutionary technology for reading books. It has a capability of presenting and customising the content according to the needs of users.
DAISY is a book with the capability of synchronising audio, text and graphics.
DAISY books also have excellent navigation facility where uses can reach any part of a book or jump to the previous or next sentence, page or chapter withh a click of a button. These books are accessible to everyone including persons with any kind of disability.
Persons with disabilities in developing countries are unable to make use of this technology due to the high cost of Daisy book players. Buddy player is finally coming to bridge this gap.

DAISY Books are developed by organisations serving persons with blindness or low vision. Buddy player now makes these books available to persons in developing countries.

Features

- HiFi Music Player
- Stereo FM Radio with recording
- Dictaphone/ Voice Notes
- Music recording - Through Mic/ Line in

- Gadgets - Talking alarms, calendar
- SRS **WOW Audio** Enhancement
- 2/4/8 Giga Byte internal Flash
- Built-in speaker
- Built-in SD Card Reader
- Large display - 2.4" high resolution TFT screen
- Innovative User Interface - Simple and intuitive navigation of functions, Power saving Ul
- User replaceable Li Polymer Battery

- **Direct Charging** through **USB/DC** Adaptor
- Field upgrade of firmware

DAISY Reader

- Digital Talking Book Reader
- Support for Daisy 2.02
- Text "highlight" – For Text & Audio Playback Synchronization
- Navigation- Chapter/Section based navigation, Paragraph/Phrase based navigation, Page Navigation, Time based navigation

Assistive Technologies

- High contrast and large fonts
- Asymmetrical and “touch friendly” button orientation
- Simple user interface- optimized with “few levels”
- Voice assisted menus for navigation
- Voice tagged folders and playlists
- Voice based “info button”

Keyboard Use

Windows system key combinations
F1: Help
CTRL+ESC: Open start menu
ALT+TAB: Switch between open programs
ALT+F4: Quit program
Shift+Delete: Delete item permanently
Windows Logo+L: Lock the computer
Windows program key combinations
CTRL+C: Copy
CTRL+X: Cut
CTRL+V: Paste
CTRL+Z: Undo
CTRL+B: Bold
CTRL+U: Underline
CTRL+I: Italic
General keyboard only commands
F1: Starts windows help
F10: Activate menu bar options
Shift+F10: Opens a shortcut menu for the selected item (same as right clicking an object)
CTRL+ESC: Opens the start menu
CTRL+SHIFT+ESC: Opens windows task manager
ALT+DOWN ARROW: Opens a drop down list box
ALT+TAB: Switch to another running
SHIFT: Press and hold down the shift key while you insert a CD-ROM to bypass the automatic run feature
ALT+SPACE: Displays the main windows system menu
ALT+ (HYPHEN): Displays the multiple document interface(MDI), Child windows system menu
CTRL+TAB: Switch to the next child window or the multiple document interface
ALT+ Underlined letter in menu: Opens the menu
ALT+F4: Closes the current window
CTRL+F4: Closes the multiple document interface window

ALT+F6: Switch between multiple windows in the same program

Ergonomics of Keyboard and Mouse

It is essential to place the keyboard and mouse in a correct and proper way so as to avoid health problems & injuries. The keyboard and mouse should be so placed keeping in mind the following points. They are: (1) Height and orientation (2) Placement (3) Design and use

Height & orientation

If the keyboard and mouse are placed at an awkward height or angle, it can cause employees to bend their wrists or lift their arms for a lengthy period of time. It is recommended that the work surface may need to be lowered or raised to keep the user's arms in a comfortable position. Installation of an adjustable keyboard extender or tray or an adjustable table can solve the problem.

The keyboard or the chair height should be so adjusted that the user's elbows are placed comfortably at the side of the body. The shoulders should be relaxed and the wrist should not be bent up or down while using the keyboard.

An important factor to be kept in mind is the angle at which the keyboard is placed along with the height. The forearms should be placed parallel to the floor with the elbows at the sides.

Placement

If a keyboard or mouse is not placed directly in front of the user, he or she will have to reach out while using it. Therefore the mouse and the keyboard should be placed directly in front of the user. The mouse should be placed at the user's side with his or her arm close to the body. There should be a straight line between the hand and the forearm. The upper arm should not be elevated or extended while using the mouse.

Design & use

The wrists should not be bent sideways or up and down while usin the keyboard. The solution for this is to move the entire arm so as to reduce bending the wrists. Also do not use the feet provided at the back of the keyboard if it causes the wrists to bend upward.

The wrist should be positioned straight, not bent up or down. A mouse pad or wrist rest should be used to place the wrists in a straight position. Alternative keyboards or trackballs or touchpad can be useful in allowing the user to maintain a neutral wrist position.

Headphones

Headphones
Dolby headphone technology is based on a unique signal processing system that allows a stereo headphone to play the sound of a five-speaker, surround sound playback system.
Dolby headphone technology plays multichannel sound sources like Dolby digital & Dolby surround movies. It has been designed to produce far more sound on stereo sources, from CDs to MP3 files.
The Dolby headphone technology can be used with virtually any type of product: audio, video, PC, or video game.
Difference between speakers & headphones
In a speaker, as the sound from the stereo system reaches the listener's inner ears, it acquires a set of spatial cues from the acoustics of the room and the physical properties of the head and the outer ears. These cues enable the brain to localize the sound and combine them into a soundfield, that places the performers in front of the listener as they would be at a live performance.

Headphones, on the other hand, feed the sound directly into the eardrums, without any of the spatial cues. This results in an unnaturally wide image that forms a straight line between the ears.

Left and right sounds appear directly besides the listener while the center sounds appear within the head. The overall result is unrealistic and can cause listener fatigue.
Dolby Headphone Technology
Using powerful digital signal processing technology, Dolby headphones electronically send to each audio channel, two on stereo programs and up to five on surround programs, the sonic signature of a corresponding speaker that has been placed in a defined acoustic environment. What this means is that Dolby headphone technology creates up to five virtual loudspeakers in a virtual room.

This is done by means of a processor that combines all the information into two encoded channels that deliver to each of the ears through conventional stereo headphones a sound that is direct and reflected from each virtual speaker. This phenomenon causes the listening sensation to be much more natural with the sound appearing out of the head.

Due to the power of its signal processing Dolby headphone technology can present the sound of a playback system in up to three different listening environments, based on acoustic measurements of real rooms. They are-
DH1: This is a small well damped room suited for movies and music recording.
DH2: It is more suited to music but can be used for movies too.
DH3: This is a large room like a concert hall or theater.
Dolby headphone technology works well with all listeners. The Dolby headphone technology works with CD, MP3 Files, and any other multichannel program source like Dolby sound, Dolby digital, MPEG encoded. It can be included in any product that provides a headphone jack like PCs, Laptops, DVD-Video, DVD-Audio, MP3 Players, Game consoles, Portable stereos, Digital TVs, Home theater's, VCRs, etc.

Seeing with Sound

When it comes to restoring vision, there are a plethora of options that are available. We are familiar with retinal implants, cornea transplants and stem cells. Most of these options are experimental, require invasive surgery and are expensive. They are also condition specific and the technology behind them is untested. Most of the above approaches involve stimulating the retina in some way; alternatively, they bypass the retina and stimulate the visual cortex directly. However, there are alternative approaches that involve a different approach. They utilize the principle of sensory substitution where one sense is used to substitute for another. There are two viable devices that utilize this approach. One is the brain port that vibrates the tongue using an array of sensors placed on it. The user wears a pair of glasses that have a camera mounted on them. The image taken by the camera is sent to a small computer which is then sent to the sensors. Another device or rather program is the vOICe which converts images to sound. It too utilizes a camera with a computer but can be used just on a computer as well for static images.

vOICe

Most people mistakenly think that the vOICe is like ultra sound and the user has to memorize the sound of various objects. This is not the case. The vOICe uses a mathematically defined mapping to sound a scene. It is this mapping that helps you in interpreting the images. Namely: • Whatever object is on your left you hear on your left, and similarly, whatever object is on your right you hear on your right. • The pitch represents height; therefore, the higher the pitch, the higher the object. • The volume represents brightness, such that the louder the soundscape, the brighter the object.

You may wonder how such mapping would translate into vision; this is where the neuron plasticity comes in. Neural plasticity refers to the ability of the human brain to reconfigure itself based on external stimuli. All sensory input from any organ of the body is translated into electrical impulses. For example, once light hits the retina, it is translated into a series of electrical impulses and then relayed to the brain. Similarly, when you hear a particular bit of sound, that sound is converted into electrical impulses. In people who are visually impaired, the visual cortex gets utilized for other functions. However, when the brain receives the particular set of sounds that translate into suitable electrical impulses, it realizes that it is actually getting visual input even though the input is from the ears. It knows that the most efficient way to process this visual input is to use the visual cortex since the visual cortex has been designed for this purpose. Thus, the visual cortex gets rerecruited for visual functions.

Use of vOICe

When it comes to learning, learning to use the vOICe is like learning a language. As anyone who has tried learning a foreign language will know, one of the most annoying stipulations of the teacher is not to translate everything into one's native language. The usefulness of this does not become apparent until a good bit of the course is over. Every language has its own nuances and translation only interferes with efficient processing. The same is the case with the vOICe. You will need to initially use your hands to feel what you are looking at but with sufficient practice this will become unnecessary. There are several ways that you can start learning to use the vOICe. All the ways though involve starting with basic shapes like triangles, circles, lines at differing angles etc. if you have a webcam and a small computer or a suitable mobile phone, you can go immersive and move around using the vOICe. Look at common objects like a bookshelf, your table, chairs, the clutter on the sideboard etc. Get used to how objects look visually. When dealing with vision, you will need to understand concepts such as perspective so that you can gauge distance accurately. You can do this even though you have monocular vision. As you come closer to an object, the object will fill a larger part of the view. Similarly, as you move away from an object, the object will fill a lesser amount of the view. It is important to be able to distinguish the foreground and background in a scene. This ability will come with practice. The vOICe has a lot of options such as zoom (useful for taking a detailed look at an object), inverse video (which is useful to see dark objects on a light background), speed control for the sonification (useful for slowing down soundscapes) etc. The vOICe can tell you the color of the item in the center of the camera view. The color identifier is not as accurate as a dedicated color identifier. This is due to the lack of a reference light. The vOICe uses ambient lighting which can yield to variable results with identifying color. Also, you need to ensure that you position the camera lens such that ambient light falls onto the object whose color you are trying to recognize.

Getting Started

You can download the program on to your computer. Start by looking at static images or follow along as you make changes on your computer screen. The vOICe has the ability to sonify the area under the mouse pointer as well as the entire screen. An interesting exercise is to navigate around the computer keeping your screen reader active and setting the vOICe to sonify the area under the mouse. You will be able to sense the changes on the computer screen as they take place.
Some points to note:
You need to use a pair of headphones with the vOICe. If you use speakers, you will be unable to fully appreciate the soundscapes and will have a hard tie interpreting the panning.
There is an exercise mode in the vOICe which allows you to practice with randomly placed shapes. You can configure what shapes are shown.
The vOICe allows you to take high resolution snapshots and the PC version also allows you to video what you are looking at.
The PC version runs on most versions of Microsoft Windows including Windows 7, Windows Vista, Windows XP, Windows 98 etc.

Speech Synthesizers

The speech synthesizer is a device that converts text characters into sounds that sound like those made by a human voice. The sound output and its clarity depend on the type of synthesizer that is used.

The first modern speech synthesizer was developed by Bell Laboratories in the 1930s. It was known as the vacoder. Data was entered with the help of a keyboard, processed by the system, and the output was generated in the form of sounds to form words. In the 1950s speech synthesizer was developed that used images as well as entered text. Progress in technology meant that by the 70’s there were speech synthesizers that were able to closely reproduce human speech. The arrival of the computer gave a further boost to the development of the speech synthesizer. The device used along with a computer produces voice patterns that are the same as those of human speech and cannot be differentiated from it.

An example is the eSpeak compact open source software speech synthesizer for English and other languages, for Linux and Windows. eSpeak produces good quality English speech. It can run a command line program to speak text from a file or from stdin. The main features of eSpeak are that it includes different voices, whose characteristics can be altered. It can produce speech output as a WAV file. SSML(speech synthesis markup language) is supported and also HTML. It is compact in size; the program and data is about 1 Mbytes. It can translate text to phoneme codes, so that it can be adapted as a front end for another speech synthesis engine. Development tools are available for producing and tuning phoneme data. It is written in C++.

There are SAP15 and command line versions of eSpeak. The SAP15 version can be used with screen readers such as NVDA, JAWS, Supernova, and Windows-eyes.

Dexterity Problems

People with motor or manual dexterity problems tire easily or are sensitive to changes in the weather. The symptoms include chronic pain. Most conditions are stable but there are others like muscular dystrophy, arthritis, and multiple sclerosis that can be degenerative.

These conditions cause difficulties in activities like writing or anything using fine motor skills. However the capacity to learn and understand is not affected by these difficulties, except for with those who have cognitive or memory problems.

The physical environment forms the greatest barrier for those people who have mobility and motor difficulties. There are certain strategies and equipment which can help in overcoming these difficulties. For example, a student may need help with his daily studies. A personal assistant can assist him with taking notes, carrying books, using material, etc. Also, assistance will be needed for personal activities like eating, washing, using the toilet, etc. A volunteer or a paid assistant can provide support in these matters.

The assistant should be well trained so that he can handle the disabled person properly.
For people who have limited or no use of their hands or arms, there is a whole range of equipment available that may be helpful. Tape recorders and pen drives are useful devices to record information. Keyboards can be modified for people who cannot write as well as others. A pointer or switch device that can be operated by any part of the body can also be used. Special software is available that can predict what a person writes from the first few words that he or she types. Voice recognition software is also a very useful tool.

For people who are wheelchair bound, there are specially designed chairs and desks. An occupational therapist can solve any problems that may occur.

Mouse Adapters for People with Hand Tremors
For people with hand tremors who cannot use an ordinary mouse, there are now new mouse adapters available which will help them overcome their disability. The mouse adapter filters out the high frequency shaky component of the movement and transmits only the steady part. This device could enable millions of people afflicted with hand tremors to perform mouse operations.

The mouse adapter works using a mathematical equation that takes the motion data coming from the mouse and filters out the high frequency motions, or, to put it simply, any quick shaking from tremors, then sends a slow steady motion to the computer.

The Technology
The adapter is about the size of a handheld calculator. It is plugged in between the mouse and the computer. There is a microprocessor inside the device. This microprocessor takes the motion data that would normally be transferred from the mouse to the computer and filters it using a mathematical algorithm, which filters out the shaky, unsteady, jerky movements. Only the steady part of the motion data is transferred to the computer.
The mouse adapter is produced by Montrose Secam, a British company. No additional software is needed to use the mouse adapter.

OCR Softwares

Introduction
Optical character recognition or OCR is a process by which printed text is converted into a machine-readable format. That is, optical character recognition software allows us to convert printed text to formats that we can read on the computer.

Optical character recognition has been around for a very long time. However, early systems were far more prone to error and were only used in specialized applications. For example, large companies such as the Reader's Digest magazine used OCR to scan daily receipts. Needless to say, these systems were expensive, unwieldy, and could only be used for text that had been produced in a specific font. Today's systems can handle general text, including text written in multiple fonts. Significant advances in OCR technology also mean that it is possible to run OCR software on a mobile phone.

How does Optical Character Recognition software work

OCR software starts by analyzing the image of the text that has to be recognized. This image is broken up into pages, paragraphs, and words, and finally into characters. After this, there are three primary ways that OCR software can recognize the text.

The first is by pattern matching where the image of a character is compared to a series of images stored in the database of the OCR. A limitation of this method is that only those characters that are already in the OCR program’s database can be recognized.

A second method is called feature extraction. In this case, OCR programs look at the fundamental attributes of a character and then determine what the character is. For example, the letter "a" is made from a circle, a line on the right side of that circle and an arc over the middle. The arc over the middle is optional. So, if a scanned character image had these attributes or features it would be identified as the letter "a."

A third method is using dictionaries. These dictionaries are language specific. This method is usually used after the other two methods have been tried. The remaining characters, or characters where the program is unsure of its recognition, are run past dictionaries. If there is a character match then that character is substituted for the scanned character image.

Today's OCR programs use all three methods to achieve the highest quality of recognition. Even then, the recognition is not a hundred percent accurate since image quality, the different fonts used, character sizes etc vary greatly.

Intelligent character recognition

Intelligent character recognition is often incorrectly referred to as optical character recognition. ICR recognizes handwriting by tracking the motion of the writer. This is the technology you use when you write using a digital stylus on a palm top or mobile phone. The technology can also recognize words. The software has a system where it learns using a neural network and adapts to your handwriting.

OCR programs and accessibility

The accessibility challenges when dealing with OCR applications are almost the same as those faced in making other applications accessible. However, there are certain unique features of OCR programs that pose accessibility challenges. For example, several OCR programs allow users to review the OCR image and to select parts of that image using the mouse. For screen reader users, this is almost impossible to do. The same applies to features where pattern training needs to be carried out.

OCR applications for the disabled

OCR, besides yielding tremendous efficiency benefits in the process automation arena, has allowed the blind to read printed material. There are specialist OCR applications that overcome some of the accessibility challenges outlined in the above sections.

Specialist versus main stream OCR software

There are special OCR applications that have been developed for the blind. The two best known such applications are the Kurzweil 1000 made by Kurzweil Educational Systems and Open Book made by Freedom Scientific. Mainstream applications include Finereader made by ABBYY and Omnipage made by Nuance. All these applications are accessible.
These applications include special features such as the editing of DAISY format books, simultaneous scanning and reading and multiple OCR engines and the converting of text to mp3 format. Mainstream applications do not have these features, but do give comparable recognition results in most cases. You will need to decide which type of application will meet your particular needs. For example, if you are a college student or in a work situation, you may need to scan read, so you would go for a specialist application, but if you are in school or need OCR for home use, you could probably go for a mainstream application.

Recognizing Mathematics

The reading of plain text as well as tables and other complex formatting is almost a solved problem. Not much research is being conducted in this area. However, the reading of mathematics is an upcoming area of research. The primary challenge when analyzing mathematical text is that mathematical text is not in a straight line. A lot of mathematical characters involved superscripts, subscripts and so on. How can recognition software analyze what part of a picture belongs to what character?

One of the first optical character recognition programs to try mathematical recognition is called Infty Reader. This program is made by the science access project. Infty Reader can scan directly or can import various images containing mathematical content. Once these images have been converted to text, they can be transformed to any format of the user's choice.

Caution: the current version of Infty Reader expects very clean images. These images need to be black and white. The best way to achieve this cleanliness, especially if you are blind and scanning, is to use Fine Reader to carry out pre-processing on the image as you want to convert to text. Once Finereader has carried out pre-processing, you can run these images through Infty Reader and have them converted to text.

Scanning music notation
It is possible to scan and edit music notation. You can do this by using products from dancing dots. The main product for scanning and recognizing music is called sharp eye. Dancing dots has created bridging technology that makes sharp eye accessible to users of assistive devices. Once you have scanned the music, using the good feel line of products, you can hear what you have scanned and edit it if necessary.
Recognizing Braille

It is possible to recognize Braille and convert it to electronic text. One of the programs for doing this is called optical Braille recognition. The program's website claims an accuracy rating of 99 point nine eight percent.

Future developments in optical character recognition

The number of languages that optical character recognition software supports is increasing steadily. Also, OCR software is becoming more and more accurate out of the box. There's also been a move towards online OCR applications. Several of these have mushroomed recently such as scanR http://www.scanr.com and TextScout.

An emerging application of OCR technology is translation using the mobile phone. Companies like Nokia have released software that allows a person to capture written text using a mobile phone camera and then converting that image into text either on the phone or online. Also, camera-based OCR is becoming increasingly popular making a good many scanners obsolete.

Camera OCR

There are several products on the market that allow a user to use a camera and recognized text. These products include the Si Recogniser from Si Systems and the Eye-Pal from ABISee, Inc. On the mobile phone, there are products such as the KNFB reader and the multi-scanner program from Nokia that allow you to convert images to text. The Eye-Pal is a separate unit which consists of a tripod like stand and a corresponding camera.

The crucial variable in camera OCR is focus. You typically need a camera that is about five megapixels to do effective camera OCR. Along with that, the camera should support auto focus and, if it is handheld, should have an anti-Shake system. The autofocus facility will insure that you get sharp images of text that you photograph close to the camera. Lacking autofocus, a camera will be unable to do this and you will not get any results for camera OCR.

Another variable to consider for scanning is lighting. If you use a conventional flatbed scanner, the lighting is not a problem since the scanner has its own source of light. However, with camera OCR, you need to ensure that you have your own light source or the environment where you are taking the images is well lit. Along with the amount of light, the consistency of light on the page to be scanned makes a difference. The lighting needs to be uniform, otherwise shadows would be created in the darker patches of the page.

Getting a high-quality scan

Irrespective of the technology you use, you need to get a high-quality scan to ensure best results when using optical character recognition software. You essentially need to ensure that the lighting is uniform across the page and the images are clear and sharp. You can do this when using cameras as explained above. When using a flatbed scanner, the challenges become slightly different. The platen of the scanner must be clean to ensure uniform lighting across the document being scanned. Also, you need to select the correct image scanning method; that is, do you want a black and white image or, a grayscale image. To maximize OCR, a grayscale image is preferred. However, there are situations where black and white images yield better results.

When dealing with black-and-white images, it is important to adjust the brightness correctly. The Kurzweil 1000 has a notable feature that automatically optimizes the scanner settings for a given document. However, this feature works on statistics and must be used regularly to ensure best results on a large number of documents.
Whichever application you choose, insure that you consult the help document before trying to scan. This will tell you about any specific settings you may need to set.
A note on scanners
There is a bewildering array of scanners available on the market. When using optical character recognition software, you should ensure that the scanner can support a resolution of at least 600 dots per inch. Usually, the best resolution for OCR is 300 dots per inch. However, for coping with very small print, 400 dots per inch and even 600 dots per inch is preferred. Beware of several photo scanners on the market. They support higher resolutions, but may not be the best for use with optical character recognition software.
Also, you must ensure that the scanners are twain compliant. Twain is a standard that is used to interface scanners with computers. The optical character recognition program uses twain to control the scanner directly. This is far better than relying on the scanner's own interface for control since the interface could have several quirks such as stealing the application focus. Also, an optical character recognition program would need to be specially adapted to cope with every scanner’s individual interface. Most scanners are twain compliant but it is worth checking before purchase. Remember, buyer beware.
Another consideration is the size of the platen of the scanner. Most scanners and cameras can comfortably handle letter-size documents. However, if you need to scan legal size documents, then your options for scanners become significantly limited. Also, if you scan books frequently, then you may want to consider purchasing a book edge scanner. In a book edge scanner, the platen of the scanner runs right to the edge of the scanner. The advantage with this approach is that books with large bindings can be scanned easily, since the part of the page under the binding is able to fit onto the platen.

OCR and Mathematics Challenges

Recognizing mathematical expression has always been a challenging task for OCR (Optical Character Recognition) manufacturers due to the complexities involved. Conventional OCR programs have low accuracy for mathematics for several reasons. Some of them are described below:
• Unlike normal text, mathematics expression is not necessarily arranged on lines. Its character sizes vary the letter and symbol frequencies are distinct from normal text.
• Additionally even if the mathematics were somehow recognized conventional OCR programs whose traditional output is say ASCII text need to be substantially augmented with some meta level language before they can express math results as their output. Although most advanced word processing programs have some such escape mechanism for doing mathematics there is still no uniform standard

for expressing two dimensional layouts subscript positioning variable sized characters unusual math operators etc. Research projects based on the needs of mathematics computation systems have only recently begun to find the solution of this issue.

• In the absence of special mathematics recognition an OCR system generally tries to decode math as ordinary text and provide whatever is closest to some text within that model. This typically makes a mess of the mathematical expression. For example superscripts are either unrecognized or pushed down to the baseline. An integral sign may be ignored or viewed as an S.

Available Products

One of the first optical character recognition programs to try mathematical recognition is called the Infty Reader. This software is developed by the science access project. Infty Reader recognizes scanned image of clearly printed mathematical documents and outputs the recognition results in a XML format. It recognizes complex mathematical formulae used in various research papers of mathematics including matrices. Another feature of Infty Reader is its handwriting interface to input mathematical formulae for users with vision and speech interface for visually impaired users. It can scan directly or can import various images containing mathematical content. The XMl file output by Infty Reader can be converted to various formats like Latex, MathML, HTML and Braille Codes.

While using Infty Reader it is important that all source documents must be clearly printed. All images need to be black and white images scanned at 600 DPI.

Recently Microsoft has added new revolutionary “Math Handwriting Recognition” feature to the latest version of the Windows 7 operating system. This feature allows a user to enter mathematical expression by using Tablet PC, mouse or any other input device and to convert them into MathML format.

Accessibility in Windows

Windows Vista has built in accessibility features that make it easier to see, hear, and use the computer. The features are useful to people who have visual impairments, orthopedic disabilities, or reasoning and cognitive problems.

Ease of Access centre

The ease of access center in Windows Vista is a centralized location from where access is provided to adjust accessibility settings. The features here include quick access to common tools, start magnifier, narrator, onscreen keyboard, and high contrast. The quick access section is read aloud while it is highlighted, allowing a person to select a tool by pressing the spacebar when the tool name is read aloud or highlighted.

Get Recommendations

This is a questionnaire that inquires about routine tasks and provides recommendations on setting up accessibility features that will improve the user's ability to see, hear, and use the computer.

Explore all settings
The ease of access center also lets a user explore seven categories of accessibility tools and options.
Windows speech recognition
Windows speech recognition in Windows Vista aids users to interact with the computer by using their voices. It is designed for people who want to limit their use of the mouse and keyboard. A user can dictate documents and emails in mainstream applications, use the voice command to switch between applications, control the operating system and even fill out forms on the web. Speech recognition is available in English, German, French, Spanish, Japanese, and Chinese.
Magnifier
Magnifier, the magnification program built into Windows Vista, has a magnifying power of 2 to 16 times the original. There are two ways in which to activate the magnifier. (a) Start magnifier from quick access to common tools in the current session. (b) Turn on magnifier, so that it turns on automatically each time a user logs on.
Narrator
Narrator is a text to speech program (or basic screen reader) that is built into the windows vista. Narrator reads the menus without leaving the actual window. There are two ways to activate the narrator. (a) Start narrator from quick access to common tools for use in the current session. (b) Turn on narrator so that it turns on automatically each time a user logs on.

Captions
Programs use sound in animation to indicate activity on the computer (such as when a document starts or finishes printing). Using this option, a user can see the visual equivalents when sounds play.
On screen keyboard
The on screen keyboard lets the user type and interact with the computer using an alternative input device like a switch instead of a standard keyboard. The on screen keyboard displays a visual keyboard with all the standard keys. A user can select the keys using a mouse or a pointer device. There are two ways to activate an on screen keyboard. (a) Start the on screen keyboard from quick access to common tools in the open session. (b) Turn on the on screen keyboard so that it automatically starts each time a user logs on.
Control the mouse pointer with the keyboard
Instead of the mouse, the arrow keys on the keyboard or the numeric keypad can move the mouse.
Keyboard shortcuts

Keyboard shortcuts make it easier to use the computer. With a keyboard shortcut the mouse need not be used so often. Keyboard shortcuts can be found in the menu of programs.

Sticky keys

Instead of pressing multiple keys at once a user can press one key at a time when sticky keys are turned on.

Filter keys

This feature ignores keystrokes that occur rapidly in quick succession and also keystrokes that are held down for several seconds unintentionally.

Visual notification

System sounds are replaced with visual cues, like a flash on the screen, so that system alerts are announced with visual notifications.

Accessibility in Mackintosh

The Mackintosh operating system has a built in standard range of assistive technologies that help people with disabilities to access the computer. This group of features is known as universal access.

Voice Over built in screen reading

Mac OS X has an advanced screen reading technology called Voice Over. Voice Over enables those who are blind or have low vision to control their computer. The speech technology invented by Apple delivers intelligibility and natural intonation at the speaking rate of up to 700 words per minute.

Trackpad

Mac OS X Snow Leopard offers a new feature -- the computer can be controlled using gestures on a multitouch track pad even if a person cannot see the screen. The track pad surface on the Mac notebook is the active window on the computer. A person touches the track pad to hear the items under the finger, moves the finger continuously to hear items and flicks the finger to move to the next or previous item. The arrangements of items on the screen is heard and a person can jump directly to the item by just touching the corresponding location on the track pad. The finger can be dragged around the track pad to decipher how many items are arranged on a web page, a spreadsheet, a presentation, or any other document or text.

Braille support

The Mac is the only computer that supports Braille displays out of the box. This is a built-in support using the latest drivers for over 40 models, including wireless Bluetooth displays. No additional software is needed. A new feature called Braille mirroring has been introduced in the Snow Leopard. This feature enables multiple USB Braille displays to be connected to one computer simultaneously.

World class web browsing

Voice Over in Snow Leopard has new capabilities that make web browsing easier and faster. Powerful multicore processors can scan and analyze large complex web pages quickly. Voice Over can read an entire web page automatically after it loads AND a person can use key commands or gestures to control Voice Over as it is talking. Voice Over can provide a customizable web page summary, the title, number of tables, headers, links etc.

Snow leopard fully supports HTML web tables. A person can hear the conteNts of the table by dragging their fingers across the track pad.

Faster keyboard navigation

A new feature called Quick now uses arrow key combinations to move the Voice Over cursor so that the computer can be controlled using just one hand. A person can press the arrow keys to move up, down, left, and right. Other combinations can adjust the rotor and move the Voice Over cursor according to the setting. Web pages can be read and navigated in no time.

The Rotor

Instead of forcing a person to memorize keyboard shortcuts to navigate, Voice Over has a new feature called a rotor. It is turned by rotating two fingers on the track pad in the same way a dial is rotated. Voice Over then moves over the text according to the setting chosen. For example, setting the rotor to “word,” makes the Voice Over move through the text one word at a time. This makes it perfect for proof reading or editing text. The rotor can also navigate web pages.

Finding Information

Many web pages are full of complex designs or lack HTML tags, making them difficult for a screen reader to interpret. Therefore Apple’s Mac operating system has a new technology capable of comprehending and interpreting the visual design of the web pages, then assigning virtual tags called auto web spots to mark the locations on the page. For example, on a newspaper website, there will be auto web spots for each lead story, for the sports or weather sections and so on. A person can jump from web spot to web spot at the flick of a finger.

Create custom labels

Some applications have items that are not well labeled. Therefore Voice Over can only describe such items as blank or empty. If a person knows what the item is or is a sighted person he can assign a name to the label. The next time the person visits the item Voice Over will describe the item, using the label.

More customization

There are many features on Voice Over like punctuation, identifying changes in text, announcing links, etc. Verbosity levels can be set to low, medium, and high, or can be customized using 30 different settings. The order in which descriptions are spoken and the amount of description read can also be modified.

A feature known as Voice Over commanders a new category in Voice Over utility lets a person assign keys, and gestures to open an application, utility, file, run an applescript or automator workflow, or perform a Voice Over command. Commanders also help those with physical or learning disabilities by simplifying complex multikey shortcuts and make commands easier to reach and enter.

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Accessibility in Linux

The Linux operating system has provisions that cover the use of adaptive technologies as well as software and hardware devices that can be installed to make the computer accessible for users with disabilities.

Technologies for the visually impaired

Assistive technologies are available for the Linux operating system for visually impaired users and many of the software packages are available free of cost.

Screen Readers

Screen readers are software applications that translate the information on the computer screen into an audio format. The translation is passed on to a speech synthesizer and read out aloud. At present, fully functional screen readers are only available for Linux in console mode. The screen readers available are Emacspeak, Jupitor speech system, Screador, Speaker, Speakup, and Zipspeak.

Speech Synthesizers

Speech synthesizers are a hardware device or a text to speech software application that produces sounds needed to provide speech output. Although hardware synthesizers are available for Linux they can be very expensive. The solution is to download and install a software synthesizer such as IBM'S Via Voice.

Hardware speech synthesizer

A hardware synthesizer is a device that is connected to the computers serial or parallel ports that translates the text into spoken speech. There are Braille labels on all controls to show the off and on positions and volume control. Hardware synthesizers can be set to speak in different tones too. They are Accent SA, Apollo2, DEC Talk Express, Double Talk.

Software speech synthesizer- A software speech synthesizer is an application that translates the text on the screen to speech output and also provides speech synthesis. Products are Festival & Mbrola.

Screen Magnifier

Screen magnifiers enable users who have partial sight to view selected areas on the screen. Gmag, Puff, SUGAT extmode, Unwindows are some of them.

Braille Devices

Braille terminals are used by individuals who are totally blind and are also hearing impaired. A Braille embosser is a hardware device for printing a hard copy of a text document in Braille. Braille translation software translates on screen text to Braille format.

Technologies for the Hearing impaired

For people who are hearing impaired the audio output must be presented on the screen in a visual format. Telecommunication device for the deaf(TDD) allows the user to communicate over the telephone using the computer as a text terminal. Example of such a product is Zapata.

Closed captioning translates texts of spoken words into a video display. Example of such a product is codecoder.

Technologies for the Physically disabled

There are a number of physical disabilities that can block a user's mobility. Linux operating system has built in features that allow for additional keyboard configuration. They are-
Sticky Keys
Allows a user single key operation instead of multiple key combination.
Mouse Keys
Provides for alternative keyboard sequences.
Slow Keys
Holds the key down for a specified period of time before the keystroke is accepted.
Toggle Keys
Sounds an audio alert that warns the user that a keystroke created a locking state for keys.
Repeat Keys
Allows a user with limited coordination additional time to release keys.
Delay Key
Have a delay between keystrokes. This prevents unintentional keystrokes. Other assistive technologies for the physically disables are on screen keyboard which enables a user to select keys using a pointer device.
Speech Recognition utilities are used by people who are physically disabled, so that they can operate the computer using voice control. Via Voice dictation for Linux is such a product.

Screen Readers for Cellphones

Like screen readers on various platforms and different environments on computers, screen readers are also available using cell phone technology. Cell phones are not only calling devices. Sophisticated technology and better power management make cell phones capable of functioning as personal digital assistant. Mobile platforms include Windows, Black Barry, Android, iPhone and Simbion. These platforms provide different features, like Office Suite, web browsing, e-mail attachment handling and many more. Therefore, assistive technology has been developed for these platforms. Different technology needs different kind of assistive solutions.

Windows Mobile/Pocket PC

For the Windows mobile platform, many kinds of screen readers are available.

1. Mobile speaks for pocket PC, by Code Factory Ink: It works with Windows Mobile Version 5 to Version 6 and supports the most broadly used Windows mobiles and those from popular manufacturers. It provides accessibility on touchscreen keyboard functioning devices. By means of these virtual keys on screen, you can adjust and fix the key function and position on screen. Then you can use this independently or in conjunction with modifier keys. You can get access to a music player, e-mail, office suite applications, calendar and much more with the help of mobile speak for pocket pc.

2. Pocket Hal or Smart Hal: It is the pocket PC base version of the popular Hal screen reader by Dolphin Ink. It is very similar to Hal screen reader on the PC; it has Hal control panel and Dolphin key, which is the home key on Windows mobile phones. Lots of features like speed adjustment, volume control, current focus, speak date and time, and change punctuation, are available with Pocket Hal. In April 2009, Dolphin Computer Access tied up with Nuance Corporation and Talks for Windows mobile became available in place of Smart Hal.

On the BlackBerry platform, accessibility is a big issue because the BlackBerry user interface is more complex for the purpose of accessibility support. In April 2009, Humanware and Code Factory joined forces to provide an access solution for BlackBerry phones, called the Orator screen reader. Orator for BlackBerry Smart phones is a unique screen reader software that provides speech output and brings a BlackBerry smart phone to life using state of the art text to speech (TTS) technology with adjustable volume and speech rate. By converting the information presented visually on the device screen into intuitive and familiar speech output, Orator for BlackBerry Smart phones allow users to access and interact with the smart phone applications.

Designed for the new generation of BlackBerry smart phones, with full QWERTY key board, Orator for BlackBerry Smart phones provides a unique mobile communication experience.

Orator for BlackBerry ® Smart phones provides:

State of the art TTS engine voice output
Auto start mode when the device turns on
Full control over the speed and pitch of the voice
Different verbosity levels to allow users to define the amount of information provided
Keyboard echo settings for text entry
Easy to use command structure
Training mode to help familiarize users with the structure

Fully operational during a call

iPhone 3G

For accessibility on Apple's iPhone 3G, the popular screen reader on Mac OSx is made available. Voice Over is part of the iPhone's OS, so there is no need to purchase separate hardware or software. Voice Over works differently from the conventional screen readers for mobile; it uses a "what you see is what you listen to" method. By using Voice Over on the iPhone, you can experience the power of the touch screen without seeing it. It follow the gestures of fingers--moving the fingers on the screen, the first tap of finger gives the description of screen object and the second tap activate it. Voice Over can be activated by iTune or accessibility menu on the iPhone. It gives the spelling suggestion when writing SMS.

Symbian phones

On Symbian phones, the two typical accessibility platforms are:

1. Talks by Nuance Corporation: Talks is the most popular screen reader for the Symbian S60 series devices. It is a very intelligent screen reader, which give access to no or low vision persons to contact directory, short messages, music player, calendar and much more content available on the device. Talks has a custom dictionary, graphic labeling and Braille support.

2. Mobile Speak by Code Factory: Mobile Speak has very sophisticated and comprehensive features. It support Braille Grade 1 and Grade 2 input, reading numbers in pairs of digits, more than 20 languages, complex script editing (if the device firmware supports this). It can be used with both Dectalk and Nokia real speak voices.

Android

On the Google Android platform, Talk Back is the access solution which, in conjunction with Sound Back and Kicks Back, provides the speech output. Sound Back gives non speech audible feedback and Kick provides the half audio support. Talks was developed by Eye-freely, a package of speaking applications. This package contains many applications, like talking caller, talking calculator, message read, calendar access etc.

These access solutions provide the power to visually impaired persons to use the phones capability in daily life just like a sighted person does. Different screen readers for mobiles give different kinds of experience. Some provide extensive keypad support, some interact with Braille, some provide access to touchscreens, and some provide speech or non-speech output to users. But all have a single goal: they empower blind users to take full advantage and use all available options on cell phones with ease.

iPhone

The exciting feature of I Phone is that it has an in-built screen reader known as Voice Over. Since it is not installed separately, compatibility is excellent.

The Fastest iPhone Ever

The new 3G iPhone quickly launches applications and opens web pages within a fraction of seconds. It is twice as fast as the 3G iPhone. Since Voice Over announces whatever appears on the screen, a visually impaired person will have no difficulty in accessing this feature.

Touch Screen

This is a feature that allows the user to access any application with the tap of a finger. This has been made completely accessible with the capability of the in-built screen reader to recognize and read whatever item visually impaired users place their fingers on. It responds to gestures like double tap to select, double tap to enter tap and hold to get context menu.

Video and 3-Megapixel Camera

These two features allow users to take photos and videos and modify them according to requirements and share them from anywhere. Voice Over allows visually impaired users to zoom into the applications or images on the screen to enjoy these features. Apart from the inbuilt accessibility features, there are couple of apps allowing a visually impaired person to auto-focus on an item to be photographed.

Voice control

This is a completely accessible feature in itself. Voice Control knows the user's music and contact numbers. The user can ask it to play the music of choice or say the number of the person to contact. It recognizes 21 languages like Spanish, French, Chinese, English, Finnish and so on. Like VC on Windows Mobile, it also allows users to open applications and carry out tasks by simply asking questions. Eg. What time is it?

Built-in Sweedish compass

With the help of GPS and a built-in digital compass, users get a map of the route on which they are going. It displays the map in the direction the user is facing. Voice Over reads the information out to a visually impaired person. Google maps and other Google suite for iPhone are adhering to accessibility requirements of VoiceOver.

The iPhone has many features like spotlight search, voice memo, cut-copy-paste and so on. All these features allow users to search for information from anywhere, capture thoughts or events as they go and cut, copy, and paste any photo or video as they require. It has almost all the features of a well-equipped computer. The exciting fact is that Apple has taken into consideration almost all the difficulties faced by visually impaired persons when making the iPhone. To get information about the accessibility of these features, you can visit the website http://www.apple.com/accessibility/iphone/vision.html

Blackberry

This brand was a little slow to respond to the demand for accessibility. We can analyze its features with accessibility in mind with the expected release of Orator, a screen reader from Humanware (an international organization involved in the manufacture of assistive technology for visually impaired and people with learning disabilities).

The manufacturers have made their product accessible to some extent to visually impaired users with some modifications. Still, it remains inaccessible to people with no vision at all. Here is a brief description of the accessible features of the Blackberry.

Tactilely discernible keypad

As the name suggests, this feature allows the user to identify the keys by touching. There will be an identifiable nib on the Five key to differentiate it from the others.

Shortcut keys

The general shortcut keys which are applied in operating a computer can be applied here also. A computer literate visually impaired person will definitely find this feature beneficial.

Bright LCD display with adjustable brightness

This feature allows the user to adjust the brightness of the screen according to his requirement.

Reverse Contrast display settings

This allows the persons who suffer from low vision to change the display into high contrast and minimize the strain on the eyes.

Speaker-independent Voice Activated Dialling (VAD) and system status information (on select Smartphones)

This is a feature that allows users to ask the phone to dial a number or play a particular tune. This can also inform the user about the battery status of the phone.

Hands-free operation with Bluetooth headset

If the headset is connected through the Bluetooth to an iPhone, with the help of voice control, the user can give commands to the iPhone like dialing a number and so on.

Features like automatic redial, automatic answer, assignable ringtones to identify callers, audible alerts and notifications, vibration alerts and notifications and so on are general features of mobile phones that are accessible to visually impaired persons. With the release of Orator, the screen reader, we can expect more accessibility, since it will announce whatever appears on the screen and

function just like any other screen reader for Symbian /Windows mobile. To know more about the accessibility of Blackberry, you can visit the website http://na.blackberry.com/eng/support/devices/blackberry_accessibility

Accessibility of Internet on mobile devices

Access to the Internet through mobile devices is rapidly increasing in Asian countries. This article tries to analyze the different aspects of this growing trend. It also tries to analyze how different companies respond to the growing demand for a cost effective and handy means to communicate with the world.
A web app (short for web application) combines the power of the Internet and the ease and functionality of multi-touch technology. Since the screen of a mobile phone is much smaller in size, surfing the Internet becomes a little tedious. But, for a casual user who is concerned only with the ease of being connected, portable devices are always an attractive option.
Apple
Apple's iPhone users can download from their website a maximum of 9 web apps from a collection of 1700 web apps and add them to their home screen. These applications allow the users to play games online, check the weather, and update themselves with the current affairs and so on. With the help of specially designed web browsers, the iPhone users can enjoy all the facilities a laptop offers. With the help of the in-built screen reader Voice Over, a visually challenged person will not have any difficulty enjoying the services used by their sighted counterparts.
Google
Google, the giant in the VOIP industry, also has developed a new Operating System, Android, to enable cellular web surfing. This OS allows the users to use all Google applications like Google Maps, Gmail, Youtube and so on. With the help of an open source screen reader Talk Back, visually impaired persons are able to enjoy all these services. To know more about this screen reader you can visit the website http://googland.blogspot.com/2009/10/g-talkback-open-source-screenreader-for.html .
Microsoft
Windows mobile Internet Explorer is another step in this direction. It also seeks to connect the world with the touch of a button. With the help of the screen reader Mobile Speak, visually impaired persons find themselves at par with their sighted counterparts.
Nokia
The web browser Safari, developed by Nokia, is an advanced step in enabling users to surf the Internet through their cell phones.

GPS products

Today GPS products are being used by both sighted and blind or visually impaired people to travel more easily. This article provides

some information about GPS, how the technology can assist a person who is blind or visually impaired, and accessible GPS product information.

What is GPS (Global Positioning System)?

GPS stands for Global Positioning System. It can tell people where they are anywhere in the world. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. For visually impaired person, GPS products complements existing aids like the white cane or guide dogs but does not replace them and use of this product when traveling independently is recommended only when the blind user has received training in the skills of orientation and mobility.

GPS solutions for the visually impaired provide information and programming accessible through Text to Speech for route planning, location identification, and turn by turn directions. The system can not only tell users their current location and direct them to a fixed address, it also reads out nearby points of interest - such as restaurants, malls, hotels, banks and intersections. The detail of such information depends on the software that is part of the receiver. A person buying a GPS unit should investigate what type of mapping software is available, the ease of updating such information periodically, and if a computer is required to update the information.

The GPS is made up of three parts:

satellites orbiting the Earth;

control and monitoring stations on Earth; and

the GPS receivers

GPS satellites broadcast signals from space. These are picked up and identified by GPS receivers. Each GPS receiver provides latitude, longitude, altitude and time. In general, GPS receivers are composed of an antenna, tuned to the frequencies transmitted by the satellites, receiver-processors, and clock. They may also include a display for providing location and speed information to the user. A receiver is often described by its number of channels: This signifies how many satellites it can monitor simultaneously. The more positional signals a GPS receives, the more accurate it is.

How can GPS assist people who are blind or visually impaired?

A GPS product can assist a blind or visually impaired person in traveling more independently. An accessible GPS product is a receiver of global positioning information that will let you know where you are in relationship to your environment. Software generally includes maps of roads and some products also include points of interests. The points of interests may not just be places you want to visit but also serve as orientation. A user should be able to find his way from point A to point B using the information provided by the accessible GPS products. There are several products available in the market. The user should check the various types to see what best serve his needs.

Available accessible GPS product for the visually impaired

Wayfinder Access by Wayfinder Systems AB

Wayfinder Access is an innovative GPS solution from the Swedish company Wayfinder Systems AB. This application for Symbian phones is designed especially to work with screen readers like Mobile Speak or Talks and text-to-speech technology, and takes into consideration the special needs of the blind and visually impaired. With Symbian screen reader software, you can get more than just the reading of the application's screens, but also a Braille support.
Highlights of Wayfinder Access include, but are not limited to:
Information provided for both pedestrian and vehicular navigation
A database of 20 million points of interest
Online maps that are regularly updated
The "Where am I?" feature that readily gives information about your current location
The "What is in my surrounding?" feature that initiates a scan of the immediate area to inform you of street names , intersections and nearby points of interest such as restaurants, banks, and much more
The new "Vicinity View" feature that allows you to hear audible references for an area with a scope that you can later adjust based on the radius of the scanned vicinity.
Feedback on points of Interest (POI), crossings or favorites that can be restricted, prioritized, and presented according to their distance from your location.
License of Wayfinder Access (lifetime) which is transferable to another compatible mobile phone at any time.
Trekker by HumanWare
It is a system that uses GPS and digital maps to help blind persons find their way in urban and rural areas. It is a personal digital assistant (PDA) application operating on a Pocket PC, adapted for the blind and visually impaired with talking menus, talking maps and GPS information. Fully portable (weight 600g), it offered features enabling a blind person to determine position, create routes and receive information on navigating to a destination. It also provided search functions for an exhaustive database of point of interests, such as restaurants, hotels, etc. It is fully upgradeable, so it can expand to accommodate new hardware platforms and more detailed geographic information.

Mobile Geo by Code Factory
Mobile Geo is apparently a collaboration between Code Factory, based in Barcelona, Spain, and GPS software developer Sendero Group, based in Davis, Calif. It operates on Windows Mobile-based Smartphones, Pocket PC phones and personal digital assistants (PDAs). The application uses Code Factory's Mobile Speak screen reading software to provide voice prompts, and is also compatible with any Braille input/output hardware that may be interfaced to a device. Mobile Geo supports blind or low-vision users by using a combination of voice synthesis and vibratory alerts.

Mobile Geo operates on Windows Mobile 5.x, 6.x, and 6.1 devices with built-in GPS receivers. This software also operates with external GPS receivers such as the Holux M1000, interfaced to Windows Mobile devices via Bluetooth. External receivers can minimize battery drain, and may provide better accuracy.
With Mobile Geo, you can pinpoint your location, learn about the points of interest (POIs) in your immediate vicinity, plan a route between specified points of origin and destination, and get instructions on maneuvers to make as well as information about waypoints along a route that you are following.
In addition, on Windows Mobile 6.1 Standard phones, Mobile Geo uses a device's capability to vibrate, in combination with Morse code, to spell out letters that stand for various events. Such events can include arrival at a destination or upcoming waypoint intersections.
Some salient features for Mobile Geo by Code Factory and Sendero include:
An always-available "Where am I?" screen provides current location (address, street, city), nearest POI and intersection, and map coordinates (longitude and latitude) at any time
Virtual Navigation mode allows a user to explore his or her immediate vicinity on the map without physically being at these locations
The included screen reader makes any additional applications on the Windows Mobile PDA or phone fully accessible
It is available with map data and POI files for different countries including the USA, Canada, the UK and Ireland, Spain, France, Italy, Germany, Austria, the Netherlands, Denmark, Norway, Sweden, South Africa, Australia, and the Singapore/Malaysia/Hong Kong region.
It will continue to run even when the application is minimized to the background, allowing the user to check email, listen to music, etc., while still receiving information about the active route
It can be used with more than 20 different Braille devices for input and output.
It is compatible with more than 300 personal digital assistants as well as mobile phones operating on GSM, CDMA and WCDMA networks.
It functions with speech output from various text-to-speech engines developed by leading providers, such as Fonix, Loquendo, and Acapela. It is, therefore, able to speak more than 20 languages.
It can be used with the speech output routed to a Bluetooth headset
Application commands can be performed using numeric or QWERTY keyboards integrated with the device, the Pocket PC touch screen, or an external keyboard
Loadstone GPS
Loadstone GPS is a free navigational application designed to be used with a Bluetooth GPS receiver and a mobile phone using the Series60 platform on the Symbian operating system. Loadstone GPS was developed to be a low-cost feature-rich navigational assistant

for the blind and it may be not as powerful as other commercially available GPS-Navigation solutions. In order to use Loadstone you need the following:
Mobile (cellular) phone running Symbian (Series60)
Bluetooth GPS receiver supporting the NMEA protocol
Optional Access software - Screen reader / Magnifier (if you are blind/visually impaired)
Loadstone GPS allows a user to save points of interest and affectively create a map of the environment. Using this map a user is informed about his or her relative position to these points and knows the heading and distance to these points. This way Loadstone GPS omits the use of (expensive) professionally designed maps while providing all of the orientational information that is needed to move around in the environment. The program is therefore able to help the user to learn and memorise a route; enabling the user to locate points such as: a supermarket, a friends' house, a train station/bus stop and even their home's front entrance.
The program is under the GNU General Public License (GPL). It makes blind people more independent of the trading policy and prices of the few global vendors of accessible satellite navigation solutions.
Since for large rural regions of our world or developing or newly industrializing countries nearly no exactly map data is available in common map databases, the Loadstone software provides users an option to create and store own waypoints for navigation and share it with others. The Loadstone community is working on import of coordinates from free sources like the OpenStreetMap project as well.
Street Talker by Freedom Scientific
Combined with a GPS receiver and a PAC Mate, StreetTalk provides a rich orientation solution for the blind and those with low vision.
With millions of Points of Interest included, you can discover new places to explore and visit – dining establishments, banks, parks – whatever is near your route. You can also save turn-by-turn directions to get there by vehicle or as a pedestrian. You might even print, emboss, beam, or e-mail your routes to other users. Switch to Virtual Mode and explore the map as though you were a pedestrian, with cross streets, distances, direction and Points of Interest announced as you virtually move around the map – a great way to get familiar with new surroundings before actually venturing out.
You can also create your own route by dropping “breadcrumbs” as you travel with StreetTalk VIP. You can recall the route at any time and travel it in either direction.
StreetTalk VIP can be used with a choice of many popular Bluetooth GPS receivers. With Bluetooth, the receiver can be placed up to 30 feet from the user.
Braille Note GPS by HumanWare
BrailleNote GPS software uses a cell-phone size GPS receiver to relay information from GPS satellites. It calculates where you are and plots a route to a destination you choose. The personal computers receive radio signals from satellites to chart the location of users

and direct them to their destination with recorded voice commands. The system uses satellites to triangulate the carrier's position, much like a ship finding its location at sea.
Visually impaired people can encode points of interest such as local restaurants or any other location, into the computer's database. Afterward, they can punch keys on the unit's keyboard to direct themselves to a specific point of interest.

Other Technologies on Mobile Platform

Bluetooth 3.0
The Bluetooth 3.0 specification will be released this year and devices will start to hit the shelves by 2010. It is expected that the 3.0 specifications will include faster speeds, transferring files at 480 MBPS in close proximity and 100 megabits per second at 10 meters. It will also feature an ultra-low-power mode that will enable new peripherals, sensors, and applications, such as health monitoring. The technology will be backwards compatible, allowing old devices to communicate with new ones.
Mobile User Interfaces + Mobile Web/Widgets
Mobile user interfaces and mobile web/widgets are now very popular in making a Mobile UI attractive and much feature rich device handling. They all point to how mobile computing is rapidly becoming a new platform for everything from consumer mobile apps to B2E (business-to-employee) and B2C (business-to-customer). Modern day smartphones like the iPhone, Android, Blackberry, the upcoming Pre, and others deliver better interfaces for browsing the web, thus making it accessible to more people.
Location Awareness
Location sensing, powered by GPS as well as Wi-Fi and triangulation, opens up new possibilities for mobile social networking and presence applications. Apart from allowing to identify routes and POIs (Point of Interest), this also allows users to see how far away their contacts are, introducing a whole new dimension to mobile communication. Over the next year or two, this sort of technology is expected to become more commonplace, but it will also raise questions about privacy.
Near Field Communication (NFC)
NFC is a technology that provides a way for consumers to use their mobile phones for making payments, among other things. Experts says that the move towards mobile payment systems will still not occur this year or the next in mature markets like the U.S. and Western Europe. Instead, NFC is more likely to take off in emerging markets. Other uses of the technology, such as the ability to transfer photos from phone to digital photo frames, will also remain elusive to more developed markets.
802.11n & Cellular Broadband
802.11n, a specification for wireless local area networks (WLANs), though not ratified as an official standard yet, is already commonplace. However, even the ubiquitous iPhone only supports 802.11 b/g at the moment. On the other hand, the other internet connection technology, cellular broadband, has the potential to make Wi-Fi almost unnecessary, at least for achieving high speeds.

Display Technologies

Display technologies will also see improvements in the upcoming years. New technologies like active pixel displays, passive displays and pico projectors will have an impact. Pico projectors - the tiny portable projectors - will enable new mobile use cases. Instant presentations in informal settings could become more common when there isn't large, cumbersome equipment to set up. The different types of display technologies introduced in 2009 and 2010 will become important differentiators between devices and will impact user selection criterion.

Access to Books

People with print disabilities deserve to read books as much as other readers, yet at present fewer than five percent of the books needed by people with print disabilities are available in accessible formats such as digital text or digital Braille.

Any person who is disabled can access books in the web-Braille format through the National Library Service for the blind. Disabled people can also join Bookshare.org, which supplies books legally.

Bookshare

Bookshare is an online library of digital books for people with print disabilities. It operates under an exception to U.S copyright law which allows copyrighted digital books to be made available to people with qualifying disabilities. Bookshare.org is of the view that people with print disabilities deserve the same ease of access to books that people without disabilities enjoy. By requiring individuals to register as members and provide a proof of disability, Bookshare ensures that only qualified individuals use the service. The Bookshare.org library provides print disabled people in the United States with legal access to over 37750 books and 150 periodicals that are converted to Braille, large print or digital formats for text to speech audio.

Thus, the goal of Bookshare is to allow access so that people with print disabilities can obtain a broad spectrum of print materials at the same time as everyone else. People with visual impairment, physical and learning disabilities can look to Bookshare to increase the quantity and availability of books and newspapers in accessible formats.

Bookshare works toward this goal by-

Building the bookshare digital library as quickly as possible through volunteers, partnerships and publishers.

Spreading the word so that everyone who is eligible to join bookshare has the opportunity to do so.
Expanding the choices of access technology available for people with print disabilities.

Visually disabled people using Bookshare can listen to books using a text-to-speech synthesized voice, read books in Braille, or access the material in large print. Hard copy Braille books can also be ordered. Members with low vision can read books in an enlarged font using either a screen magnifier or by opening the book in a software program that supports increased font size, column, contrast, etc.

Physically disabled members can read books on a computer or a variety of portable devices, either visually or with text to speech.

Bookshare also serves as a useful resource for people with learning disabilities. Members with severe dyslexia typically benefit from access to the full text of books in digital format, for multimodal reading with both visual and audio. Software programs can provide a wide range of support designed specifically for individuals with learning disabilities, including highlighting of text as it is read aloud, to indicate changing margins, different text formatting, and new paragraphs, for instance.

Audio Materials

Since many students with visual impairments are not readers of Braille, they use sound recordings to access their print materials. Audio versions may be a good supplement for Braille readers who cannot access Braille in a foreign language, either due to lack of understanding of the Braille books or because of the unavailability of Braille materials or software that works with the language.

Many students who are blind or visually impaired utilize national libraries to obtain audio textbooks for school and can also turn to these resources for books recorded in foreign languages. Some cassette and digital audio formats require specific machines for their use; for example, sound recordings may use the DAISY (Digital accessible information system) format, for which a user requires specific software.

Books produced with DAISY are different from typical CD books. DAISY allows the listener one-click access to the chapter, line and page required. DAISY books are produced and distributed in over 40 countries.To create DAISY formats the new “save as DAISY XML, add” function has been designed and incorporated into Microsoft’s Word 2007, Word 2003, and Word XP; this allows users to change open XML based text files into DAISY XML navigable books. This add-on can be downloaded freely by MS Office Word users. The XML output produced using this add-on can then be processed through the DAISY Pipeline--a free downloadable transformation suite that supports the complete process of conversion of DAISY XML into DAISY digital talking book (DTB) format.

The International federation of library associations (IFLA), Section of Libraries for the Blind

The IFLA provides information about libraries or centers overseas that loan or exchange accessible formats of print materials.

There are sound recordings from the sources in other countries; those recorded for native speakers may include dialects different from those used in foreign language course.

India's talking book libraries have 4200 holdings in Hindi; these are primarily in standard compact cassettes, but about 16 per cent are in DAISY format. Pakistan offers minimal audio books in Urdu and Arabic on cassettes. Saudi Arabia has a couple of talking book libraries with about 20,000 holdings in Arabic, which are loaned out on standard compact cassettes. Turkey provides several hundred audio recordings, also on standard compact cassettes. Lebanon holds and produces a small collection of audio books on 2 track or standard compact cassettes. Russia has over half a million talking books available through libraries. People in the U.S.A. have to buy their audio books.

WAI and WCAG 2.0

Web control accessibility guidelines (WCAG) 2.0 cover a wide range of recommendation for making web content more accessible. Following these guidelines will make content accessible for a wider range of people with disabilities including blindness, low vision, deafness, learning disabilities, cognitive limitations etc. These guidelines will also make web content more accessible to general users.
Principle 1: Perceivable
Information and user interface components must be presented to the users in such a way that they are able to perceive them.
1. One should provide for text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, Braille, speech, symbols or simpler language. All non-text content that is presented to the user has a text alternative except for in the following situations.
Controls, Input: If non text content is a control or accepts user input then it should have a name that describes its purpose.
Time based media: If non text content is time based media then text alternatives should at least provide description identity of non text content.
Test: If non text content is a test or exercise that would be invalid if presented in text, and then text alternatives should at least provide description of non text content.

Sensory: If non text content is meant to create a sensory appearance, and then text alternatives should provide a description identity of non text content.
CAPTCHA: If the purpose of non text content is to confirm that text content is being accessed by a person rather than a computer then text alternatives that identify and describe the purpose of non text content are provided.
Decoration formatting invisible: If non text content is for pure decoration then it can be implemented in such a way that it can be ignored by assistive technologies.
2. The second guideline is for time based media. The following alternatives are to be kept in mind.

For prerecorded audio only an alternative time based media is provided that presents equivalent information for pre recorded audio only content.
For prerecorded video either an alternative time based media or an audio track is provided that presents information for prerecorded video only content. Prerecorded captions, captions are provided for all prerecorded audio content in synchronized media.
Audio description or media alternative: An alternative for time based media or audio description of the prerecorded video content is provided in synchronized media.
Captions (Live): Captions are provided for all live audio content in synchronized media.
Audio description (prerecorded): audio description is provided for all prerecorded video content in synchronized media.
Sign language (prerecorded): sign language is provided for all prerecorded audio content in synchronized media.
Extended audio description (prerecorded): where pauses in foreground audio are insufficient to allow descriptions to convey the sense of the video, extended audio description is provided for all prerecorded video content in synchronized media.
Media alternative (prerecorded): alternative for time based media is provided for all prerecorded synchronized media.
Audio only: (live) an alternative for time based media that presents information for live audio only content is provided.
3. The third guideline is adaptability, which says that content should be presented in different ways. The following points should be kept in mind.
Information and relationships: Information structure and relationships conveyed through presentation can be determined programmatically.
Meaningful sequence: When the sequence in which content is presented affects its memory, a correct reading sequence can be programmatically determined.
Sensory characteristics: Instructions provided for understanding operating content do not rely only on sensory characteristics of components.
4. The fourth guideline is about being distinguishable: making it easier for users to see and hear content. The following points need to be kept in mind.

Use of color: color is not used as the only visual means of conveying information, indicating an action, prompting a response or identifying something visual.
Audio control: If only audio on a web page plays automatically for more then 3 seconds, a mechanism is needed to pause or stop the audio.
Contrast: The visual presentation of text and images of text has a contrast ratio of 4.5:1.
Resize text: Except for captions and images of text, text can be resized without assistive technology up to 200 percent.
Images of a text: If the technologies being used can achieve the visual presentation; text is used to present the information, rather than images of a text.
Contrast (enhanced): The visual presentation of text and images of text has a contrast ratio of at least 7:1.
Principle 2: Operable
1. User interface components and navigation must be operable.
Keyboard: Enable all functions to be available from the keyboard. The functions of the content should be operable through a keyboard.
2. The next guideline is to have enough time. Provide users enough time to read and use content. The following points should be kept in mind.
Turn off: The user is allowed to turn off the time limit.
Adjust: The user is allowed to adjust the time limit.
Extend: The user is warned before the time expires.
Real time exception: The time limit is important and extending it makes the activity invalid.
20 hour exception: The time limit is longer than 20 hours.
Pause, stop, hide: For any moving blinking or scrolling information that starts automatically, lasts more than five seconds and is presented together with other content, there is a mechanism for the user to pause, stop, or hide it.
Auto updating: For any auto updating information that starts automatically and is presented together with other content, there is a mechanism for the user to pause, stop, or hide or control the frequency of the update unless the auto updating is part of an activity where it is needed.
No timing: Timing is not an essential part of the event presented by the content, except for non interactive synchronized media and real time events.
Interruptions: can be postponed or suppressed by the user
3. The guideline that follows next is concerned with Seizures. Do not design content in a way that will cause seizures.
Three flashes or below threshold: Web pages do not contain anything that flashes more then three times in any one second period.

4. Navigability is the fourth guideline under this section.
Bypass blocks: A mechanism is available to bypass blocks of content that are repeated on multiple web pages.
Page titled: Web pages have titles that describe topic or purpose.
Focus order: If a web page can be navigated and the navigation sequences affect meaning or operation favorable components receive focus in an order that presents meaning.
Link purpose: The purpose of such link can be determined from the link text alone or from the link text together with its programmatically determined link content.
Multiple ways: More than one way is available to locate a web page, within a set of web pages.
Headings and labels: Headings and labels describe topic and purpose.
Focus visible: Any keyboard user interface has a way of operation where the keyboard focus indicator can be seen.
Location: Information about the user's location within a set of web pages is available.
Link purpose: A mechanism is available to allow the purpose of each link to be identified from link text alone.
Section headings: Section headings are used to organize the content.
Principle 3: Understandable
Principal information and operation of user interface must be so that it can be understood. 1. The first guideline is readability. Make text content readable and understandable.
Language of page: The default human language of each page can be determined programmatically.
Language of parts: The human language of each passage or phrase in the context can be programmatically determined.
Unusual words: A mechanism is available for identifying specific definitions of words or phrases used in an unusual way.
Abbreviations: A mechanism for identifying the expanded form or meaning of abbreviations is available.
Reading level: When text requires reading ability more advanced than lower secondary level, supplemental content or a version that does not require more advanced reading ability than secondary level is available.
Pronunciation: A mechanism is available for identifying specific pronunciation of words.
2. The next guideline is predictability. Make web pages appear and operate in predictable ways.
On focus: When any component receives focus, it does enable a change of content.
On input: Changing the setting of any user interface component does not automatically cause a change in content.
Consistent Navigation: Navigational mechanisms that are repeated on multiple web pages within a set of web pages occur in the same relative order or each time they are repeated.
Consistent identification: Components that have the same functionality within a set of web pages are identified consistently.
Change on request: Change of context is possible only by user request.
3. The third guideline is concerned with input assistance--Helping users avoid and correct mistakes.

Error identification: If an input error is detected, the object of the error is identified and described to the user.
Labels or instructions: Labels or instructions are provided when content requires input from the user.
Error suggestion: If an input error is automatically detected and suggestions for corrections are known, the same are provided to the user.
Error prevention: For web pages that involve legal commitments or financial transactions for the user, that modify or delete user controllable data in data storage systems the following features are available-
Reversible: Submissions are reversible. Checked: Data entered by the user is checked for input errors and the user is allowed to correct them. Confirmed: A mechanism is available for reviewing and correcting information. Help: Context relative or sensitive help is available.
Principle 4: Robust
Content must be robust enough so that it can be interpreted by a wide variety of user agents including assistive technologies. The guideline to be kept in mind here is compatibility with current and future user agents.
Parsing: In content implemented using markup languages elements should have complete start and end tags, they should be noted according to their specification and should not contain any duplicate features.
Name, Role value: For all the interface components the name and role can be programmatically determined. States, properties and values that can be set by the user can be programmatically set.
WAI
WAI has published an updated user agent accessibility guideline UAAG 2.0 working draft with changes to ensure that “the user interface is operable” and glossary sections. UAAG defines how browsers, media players, and other user agents should support accessibility for people with disabilities and work with assistive technologies.

The document provides guidelines for designing user agents that lower barriers to web accessibility for people with disabilities. User agents include browsers and other types of software that retrieve and present web content.
The UAAG guideline is based on the following principles.
Principle 1: Comply with applicable specifications and conventions.
Principle 2: Allow or enable programmatic access.
Principle 3: Perceivability--The user interface and content must be presented to users in ways that they can perceive.
Principle 4: Ensure that the user interface is operable.
Principle 5: Ensure that the user interface is understandable.

Accessibility and open source technologies

A web browser provides a uniform user interface to different types of websites. This interface should be made accessible and more interactive. This is a goal which has not yet been achieved. A universally accessible browser needs modifications, and additional functions.

Although there are open source and free software components, their use and integration is complex because they have been developed in different diverse environments. They follow standards and rules not in accordance with the web. Therefore, to solve these problems, several activities have been initiated that aim at building the capacity of open source software for web accessibility. One such activity is the development of adaptable multi interface communicator (AMICO): WEB, infrastructure that enables efficient reuse and integration of open source software components into the web environment. The main contribution of AMICO: WEB is to enable the syntactic and semantic interoperability between web extension mechanisms and a variety of integration mechanisms used by open source and free software components. The design is based on experience in solving practical problems where open source components have been used.

Open source, free software, free open software (FOSS) or free libre open source software (FLOSS) are all alternative names for software that is created by open collaborative communities. “Free libre” indicates “free” as in freedom or free speech. FLOSS may have a purchase price but a user is granted several freedoms. They are:

1. Freedom to run the program for any purpose. 2. The freedom to study how the program works and to adapt it to one’s needs. Access to source code is a precondition. 3. The freedom to redistribute copies. 4. The freedom to improve the program and to release the improvement to the public, so that the whole community benefits.

The freedoms are enforced by using copyright and licensing laws to guarantee that the software will be kept available for the community and not be made proprietary property. There are many licenses with different levels of enforcement with “free” licenses being strongest.

Mozilla and Firefox

Firefox

Firefox is quickly becoming a choice for those interested in developing accessibility content and those wishing to access web content in a more user friendly and accessible manner.

Firefox is a cross platform standalone web browser developed by an open source community that is coordinated through the Mozilla project.

When describing Firefox accessibility, there are two points that must be noted. The first is the accessibility of firefox itself as a web browser. This includes the ability of the assistive technology and browser to work together, the usability of the browser interface and the modifications for accessibility. Second, the browser and assistive technology must support the accessibility of web content that is accessed by the browser. Firefox supports both these aspects of accessibility.

The Firefox browser interface is accessible for keyboard users and allows many accessibility customization options, including customizable user styles (for setting font color, contrast, size, etc) and high contrast, large print themes. Firefox also supports the accessibility features built into web content when used with up to date versions of the screen reader.

Open Source Accessibility
As an open source project, Firefox is shaped and developed by members of the community. Anyone can contribute to make Firefox better. The needs and wants of the community are represented by the product. This means that accessibility improvements tend to be implemented by the users. The accessibility project at Mozilla, which coordinates the accessibility efforts across many open source projects, has community members that write code for Firefox accessibility as well as accessibility experts and individuals with disabilities who all contribute to making Firefox more accessible.

Because of the open source nature of Firefox and the large body of contributors, accessibility has been and continues to be implemented very quickly. Traditionally, screen reader accessibility has been available mainly through using Internet Explorer on Windows. This meant that new accessibility features were only made available in new versions of Internet Explorer and only if they were implemented into the browser. As of now, several assistive technologies (JAWS, Windows-eyes, and Zoom text) are available for use with Firefox.

As a result of the open source nature of Firefox, assistive technology support for Firefox is much easier for developers to implement than with other browsers. Because Firefox is a cross platform product, it can be made available for accessibility on other operating systems. There are already several accessibility features, tools and extensions for Firefox on Mac, Linux, and Unix operating systems.

Accessible browser technologies

Although the quantity of multimedia content has increased tremendously over the last few years, people who have limited or no vision have not been able to access, see and use this content.

A new multimedia browsing accessibility tool enables people who have visual handicaps a greater ability in accessing online content through a browser, similarly to a sighted person using a mouse.

For example, if a visually impaired person wants to view a streaming video, he can select the play button by simply pressing a predefined shortcut key instead of searching in the content for buttons that control the video.

Users can also control the volume of an individual source in order to listen to different sound sources without losing track of the screen reading software due to the sound of a video. If a content creator wants to add a voice speech for a video, he can write a text script as a piece of metadata. The tool adds the audio description by using a text-to-speech engine. There are plans to use this technology to include enabling flexible audio speed control and contributing the work to an open source development project.

How does the technology work?

Usually people who are visually impaired browse web pages using screen readers like JAWS or a voice enabled browser like the IBM home page reader. However these tools are not able to handle multimedia applications. Visually impaired users cannot see the multimedia control buttons that appear on the screen; adding to the problem, the default audio of a streaming video starts to play after the page is loaded, interfering with the synthesized assistive voice coming from the screen reading software. Additionally most multimedia content works only with a mouse rather than a keyboard making it difficult for people who are visually impaired to use multimedia content.
IBM Accessibility Internet Browser for Multimedia is built on top of the Eclipse Rich

Client platform and works as a standalone application. When a user opens a web page, the tool analyzes the multimedia content on the page. Then the tool lets the users control the multimedia content by letting them play, stop, or pause the video, control speed, volume etc by using simple shortcut keys.

There is also a function to provide an alternative text based interface for the content based on XML metadata. The tool uses metadata to reorganize or simplify the original content. Although metadata must first be created, once created, the sites usability increases significantly.

Multimedia content is meant mainly for sighted users, who use a mouse. Therefore, it is difficult to understand the content with a voice interface or to control it using a keyboard.
This tool also has the feature to provide audio descriptions to movies based on XML metadata by using text-to-speech engine. The tool can work with screen readers (JAWS or Window-eyes) by allowing it to speak and can also work as a self talking browser.

Accessible widgets

Accessible widgets should be able to have device independent behavior and not only support actions through the keyboard. One must use where needed the most generic event handler possible. For example, take a widget where the down arrow key selects an element in the widget. The selection needs to be identified with a specific style. Instead of modifying the style of the element when executing the down arrow key event, focus the item from the down arrow key event handler and change the style via a focus event handler. If this is done and the focus is set from a means other than the keyboard, such as a voice input system, the styling is properly set and does not depend only on keyboard actions.

When keyboard navigation is implemented for accessible widgets the best solution is to copy the behavior of the operating systems. For example, the right and left arrow keys are used to expand and collapse nodes in a windows tree control and the up and down arrow key move between the nodes in the control. It is not always possible to copy the operating system or browser behavior because the widgets may not be able to capture the necessary keys. People from the industry are working to create a style guide to describe the navigation and behavior of web widgets. When it is completed, the style guide will be provided to open source. The style guide will try to overcome the differences between the operating system and provide a generalized solution for web components.

Within all widgets the interaction between keyboard and mouse is important. Users may switch between using the mouse and using the keyboard at any time. Therefore, while creating the widget one cannot think of only keyboard or only mouse use. The widget component will need to store information about the current item in focus. It is also more useful to place the keyboard event handler on an owning object in the component hierarchy or order rather than let the actual element generate the event, for example, on the table element rather than on each td element. This is the better way of doing it; although the event handler provides information on exactly what element generated the event, it is often easier to use the stored point as reference.

A component supporting both mouse and keyboard will usually have both onclick and onkey events. The onclick handler must include steps to update the point of action or regard so that any keyboard actions after onclick will continue to work.

Trapping key events: When keyboard navigation is being designed and set one must first determine where to trap the key event. It is best to trap the key event as high as possible and use the event object to determine actual source of the event and execute the necessary action. This method does away with the need to add a key handler to each individual element. Once the event is handled by the component, it will stop that event from being passed on to other elements.

Tab index and focus: When navigation is done through the keyboard it is important for the element that is navigated to receive focus. The focus should not be set through CSS- Call the focus () method on the element. Styling can be used to improve the visual focus or execution but it should not replace actually setting focus on an element. A screen reader will only speak information about the element when it receives focus. The tab index value is used to provide direct focus to an element. The tab index feature can be used to include additional elements in the tab order and to set programmatic focus to them.

When designing or adding support to the keyboard navigation, assume the widget as a component. The tab key is used to navigate from component to component on a page and then the arrow and other keys should be used to navigate within the component. In a tab index, only one element at any time should have a tab index equal to zero. This feature allows the user to navigate into and set focus within the component using the tab key. After this the onkey events should be trapped and the arrow keys used to navigate within the elements of the component. All the elements within the component that are able to receive focus must have a tab index equal to -1. Where an element, during programming, is given focus, the tab index value is changed from -1 to 0 and the tab index of the previous element with focus will be changed from 0 to -1. This will make sure that only one element within the component is in the tab order of the page and the element with tab index=0 is the element that is currently in focus.

Add ARIA Information: The accessible rich internet applications roadmap is being developed by W3C Web accessibility initiative (WAI) protocols and formats working group. Role and state information is being created by the group and will be added to provide semantic information about user interface components. Browsers will then translate this role and state information into accessibility api for the platform that is being used.

Assigning Roles: The tab index is used to provide keyboard focus or to allow programmatic focus to an object. When a tab index is added to an element the element will now be included in the accessibility hierarchy of the Firefox browser. Information on elements in the accessibility hierarchy will be provided to assistive technologies.
Providing hierarchical information: To enable Firefox to correctly place the parent child relationship between objects and to send this information via an accessibility API to assistive technologies, the best method is to create components in an orderly way. When

creating a menu bar, it is best to have components that make up the menus and menu items of the menu bar are children of the menu bar. Also menu items should be children of the owning menus. This order allows firefox to provide menu information to the assistive technologies and lets a screen reader speak more information about the menu, like menu open, file, item 1 of x when the user opens the menu.

Using presentation role: Although one uses CSS for layout, tables are still used to arrange elements on a page. Entering information in tables can easily confuse the hierarchy of the component. Therefore, if tables are to be used, they can be marked with a role of presentation to eliminate them from the hierarchy.

Assigning states: While identifying the role of the widget, the state of the widget must be identified and updated. The initial state is set within the widget template, as the state changes during user interaction with the widget the state must be updated.

Create ALLY Subclass to support high contrast/images off mode: When creating new widgets do not use CSS background images to present information. Instead use real image elements.

DHTML and Javascript web applications

JavaScript is one of the most popular scripting languages on the web. One of the main reasons for this is its high interactivity for websites and the fact that it can work on all browsers.

DHTML means dynamic hyper text markup language. It is a term that combines methods of making interactive web pages. It consists of a combination of HTML, CSS, and JavaScript. JavaScript combined with HTML code results in the creation of DHTML. It is good for many reasons to use JavaScript. It is simple and at the same time most powerful and makes the website appealing to visitors. JavaScript works on all major web browsers like Internet Explorer, Firefox, Safari, Opera and Chrome.

One task that is not done with JavaScript is framing URLs. This is because sometimes search engines cannot see JavaScript rendered URLs. This problem usually comes up in navigation menus.

A website’s navigation must be SEO- friendly. If HTML, CSS, and JavaScript are combined properly for a DHTML navigation menu, all navigation will be 100% SEO friendly.

JavaScript/DHTML Capabilities:
1. Interactive text layout: changing elements on the web page as visitors work down them. Expand on click links, adjustable windows etc.
2. React to visitor actions: Loading a new web page for example clicking on an HTML element in a page.
3. Create cookies: Cookies store a little information on a visitor's computer. Cookies can record the visitor's and customize their next visit according to their preferences.
4. Analytics: Track visitor's to the web site for use in SEO improvement.

The reasons to use JavaScript/DHTML are:
1. When you want visitors to your web site to have a visually engaging user interface and a dynamic look and feel.
2. When you need a high degree of interaction of visitors with your web site.
3. When validation is needed of information collected on a web form.
4. When boxes are needed to pop up for problem alerts and confirmation of visitor's actions.
5. When you want the website to do more to help your business.

The possibilities and limitations of HTML

Possibilities of HTML

From presenting to reprocessing and interaction, HTML is meant to give users reasonably attractive pages and also to support a very simple level of interaction through forms and hyperlinks. The application logic supported by web browsers on the level of HTML pages and scripts is relatively simple. Applications designed for the web place their processing on the server, storing information in databases and using the web browser as a mere window on the server's information. This enables the use of more advanced server side facilities for security, processing and connectivity. While dynamic HTML makes web browsers a more advanced interface capable of animated views of information, the form remains the main way for users to manipulate information and input new information. Some web browsers let users edit HTML and send it back to the server, but the editor is a separate application used only for editing HTML.

HTML & XML processors tend to treat the text they receive in different ways. While both the processors read a document from start to finish, HTML processors read HTML documents using HTML specific understanding. HTML parsers are built with only one goal in mind--To read HTML, whether the parsers enables the browser to view the document, retrieve information for a search engine, or

processes some information like feeding a shopping agent information, HTML parsers must know a lot about HTML'S vocabulary, including information and a complex set of rules, about which element does not read tags, how to properly end elements when end tags are omitted and rules for dealing with some tricky elements.

For instance, the real purpose of a META element is defined in an attribute and that purpose may influence the parsing process for the rest of the document when things such as character endings are declared. The input element in the same way uses a rule or value to define its true purpose. It would need processors to keep track of a large amount of information to process a form correctly if input elements are nested, so nesting of input elements is not allowed. Therefore HTML parsers are tightly bonded to their particular applications applying processing rules that make sense to their particular application.
For example, search engines discard all markups and focus on text except for META elements which provide keyword information. Browsers need to collect as much information as possible from the parser, but they apply their own rules as to how markup transforms into document structures.

Limitations of HTML

While HTML does a good job formatting web pages for display, its weaknesses lay in its capability to supply all the features that a user seeks in an information application. Partial lists of these weaknesses are searching, site management and link management.

The structure of HTML is meant to format pages. There is not enough structure in HTML for the processing needs of an information application. HTML does not have the capability to define new structures by defining relationships between classes.

Mouse over menus

Dropdown Menu Features
Easy installation and customization: dropdown menu parameters can be tuned manually or using deluxe tuner. Then add several rows of code written within a HTML page. The menu is ready.
JavaScript API: JavaScript API is used for dynamic changing of items, (text, link, icons and even individual style).
Making a drop down menu active/inactive, addition/removing of items, getting information on any menu's submenu, and items.
Cross frame menu: Cross frame mode allows one to build full featured menus on the pages that use frame based structure.
Keystroke support: One can control the menu from the keyboard.
AJAX Menu: This technology allows data to be loaded from the server to the submenus.

Popup Menu: Creation of contextual menus for ones pages.
Smart Scrollable feature: When the submenu is larger than the visible area of the page the submenu will be automatically decreased.
Sound support: One can add sound effects to all menu events, menu mouse over, button click.
Search support: A search bar can be added to the menu.
CSS JavaScript menu: menus can be built based on cascading style sheets.
Objects overlapping: Sub menus drop down over all the objects of the page.
Filters and traditional effects: Those effects will make the menu look more attractive and stylish.
Individual styles: Create individual styles and assign them to any sub menu and item.
Moving menu: A mouse is used to move a menu as a usual window.
Floating menu: When the page is scrolled the dropdown menus remains visible. The menu can float over one or two coordinate axes.
Multilevel dropdown list and multicolumn DHTML menu script: There can be multilevel menus. Create as many rows of the menus as necessary.
Ways of showing sub menus: Submenus can be shown in four ways. From left to right and also from left to right + upwards. From right to left and also from right to left + upwards.
Image based navigation: Use images for icons, backgrounds of submenus and items.
Orientation of menus: Create both horizontal and vertical menus and submenus with any amount of menus on one page.
Any HTML Code: Insert any HTML code inside the dropdown menu item, be it a form or a picture a frame object or a text.
Fonts, Borders and Background colors: Use any necessary font, any color, and size and font decoration. Create any available type, thickness, and color of a menus frame. Choose any color for background of submenus and items.
Separators: Create separators using own pictures, size and alignment.

Calendars

The following features are available on a Google calendar.

1. Share your schedule: Friends, family and colleagues can see the calendar and also the schedule that others have shared with the user.
2. Get the calendar while on the move through the mobile version of Google’s calendar that is made for the small screen; it can connect to the mobile’s built in calendar, so that the calendar can be accessed even when a person is not at their desk.
3. Never forget an event: Customizable reminders keep a person constantly informed of their schedule. A person can be notified by email or can get a text message sent to his mobile phone.

4. Send invitations and track RSVPs: Other people can be invited to events on a person's calendar. Guests can RSVP to events by email or through the Google calendar.
5. Synchronize with desktop: The events can be synchronized with Microsoft outlook, Apple iCal, and Mozilla Sunbird and the calendar accessed.
6. Work offline: Even when there is no internet access, a person can view a read only version of the calendar through offline access, no matter where they are.
All these services are free.

Expandable list items

If there are a lot of content-entries, categories, and sidebar information, a web page may look cluttered. The way to solve this problem is to make the list expandable and collapsible. A method from Bleeding Ego based on JavaScript is simple to implement and works well.

* Expandable listmenu script Author: Daniel Nolan http:// www.bleedingego.co.uk/webdev.php
1. Upload listmenu.js to your server. Copy the script into a new file with a text editor and save the script as listmenu.js. Upload the script to a location within the public directory of your server using an FTP Program. (A copy of the script can also be found at Bleeding Ego)
2. Add a script reference line to the header of your index or archive template. In the header section of the template in which you want the expandable list menu to be used, add the line, <Script="http://www.your_web_site.com/path/to/listmenu.js type= "Text/JavaScript"></Script>
Replace the http://www.your_web_site.com/path/to/ with the actual paths on your server to the listmenu.js that was uploaded to the server in the step above.
3. Insert your list into your template or document using the following structure.
<ulclass= "treemenu">
• top level item
list item
list item
< a href=’’’’>list item
list item<list item

4. Add list menu style sheet elements to your style sheet. You can style their list by adding some style elements to the style sheet. Refer to listmenu.css for samples of some css elements to add to the style sheet from Bleeding Ego.

Simulated widgets

Previous research into the development of usable virtual environment (VE) interfaces has shown that applying 2D Techniques can be effective for tasks involving widget manipulation. Also, physical props for manipulating these widgets can provide feedback to aid the user. However, it is not practical to require the use of physical props because of real world constraints such as cramped workspaces. We observe empirical results from experiments where 2D interfaces used in 3D spaces have a great influence on effectiveness for manipulation tasks.

A number of novel techniques have been used to support interaction in 3D space. Glove interfaces allow the user to interact with the environment using gesture based commands. Laser pointer techniques provide menus that float in space in front of the user and are accessed using either the user's fingers or a 3D mouse. It is difficult to perform precise movements with the interfaces. This is due to the fact that the user is pointing in free spaces without the aid of anything to steady the hands.

Types of actions
A test bed has been designed and provides 2D widgets for testing typical UI tasks such as drag and drop, manipulating slider-bars, pressing buttons from within a 3D environment. The system uses a virtual paddle, registered with a physical paddle prop as a work interface for manipulating 2D interface widgets within the VE.

Widget representation
In previous studies all the shapes manipulated were 2D. Even though the shapes had a 3D bounding volume for detecting collisions, a 2D shape was displayed to the user. This was developed more for applications where a physical surface was present than those where no physical surface was present.

Simulated surface constraints
The superiority of the passive haptic treatments over the non-haptic treatments from previous experiments leads us to analyze which aspects of the physical surface accounted for its superiority. The presence of a physical surface (1) provides tactile feedback felt by the dominant hand index fingertip. (2) Provides hap Accessibility for Developers: Simulated widgets

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Simulated surface constraints

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person presses the physical finger past a certain depth, the virtual hand pops through the surface, and is registered again with the physical hand.

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Accessibility in dynamic content on the Web

The dynamic accessible web content plan dwells on the accessibility of dynamic content for people with disabilities. The plan discusses the technologies to map controls and events to accessibility API, including custom controls. The plan also highlights new navigation techniques to mark common web structures as menus, primary content, secondary content, banner information, and other types of web structures. These new technologies can be used to provide accessibility to the disabled on the web.

Problems of HTML

Accessibility with traditional HTML has a number of problems that make it difficult to support dynamic content.

1. Accessibility is dependent on isolating semantics from both content and presentation information. Extracting this semantic from today’s HTML content is not reliable. 2. HTML allows content to be repurposed for presentation formatting without providing a way to convey this information. 3. HTML, when combined with script and CSS may be repurposed to create dynamic custom component without the ability for the author to convey this information to the native accessibility architectures. 4. HTML cannot attach meaningful meta data about document structures.
Requirements
A technology must
Allow for discovery of custom UI components through the use of semantic web technologies

Support today’s accessibility architectures
Allow for separation of content and presentation
Allow for passive monitoring of the application by an assistive technology
Leverage new W3C efforts to solve the problem.
Be light weight in order to see uptake among HTML authors.
Be scalable, i.e. make simple things easy and complex things possible.
Be internationalizable; guarantee user agent support up front.
Solution
The authors do not have the ability to provide the proper accessibility information in the markup to support accessibility APIs on the target platform. The problem is not only limited to HTML but also extends to SUG. Declarative markups will address some of the issues. Work is being done on XFORMS and XHTML to add accessibility features through declarative markup of the language.

There are new rules and arrangements for keyboard focus and semantics to support platform accessibility APIs. Adaptive technologies that need to provide alternative access to complex user interfaces, authored through HTML, do not know about the semantics behind specific portions of the HTML document. Each platform accessibility API has the idea of a role for GUI object. This is so for Microsoft active accessibility (MSAA), Java accessibility API, the Gnome accessibility toolkit, etc. To add this information, namespaces are used to pull in the role attribute from XHTML2 and a value is given from GUI role taxonomy.
As this is dynamic content, the state of these new repurposed objects will change. The WAI Accessible states and adaptable properties module provide the common accessible properties needed to support the accessible state or property information provided by the platform accessibility API defined previously. We need to use namespaces to extend HTML to get this information.
All the adaptive technology solutions, such as screen readers and onscreen keyboards, need to know what object currently is in focus. For example, a user might want to insert text into the current object with focus, or announce information about the object that is in focus. HTML 4.01 and XHTML 1.x limit script authors to only being able to provide focus to form and anchor elements. However, the document object model specification allows all elements to receive events including keyboard events. This means that HTML by design prevents script authors from making all HTML elements keyboard accessible. This makes the use of web pages difficult as gaining access to all elements means using the Tab key on desktop browsers. To solve this problem XHTML 1.x is being modified with a feature from Fire fox and Internet Explorer to define tab index for -1.
In addition to the common rules that are available in the GUI role taxonomy, XHTML 2.0 has a collection of common roles that define relevant parts of a document for the purpose of accessibility. User agents may include device equivalents, such as key mappings in the case of a desktop user agent, to navigate to these sections of a document independent of the web site.

It will be necessary to describe how to interact with a document having a specific role. This is important when defining roles not included in the common set previously specified. It should be able to describe UI widgets and how to interact with them. RDF is a way for using data and provides a W3C standard based approach to represent this information.
Future opportunities of roles and semantic web technology
Structured textual markup: Enhancing structure of the markup of a document including data tables.
Knowledge representation of web content: As a secondary benefit roles improves compatibility knowledge based services and the semantic web. When accessibility and the semantic web are integrated, accessibility advances.
Adding concept in the type of content for adaptation to the user scenario: The more one understands about the content, the better it can be adapted for the end user.
XML Events and Handlers HTML is a device dependent solution. A disabled user when browsing a web page is faced with a number of problems. For example, there are a number actions to be performed on a web page, and the disabled user faces non informative information provided by HTML'S intrinsic events. The information provided is very device specific and non informative. For example, what action does an event handler perform in response to an onclick event? There may be more than one action that could be performed. A disabled user would like to study his options and make decision.
Generating the correct mouse event is a problem. The HTML working group is trying to solve these problems through XML events. XML events provide XML languages the ability to integrate event listeners and associate event handlers with document object model level 2 interfaces. The result is an interoperable mode of associated behavior and document level markup.

AJAX

Recently, there has been a lot of interest in using AJAX for building web applications. There are many advantages in using AJAX forms. It is possible to create an advanced user interface that does not refresh the page for every change made by the user. It is also possible to improve the workings of complex forms.
Inexperienced web users have problems in understanding the traditional way of posting form data. This is especially so when pressing the "back" button after submitting the form makes the browser display a warning message that the form is being resubmitted.

AJAX forms require more from the client than traditional forms.
1. JavaScript has to be enabled. This means that certain browsing devices like certain mobile terminals and lynx cannot be used.
2. The browser has to support XML Http Request Object (or similar). At present this is available on Mozilla, Firefox, Internet Explorer and Safari.

These requirements are not a problem for most applications. However, there are some other problems regarding accessibility. Consider a simple AJAX calculator. Users who have screen readers will not have a problem using the form. However, when they click the (ADD) button, they will not know that the result value has been updated.

Improving Accessibility of AJAX Forms

1. Inform the user at the top of the form that it requires JavaScript or detect JavaScript automatically and warn the user that it is not available.
2. Inform the user that the page is updated dynamically. This is especially important for users who use screen readers.
3. Make arrangements to receive an alert when information is being updated. This will help a user who uses a screen reader.
4. Highlight recently updated areas for a short period of time. This will help sighted users who can then understand what has happened.

Web 2.0 mashups

Mashups

Mashups are web applications that combine data and content from more than one source. Mashups have a number of accessibility issues and usability problems, like inaccessible services, inconsistent keyboard navigation and usability problems.

There has been significant progress made by the industry in addressing the accessibility of Web 2.0 applications through the development of the W3C web accessibility initiative and accessible rich internet application specification (WAI-ARIA).

Companies are now displaying content and data through public service APIs, creating what is known as “programmable web.” This move provides an opportunity for application development through adding of all content called mashups. Sources of content and data can be from web feeds, web services and screen scraping. Mapping, photo sharing and video sharing services are some of the applications well suited for mashups.

Accessibility and usability study: QED WIKI

QED WIKI is a situational application builder. It allows a user to quickly mash data and content from a variety of sources on the web into a user interface (UI) for a particular purpose. To illustrate, an emergency response team managing the effects of a natural disaster would need to create a situational application combining various factors, weather predictions, directions to hospitals, and handing out medical supplies on a map of affected cities and neighborhoods. Such an application must be created in a matter of hours and will be used for only a short duration.

Combining data and content from several different web sources and local resources into a single web based user experience presents several accessibility and usability challenges, which applications like QED WIKI must address. They are:
1. Content pulled from two remote web services and mashed into one situational application, could have conflicting accelerator keys, tab ordering, identifiers, etc.
2. Content from a remote web service when integrated into a situational application could make the user interface inaccessible.
3. Content from a remote web service could trap user focus.
4. Content from a remote web service could change in a way that makes the situational application suddenly inaccessible.
5. Reuse of the situational application UI components as widgets could lead to conflicts among components written by different developers.
6. Widgets that pull content from different web resources may have different interaction levels.
7. The layout of widgets could be affected by sizing and styling of content from remote services leading to layouts that are difficult to view.
8. Content provided by a remote service may not be suitable for local users.

RSS Feeds and Accessibility
Really simple syndication (RSS) aggregators, feed readers, and blogs, are now on web sites and news stories all over the world. However, it is not very easy for people who are disabled, especially those with vision loss, to access the new technology using a screen reader, such as Windows-eyes or JAWS.

The American Foundation for the Blind (AFB) did a study to identify the problems faced by visually challenged people using JAWS V5.1 & ALUA 540 Satellite Braille display, two popular assistive technology products that provide access to information on a computer screen. AFB looked at how easy is it for people to read and subscribe to blogs that are frequently updated through RSS. Known as RSS readers, feed aggregations, or feed readers, these programs check for, download, and organize new content from blogs and news sites defined through RSS. For evaluation, AFB looked at five well known RSS readers including Bloglines, Feedster, Newsgator, Feeddemon and myYahoo!
AFB’s evaluation revealed a lack of comprehensive how-to information meant for novice bloggers. Most tutorials assume that users are able to access and see the instructional diagrams, applications, and web pages. Text explanations were few. Also, there were instances where help sections weren’t useful because they gave mouse instructions instead of keyboard instruction and described buttons using visual descriptions that were not useful for screen reader users.

The most serious accessibility issue around blog hosting services is the inability to create user accounts. This is due to automated pictorial verification, which asks users to retype words they have seen on screen. Visually impaired users are unable to complete this task successfully. Also RSS readers were difficult to work with, because of problems with inaccessible information, procedures, and menu bars that were difficult or impossible to access. Web pages also have flaws. Improperly labeled page elements and non intuitive user interfaces make guesswork out of signing up for services and can turn a basic task like installing a program into an impossible task for a person with vision loss.

Accessible Folksonomies (Tagged Content)
A folksonomy is basically a taxonomy created by the people and for the people. A user community tags various types of content with user created keywords. This concept is seen on a number of community driven sites. Some of the folksonomies on popular sites like Technorati, Flickr, metafilter, del.ici.ous have the same accessibility problems. They are:
Unstructured links: With the exception of technorati, each of these menus was nothing but an unstructured collection of links, separated by only white space, or a non-breaking space entity. Making these items a list would provide visually disabled users with more feedback about the number of links as well as the ability to skip the link.
Extraneous markups: Each of these pages uses a fair amount of extraneous markup to achieve its goal.
Fonts were defined in pixels: As a result it was not possible to resize type as in Internet Explorer.
Lack of content: These menus requires a user to actually view the page in order to find the relative popularity of tags. There is no additional context that will be used to determine popularity.
Solutions
1. Use lists: Lists have become the structured way of making a collection of links. Lists provide additional structure and can influence accessibility.
2. Avoid inline style declaration: Assign a class to each LI element.
3. User relative font sizes: Defining font sizes in em’s would allow users to easily resize type in any browser. Fractional em’s are easy to calculate.
4. Add content: It is a good idea to add each topics relative rank, to the title attribute of the anchor.
5. Consider alternate views: There’s no reason that the standard folksonomy menu is the only way of describing or displaying the popularity of tags. An ordered list sorted according to popularity would do away with some of the need for visual clues.

Accessibility in wikis

The field of accessibility has become vast and complex; people's need for detail and specialisation has increased. This makes it difficult to build accessible web pages, especially when knowledge is spread around blogs and columns. Wikis may provide the answer to this problem of gathering knowledge and organizing it. The following examples will illustrate this:

Scripting Enabled: This pertains to using scripts to enable access for people with disabilities to sites that are difficult to access.

Global assistive technology: Global assistive technology has been set up by abilitynet a UK Charity that specializes in technology for people with disabilities. It is a collection of updated information on all points of assistive technology. It is a wiki that provides information to users on hardware and software.

Project Possibility: Project Possibility is a community project that creates opensource software for people with disabilities.

Codetalks: Meant for the developer, Codetalks is a source of information that includes rich internet application and widget accessibility using accessible rich internet application specification from web accessibility initiative (WAI ARIA).

Accessibility--Mozilla wiki: The Mozilla wiki documents specifics around technical accessibility including WAI ARIA projects and drafts for Gecko, a Firefox rendering engine.

Accessibility--Second Life Wiki: The Second Life Accessibility Wiki is a resource aimed at end users documenting what accessibility features are available in Second Life.
Blind Wiki: Aimed at blind contributors, Blind Wiki documents information about accessibility, technology, helpful tools, and links for people with vision loss.

Application development with XUL

Application development with XUL
Introduction to XUL
The objective of enabling access for Firefox on all platforms has implications far beyond building cross platform accessible websites. Mozilla's advantage lies partly in a technology called XUL, which is a relative of XML and can drive user interfaces.
Although similar to HTML AND JavaScript, XUL has more built in widgets and is used to develop standalone applications that are not bound to a web browser. XUL is a favorite with software developers because it is easy to use and understand. XUL has been used

in projects like Firefox and Thunderbird. Now, an environment called XULrunner will allow XUL applications to run without being bound to Firefox.
XUL has many advantages as far as accessibility is concerned. WebAIM will be collaborating on a Mozilla Foundation project to include accessibility information in XUL documentation, create guidelines and develop an XUL accessibility checking tool.
Accessibility Considerations
Since XUL replicates user interface components, many basic interactions have to be re-mapped to ensure that users with disabilities are able to access and use the generated interfaces.
Keyboard Access
Keyboard access is one of the most important needs to keep in mind as it has benefits to multiple groups of users with disabilities. Mouse-dependent scripting should be avoided.
Assistive Information
Users of assistive technologies often require additional markup to understand meanings and associations that may be intuitive to visual users. This additional markup is what is known as assistive information. Providing the additional information is easy, but is often forgotten because it yields little or no visual change. Developers should remember to include alternative text, titles, form labels and to test for the assistive information using assistive technology.

Accessibility for XForms

Assistive technologies API for X forms is supported from Firefox3 (Gecko 1.9). The elements behavior for X forms is done according to the accessible toolkit checklist. Accessible X forms can be obtained by downloading accessible X forms enabled build. For Firefox, a user can directly download the “Trunk” build and install XForms extension, which exists in the “XPI” directory of the build. X Forms accessibility is implemented only on Trunk. Trunk builds are not stable and should not be installed on top of the Firefox used for daily browsing. There are two ways to test X form accessibility. The first is to use assistive technology such as a screen reader or an accessibility testing tool. The second way is to use a toolkit check list to check keyboard navigation for X Forms controls.

AT API: Accessible properties

This section describes common rules for accessibility properties formed for forms control elements.
Name: It is formed from value of child X Forms label element if the element does not have labeledby attribute
Description: It is formed from value of child X Forms hint element.

State: It is formed from model item properties of instance node that forms X Forms element is bound to as form valid/invalid or inrange/out-of-range states of instance mode.
Attributes: It redefines data type ARIA attribute.
Children: Mozilla X Forms implementation allows form control elements to have child elements. This makes it easier to form accessible children from any accessible child elements of form control element.
Form Control Module: Some of form control elements can be represented in other ways by different widgets. The list of accessible presentation for form control elements are-
1. Input: A key X Forms element to show and change the instance data to which it is bound. The representations of input elements that are accessible are – text field, check box, date picker, calendar, day's list, month's list.
2. Secret: This is meant for inputting password and it is represented by a multiline text field.
3. Output: This shows instance data to which the element is bound; text and calendar are examples.
4. Upload: This allows a user to select a file represented by upload.
5. Range: This allows the user to choose a value from a certain range of values represented by slider.
6. Trigger: It is represented by a button and allows the user to make an action.
7. Submit: It allows submission of selected instance data. It is represented by a button.
8. Select: The user can choose one or multiple values represented by listbox and checkbox.
9. Select1: It allows the user to chose a single value. Example are combobox, listbox, and radiogroup.

Additional elements can be used as child elements to the form controls described above. Some of them may not be accessible but they have accessible properties for X Forms elements that hold them. They are: label, help, hint, alert, & message.

Screen Reader IT Interoperability

Screen readers are software programs that covert text into synthesized speech and enable blind people to listen to web content. Screen readers allow users to browse the web in many ways. The screen reader can read everything from top to bottom, line by line, or the user can use the tab key to move from link to link. Examples are JAWS, Windows-eyes and Home Page Reader.
Limitations of a screen reader
Images
Screen readers cannot describe images. The only way a screen reader can process an image is by reading the text in the document that is an alternative to the image. If there is no alternative text, then the screen reader cannot read the meaning of the image.
Visual layout

The screen reader cannot view the whole page as a visually abled person can. It reads the page in a linear fashion, one word at a time.

Data table

As a screen reader reads in a linear way, it gets confused by data tables. For example, listening to a large data table with 12 columns and 24 rows, row by row, by the time the 20th row is read the user will have forgotten the heading in column 6.

Solutions

Screen reader users use their keyboard as their main means for browsing the web. This is an important aspect that developers must consider. Some developers write programs that work only if it is accessed by a mouse. Keyboard inaccessibility is the result of JavaScript events that operate either through the click or the movement of the mouse. For example, any event triggered by onmouseover event will only work when the user moves the mouse over that particular object. There is no way to access that type of content using a keyboard alone without making another method available.

Interoperability

Microsoft is creating a stronger and more forward looking accessible technology in order to build a digital society that includes people with disabilities. An improved interoperability model for assistive and information technology products would present a range of alternatives to consumers who are disabled.

An IT ecosystem is made of several components including an operating system with settings and programs that are useful to people with visual disabilities, hearing loss, pain in their hands or arms, reasoning and cognitive problems. Accessibility IT would also include accessible applications, like a web browser and word processor and hardware. All these products will be manufactured by different companies. For that very reason, IT interoperability is very important to achieve broad digital inclusion.

For Users

For users with disability, interoperability hitches can mean a troublesome experience; multiple assistive technology tools behave uniquely and need cobbling together of imperfect solutions that pose security and stability problems. Improved operability can make assistive technology products that can work with a wider variety of software programs, websites and internet tools. Improved operability will allow customers to have control over user interface including scrolling, selecting, changing values and resizing.

From Developers

The IT industry has achieved its present level of interoperability through the use of four methods or pillars of technological interoperability. They are:

1. Products: Involves design of products to be interoperable with other products and services right out of the box with no modification.
2. Community: Involves working with IT community including partners, customers and competitors to develop interoperable products and solutions.
3. Access: Involves providing and gaining access to technology through licensing of products, copyrights, trademarks etc.
4. Standards: Involves developing and implementing industry standards and introducing them into products and services.

Personalization

Multimedia documents, like textbooks, reference materials, printed materials, use techniques that help people with disabilities to access them. This includes people who are blind, deaf, hard of hearing, physically disabled, etc. Print disabled users have different kinds of requirements. Therefore a personalization approach is needed where rich media documents are modified to the needs of an individual reader.

Navigation
To solve the problems in navigation, a tourist guide was developed for a particular town. The guide included text, images, text annotations on the maps, subtitling of videos. There were also interface adaptations. An evaluation was carried out with a number of partially sighted, deaf and dyslexic users. The following matters were investigated.

1. Personalization of intradocument navigation structure.
2. Personalization of intra page navigation structure.

While the users appreciated the features available to a degree, they wanted a number of improvements and modification. Aspects of content and interface were to be modified.

Interaction

Customization of interaction leads to differences in the user interface as well as different structural views of indexes. Customization of content will include insertion of sign language video, highlighting of text, alternative support for screen readers, reorganization of layout etc.

Semantic triage

Access to and movement around complex hypermedia environments which include the web is important for web design and usage. A user should be able to access the web without any difficulty. Therefore, designers and users alike place great emphasis on accessibility.

Accessibility becomes complicated if the user is visually impaired. One way of making it easier for a visually impaired user to access information on web pages is to encode the meaning of that information into the specific web page concerned. There are, however,

certain problems with this approach. The main problem is that authors and designers will not separately create semantic markup to coexist with XHTML as it is unnecessary.

In recent times, web page design involves a separation of presentation, metadata (XHTML) and information. However, this is not enough to provide trouble free access to visually impaired users.

Consider, for example, cascading style sheets Zen Garden web site. This is a recent model which includes the application of current standards of web and separation of presentation and content. However, this is not accessible to visually impaired users as the information is presented in an order according to the designer and not the user. Visually impaired users interact with these systems in a serial manner according to audio input as compared to the opposing form of visual input. For the visually impaired, content is read from top left to bottom right, with no scanning and slow progress. Therefore, this puts the visually impaired at a disadvantage, as they have no idea which items are menus, what is the structure of the page layout, what is the amount of content and where is the focus of information. Any meaning contained in the visual presentation is lost.

Even though CSS concepts look as though they have a meaning with respect to information presented, there is no way of relating this to the user because of lack of machine interpretable semantics. Therefore, the challenge is to see how semantic information can be built into general purpose web pages without altering the page's design vision, so that the information is available to visually impaired users.

Accessible javascript toolkit

As applications are getting increasingly complex to build, a number of toolkits have been created to make the process easier. Many of these toolkits do not address accessibility. DOJO is an open source JavaScript toolkit for building web 2.0 interactive applications that incorporates accessibility issues.

Overview
The objective of DOJO is to enable quicker building of complex web applications. The toolkit has an abstraction layer for the coding difference between internet browsers. A core set of DOJO widgets is being written for the 1.0 release. This is the dijit component of DOJO. The objective is to provide standard APIs with a standard look and feel. A primary issue is to provide customization using CSS support for data integration internationalization and accessibility. To achieve these goals, the code has been modified. The options are

few when creating widgets to maximize performance and browser support for cascading style sheets. Drag and drop is no longer widely implemented within widgets.

Applying ARIA to DOJO

When original DOJO interface components were first created, the goal was to have high performance and complex widgets. The controls used to work only with a mouse and accessibility for disabled persons was missing. Therefore, IBM got to work with the DOJO open source community to overcome this problem.

Keyboard support: The first objective was to make widgets work with the keyboard as well as the mouse. Most applications have form controls as their building blocks and links to enable users to tab from one component to another. As user interface components get more complex, interaction will require a lot of tabbing. The IE and Firefox browsers allow any HTML element to receive focus by adding a tab index attribute to the element. Using this technique any element can receive keyboard focus and arrow key navigation can be done.

Widgets need to be activated using the keyboard and the mouse. There is a special onclick event in the dijit system to support a mouse click. Using this feature the keyboard and mouse activation of an element is done by dijit. Application of this technique makes DOJO widgets accessible.

Assistive tech support: Just navigating through an application does not serve any purpose. The user has to understand the function of each component to get to know what keystrokes and interaction are possible. The ARIA roles and states are applied to DOJO widgets to enable full access using screen readers.

Low vision support: A requirement is that web pages should run while cascading style sheets are turned off. Users who have low vision create a separate personal style sheet to provide the needed font size and colors to interact with web pages. The user would tell the browser that he would use the personalized style sheet rather than the one that is on the web page. Nowadays, complex web applications use CSS positioning to create complicated layouts. The applications will not run well if CSS is turned off.

Web applications that use the Dojo widget set will not be able to claim compliance to U.S section 508 technical standard 1194.22 web based intranet and internet information and applications part id: “ Documents shall be organized so they are readable without requiring an associated style sheet but they can claim that ‘equivalent facilitation’ has been provided”.

High contrast modes: The use of CSS background images to create the look and feel of the component causes accessibility problems.

If the operating systems high-contrast mode is enabled, the images added using CSS are no longer displayed and the user cannot see the user interface. The solution to this is to require that all DOJO components use real HTML elements.

Eclipse

A major goal of Eclipse 2.0 was to supply support for the use of Eclipse by people with disabilities. There are several types of disabilities which can be served by accessible applications. The main categories are mobility, contrast, sound, and color and use of screen readers.

Mobility enablement
Mobility enablement spans a wide range of issues. The main issue is that of mouse use. A mouse was added to a computer to save labor. However there are many applications that cannot operate without it. Many people cannot or prefer not to use the mouse because of problems with injuries and poor motor control.

Contrast and colors
Contrast and colors are a problem for people who are not blind but cannot see fonts or color differences. Some people work in high contrast mode where they use only black and white. Therefore, colors should not be used as the sole means of presenting information. The same is true for sound because not only do deaf people need a visual picture but many people turn off the sound while working.
Screen readers like JAWS use Microsoft active accessibility support to read the contents of windows and dialogs to the user. Screen readers infer content from the content that has focus and its associated widgets. Developers need to be careful of tab support for screen readers as this is someone using one will navigate the application.
The main issue of accessibility and solving it in Eclipse can be illustrated with the example of a view. The view will be a simple entry with fields for name and password and an OK button. It starts off as: Public void createpartcontrol (composite parent)

```
// we have created a label at the top for our label usage with
   // a welcome label underneath. We have set its font bold we have defined titles
  // for our text entry & then the fields. Finally we add a button at the bottom of the fields.
```

A common accessibility problem is presenting something that looks great with your operating system but is unusable with other people's settings.
Colors & Images

An example of this would be a problem image. The title image consists of information that the user must have in order to use the application; if the user cannot read the image they cannot use the application. The most common setup for this case is the high contrast and mode in the windows environment. In high contrast text is generally shown as white on a black background and all of the fonts are increased in size. High contrast themes and modes are provided by windows operating system for those who cannot see the subtle differences. High contrast comes in white on black and black on white as accessible applications should be able to handle both. Eclipse is tested using all of high contrast needs provided by Microsoft.

Fonts

Like colors, fonts also need to be configurable for those who cannot see small fonts. The windows operating system offers large and extra large size font size modes, for setting the fonts to be more readable to those with poor eyesight. All dialogs and windows should be tested with the fonts set to these sizes so that none of the text is cut off and fits in the visible window. Eclipse is tested for sizing using the windows high contrast mode in windows XP at 1152*864 resolutions using the fonts provided by the high contrast mode.

Keyboard & mouse

The most important part of accessibility is that everything in an application must be accessed by a keyboard. Without a keyboard people who cannot use a mouse will not be able to use the application. Menus on any of the views provided by eclipse are accessible. F10 will give the main window menu focus, shift+F10 will bring the context menu for a view, ctrl+F10 will activate the pull down menu for a view if there is one and alt+ will bring up the view menu.

Accommodating screen readers

There are now many screen readers that can read aloud the elements of the user interface. JAWS is the most popular. Screen readers attempt to understand the relevant information about a widget and those that surround it and present that information to the user. They do this by taking the widget that has focus and inferring which of its siblings and parents have useful information.

As text and combo box widgets do not have a label associated with them, there are several ways one can get a screen reader to infer a label for a widget with focus. A label immediately precedes the focus widget in the z- order. The focus widget is the direct child of the shell. It is the parent of a widget that has a label and is labeled itself. Our example had text and labels in the wrong z- order. We created both the labels and both the entry fields. This prevents screen readers from providing information to users. Screen readers also use the z- order to determine labeling for text and combo box widgets.

A screen reader will not only read the label of a widget with focus will also read the labels of any parents of that widget which have

one. A screen reader will stop at the first unlabelled parent so one must be sure that there are no intermediate composites between labels you want read. If one wishes to label widgets they should be contained in a group box.

Reflexive User Interface Builder

The IBM reflexive user interface builder (RIB) is an application that constructs and renders graphical user interfaces for Java swing and Eclipse standard widget toolkit (SWT) based upon a descriptive XML document. Java swing is a rich GUI toolkit included with Java that provides an operating system independent GUI component.

Eclipse SWT is an add-on GUI toolkit that takes advantage of a host operating system GUI component for maximum host integration. RIB is a specification for a markup language in which to describe GUIs and an engine for creating them. This application can be used as a stand alone application for testing and evaluating basic GUI Layout and functions. It can also be used as a library within the context of a java application, for creating GUIs on that application.

Version 1.0.1 of RIB has its functions split. The validation function have been moved to RAVEN, a new Alphaworks technology. RIB is now used specifically for creating and rendering Java rich client GUIs based on a description specified in an XML document.

This technology runs on Java 1.4.2 and above and Eclipse 3.0.1 and above. RIB at present supports only Windows NT & Windows XP.

Java 2

The graphical and user interface have developed tremendously in terms of capabilities. The Java 2 platform is an architecture that supports complex cross platform user interface and is made up of numerous high level components, an advanced feature rich device independent graphic system and a lot of multimedia extensions. The Java 2 Platform also comes with many new accessibility oriented features, introduced in v. 1.4.0, increasing the each with which programmers can integrate accessibility features. Such features include support for text editing by assistive technologies, Mnemonic Tab Navigation, and an interface which provides the mechanism for an assistive technology to determine the extended graphical representation of an object. Other interesting features are the screen magnifier and reader properties, which allow Java platform libraries to know when a screen magnifier or reader is present on a system.

Writing accessible accessibility tools

Developers & testers make use of various tools to help them in creating, testing, and deploying applications and content so that it is accessible to disabled people. Disabled people cannot use these tools because they are not accessible to assistive technologies like screen readers.

The software development community has a long history in creating tools that help in creating, testing, and deploying applications and content. These tools have been gradually developed to help application developers enable their applications for accessibility.
An example of an inspection tool is Microsoft Inspect32 for displaying common accessibility related properties of GUI components, such as their accessible name, accessible description, accessible role, and accessible state. Other tools in the Microsoft Active accessibilitydevelopment and testing portfolio include AccEvent and AccExplore, which are typically used along with Inspect32 to monitor the events being generated by components within a GUI or document elements within a browser to navigate the order of objects that can be accessed through assistive technologies.

The problem is that the tools by themselves are inaccessible because JAWS can only read Inspect32 contents when Inspect32 has focus. Studying properties is inefficient and time consuming because of reliance on the JAWS cursor. With the use of the JAWS cursor, information that is not accessible is buried along with inspected application. Only keyboard focus tracking and navigation shortcuts can be used to find a cursor of interest. There is no context for navigation of accessible objects.

ACTE and Accessibility Probe
The Eclipse accessibility tools framework (ACTF) is first a collection of accessibility tools such as a compliance validation engine, inspection event monitoring tools, and simulation and visualization utilities. The ACTF is also a framework made up of reusable components for building tools for providing truly usable access to existing Eclipse based applications.

Accessibility Probe is one of the entities included in ACTF. It combines the functions of an inspect tool like Inspect32, a hierarchy viewer like AccExplore and an event monitor like AccEvent into one Eclipse rich client product (RCP) application. It also supports applications that use either MSAA or IAccessible2 accessibility architecture. Unlike other tools of its kind, its accessibility tools are accessible.

How it works
As an RCP application, AccProbe has three views:
Explorer view, for navigating among the hierarchy of accessible tools.

Properties view, for viewing properties of accessible objects
Event monitor, for monitoring the events activated by accessible objects

When AccProbe is initially launched, the explorer view is populated with the top level windows of the Windows desktop. Users can use the standard keyboard controls for navigating a tree in explorer view to explore the order of accessible objects.

It can find objects having a specific accessible role or name using the find command, or select objects by tracking keyboard focus, mouse cursor position, or the text caret position while moving through the application being analyzed. Selecting a node in the explorer view also selects the top-level window to be monitored for events.

Developing Accessible Software for Data Visualisation

A large number of countries are enacting legislations that need Information Technology to be fully accessible to all users. For software products to be accessible they have to be designed and implemented so that they can be used by people with varying disabilities. A large number of users of information technology products have disabilities like impaired vision, hearing, mobility or cognition. To help them a number of rules and regulations and standards for accessibility are in force all over the world.Whenever software is accessible, the disabled can use assistive technologies like a screen reader to help them.
The IBM Checklist
The IBM checklist specifies the principles and guidelines for input methods, output methods, and consistency and flexibility.
Input Methods
For input methods, the requirements are:
1. Support the user's choice of input methods, including keyboard, mouse, voice, and assistive devices via the serial port.
2. Provide keyboard access to all features and functions of the software application as the main requirement.
3. Provide support, usually by means of the operating system, for input through the serial port. Keyboard movement of the mouse pointer and other keyboard enhancements.
Output Methods
For output methods, the requirements are:
1. Support the user's choice of output methods, including display, sound and print.
2. Provide text label's of icons, graphics, user interface elements and support visual indications for sounds as the primary requirement.
3. Implement the accessible application programming interfaces (APIs) for example,
4. Java accessibility or Microsoft active accessibility, so that the desired operating system meets this principle.

Consistency and Flexibility
For consistency and flexibility, the following are the requirements:

1. Make the application consistent with the user's choice of colors, font sizes, keyboard settings, and system operation.
2. Provide a user interface that can be customized to accommodate the user's needs and preference like fonts, colors and display layout.

Customizable cross-platform look and feel

For people who are not disabled in any way, an application's look and feel is only a matter of choice. However, for people with visual impairments, it is necessary to customize the look and feel of the application so that it can use specific fonts, color schemes or icons. Visually impaired users need a look and feel with a high contrast between text and background and large fonts and icons.
The IBM Java accessibility checklist specifies that all user interface objects must support high contrast settings.
At the first instance, the "native" look and feel designs make the metal look and feel seem useless. However there are some cases where the metal look and feel can be helpful.
Modifying colors and fonts
Javax.swing.plaf.metal.metal is the main class of the metal look and feel. The Java API documentation of this class shows that most of the methods defined in it are getters, returning the colors and fonts to draw different widgets available n the swing framework. However, the return value or the getters is passed on to another class called a theme. The sole purpose of the theme is to provide the value of the colors and fonts to use.
Customizing colors and fonts of the metal can be done in three easy steps. 1. Creating a new class that extends javax.swing.plaf.metal.metaltheme or its default implementation, java.swing.plaf.metal.Defaultmetaltheme.
2. Overloading the getxxxfont() methods from the theme class so they return the fonts or colors needed in the new theme.
3. Setting the new theme in the metal look and feel by invoking the MetalLookandFeel.setcurrentTheme (theme) static method.
Modifying the Icons
Modifying icons is necessary if a user wants a look and feel with large fonts. The size of the icons used in check boxes and radio buttons should be adapted to the size of their font. Icons cannot be modified in a theme. The metal look and feel stores the list or the graphical resources to be used (colors, fonts, images) in a javax.Swing.UIDefaults object. Each image required by different widgets is stored by the look and feel under a specific key in this table.
Scaling the Icons

The metal look and feel does not use GIF Files to paint the icons. It creates them dynamically through a factory class called Javax.Swing.plaf.metaliconfactory.
A customizable high contrast look and feel
Listing 2 HighcontrastLAF.Java file shows the source code for the look and feel that is based on the metal look and feel and a color scheme that was created to provide a customizable operating system independent high contrast look and feel.

AIX

AIX Version 1, introduced in 1986 for the IBM 6150 RT workstation, was based on UNIX System V Releases 1 and 2. In developing AIX, IBM and INTERACTIVE Systems Corporation (who IBM contracted) also incorporated source code from 4.2 and 4.3 BSD UNIX but accessibility was not a consideration in all of these versions. Accessibility removes the barriers that prevent people with disabilities from participating in social, professional, and practical life activities. By combining new accessibility support in AIX 5L (the AIX operating system for POWER-based systems and Itanium-based systems, with an affinity for Linux) with built-in functionality in standard UNIX components, you can make AIX more accessible for your users.

How to make AIX applications accessible
Using X Keyboard Extensions to increase accessibility: when enabled, support standard keyboard accessibility functions for the X Window environment and applications such as StickyKeys, RepeatKeys, SlowKeys, BounceKeys, ToggleKeys, and MouseKeys.
Activating the X Keyboard Extensions: To enable the X Keyboard Extensions on your AIX system, you must modify the /usr/lpp/X11/defaults/xserverrc file, which is the file that starts the X server
Using Style Manager in Common Desktop Environment (CDE): In CDE, use the CDE Style Manager to customize color, font, background, and auditory output. You also can customize the color and shape of the mouse pointer for CDE and X Windows.
Changing the shape and color of your mouse pointer: The following command allows you to change the shape and color of the mouse pointer. Run this command at the root window only:
xsetroot -cursor_name name -bg color Use the /usr/include/X11/cursorfont.h file, which has the names of the cursor, to change the cursor into the following shapes: X-cursor-Cursor converts to a large X arrow-Arrow cursor points to the right base_arrow_down-Cursor points downward base_arrow_up-Cursor points upward circle-Cursor converts to a circle To change the cursor to a large red X, run the following command in the command window: xsetroot -cursor_name X-cursor -bg red
Using Web-based System Manager with the IBM SVK: The Web-based System Manager in AIX 5L is a suite of system management tools written in the Java_ language. Making the graphical user interface accessible to visually impaired users required some additional technology. The SVK, available from the IBM alphaWorks Web site, provides the link between the Java code and a speech

synthesizer that translates the Web-based System Manager GUI to speech output. SVK, working with the Java Accessibility API, supports speech output for Java applications like the Web-based System Manager without requiring modification of the base code. The SVK runs as an application in the Java virtual machine that the Web-based System Manager supports. The SVK supports DecExpress and Accent SA hardware text-to-speech synthesizers.

Using accessibility features in applications: with the Java Foundation Classes / Swing 1.1 check how to make your application accessible with the SVK:
1. Define mnemonics and accelerator keys for tasks that are frequently performed. For mnemonics, set the mnemonic key on components that extend AbstractButton.
2. Make components that do not get focus (like JTextFields) accessible: Create a dummy JLabel and setLabelFor on non-accessible components.
3. Associate JLabels with corresponding JTextFields.
4. Describe icons and graphics and set the descriptions on all components. For example, icons should have text description for fly-over or hover help.
5. Add perks where application information is announced and where no focus is rendered. A perk is a programmable user interface extension. Perks that are part of the SVK are usually programmable voice output user interface extensions that announce application information to augment or replace your visual interface.

Conclusion
Computer users with varying abilities need equal access to technology and information. You can configure your AIX system to be more accessible to your users, as well as enhance your code with accessibility features. The easiest way to build an accessible Java application is to use JFC/Swing 1.1 and follow IBM guidelines for making Java applications accessible.

Palm

The Palm webOS platform is an operating system that allows designers and developers to create applications that users can run on applicable devices. Designers, developers, and anyone who can design and develop a website using HTML, CSS, and JavaScript can create a Palm application.

The Uniqueness of the Palm Interface

The Palm application has non-object-oriented graphical user interface and is a modal application with unique user interactions very different from Windows. There is also a good limitation of display space. Palm OS devices have been designed to achieve an admirable balance of usefulness and minimalism: frequent commands should be readily accessible; navigation within an application should be limited; intermediating dialog windows should be limited in number; data should be entered and accessed quickly. In sum, an application should be designed to be so simple that a user can learn the basic functions of that application and be productive within minutes. In the Palm OS environment, modal behavior is ubiquitous. A running application must be stopped before another can be started. Dialog boxes must receive some kind of user action before returning to the parent application. However, the Palm OS device has been designed so that the user becomes easily accustomed to this behavior: Applications are streamlined and start and stop immediately; dialogs often require simple decisions and actions in order to interact with them. Above all, simplicity is an overriding philosophy of the Palm OS device. These characteristics should be taken into consideration during the design of any Palm OS application.

Building applications

The Palm Mojo SDK includes a number of tools to help developers build, debug, and deliver applications. The first step in creating an application for Palm webOS platform is usually to generate a basic application with one or more scenes. You can generate an application and scenes automatically either with the palm-generate tool on the command line or by using the Eclipse plug-ins. To develop your application, use the command-line tools and your favorite text editor, or use Eclipse with the Palm plug-ins. Debugging is similar to what you would be doing with other mobile devices; you can use the emulator or you can use the actual device. To check data flow, you can use Inspector Tool for inspecting the DOM of stages and scenes running on the device or emulator. Palm API will certainly help you do most of the things in an easy manner.

Accessibility considerations: Making Palm OS text easier to read

While there are some limitations to accessibility that are difficult, if not impossible, to overcome, the Palm OS application can be made more accessible for users with certain physical limitations. Specifically, if users with visual impairments are taken into consideration during the design process, some of the limitations of viewing information on a handheld screen can be mitigated. Many of these considerations are straightforward. Choose backgrounds for forms that provide high contrast with the displayed resources. On Palm OS devices with color displays, choose default colors that provide high contrast and avoid implementing sets of colors that cannot be discriminated by users with color vision impairments, especially if the colored components are intended to convey information. Consider providing a user interface that allows the user to select the color of each type of resource object to meet their needs; use the Palm OS UIPickColor API to provide this support. A mechanism can be provided to change all text to a larger font.

However, this is complicated and requires more effort to develop. The Palm API does provide a mechanism to achieve this but the sensible approach is to have the accessibility needs satisfied with the inception of the project.

Structured HTML and CSS

Over a period of time web design, web standards & best practices have become important. Before the use of cascading style sheets (CSS), correct HTML structure was often neglected in favor of improved visual layout. HTML elements like tags, and layouts were often overused & not structured correctly, while elements with specific functions were underused.

Separating content from presentation

There are many benefits to separation of content from presentation. CSS provides a way to move presentation attributes out of HTML code and helps improve HTML structure.

Structured HTML

Structured HTML is HTML that is well formed and uses elements with semantic value. The steps to be taken while using structured HTML are:

1. Use heading elements to denote hierarchy of headings.
2. Putting list of things especially menus, inside proper list forms.
3. Ensuring that all of the text is inside the proper HTML element, such as paragraph.
4. Creating data tables by adding the semantic elements that define structure such as summaries, and table heads.
5. Removing every piece of presentational markup from your HTML code.
6. Placing all the presentation details in external CSS files.

The benefits of structured HTML are that it improves accessibility, improves search engine results, is device independent and performs better.

Accessibility benefits of CSS

Moving all presentation styles to CSS improves accessibility in the following ways.

1. CSS allows us to control layout: We can use CSS to control layout and allow the main content of a page to appear higher in the HTML source sequence. This makes it easier to get the content with a screen reader and also enables a search engine to get the content faster.
2. CSS allows us to use hidden elements: With CSS we are able to hide elements from visual display while keeping them available for those who use screen readers or other assistive technology.
3. CSS can offer alternative schemes for viewing content, alternate style sheets with high contrast, color combinations or layout that can display a huge increase in font size for those who need it.

4. CSS enables device independence: Just like the feature for alternate style sheets to change its appearance, style sheets for different devices can be offered.
5. CSS enables better performance: Sites that modernize by using the principles of separating content from presentation see HTML file sizes shrink by 30-40%.

Portals and portlets

IBM is contributing software to Mozilla Foundation's Firefox web browser, to make it easy for users with visual and motor impairments to access and navigate the web. Apart from contributing code that will allow a web page to be automatically read or magnified, and to be navigated with keystrokes, IBM is contributing Dynamic hypertext markup language (DHTML) accessible technology to Firefox version 1.5. This will allow software developers to build accessible and navigable rich internet applications.

This software will make Firefox 1.5 running on Windows the only browser to give developers the ability to add accessibility functions RIA that will make them more accessible to the disabled and the elderly. With the new accessibility features in Firefox 1.5, all users can easily navigate web based applications through the keyboard. With the use of DHTML, web developers can create web pages that reduce the amount of tabbing required to navigate a document and minimize keystrokes for people with disabilities.

IBM and Mozilla's work is an important step in helping to make the increasingly popular browser acceptable for adoption by the government. The accessible DHTML technology can help portals like Yahoo! become accessible to the disabled.

Programming for the blind
A totally blind programmer uses Windows XP as the operating system and JAWS to read what appears on the screen in synthetic speech. For Java programming, Eclipse is used since it is a fully featured IDE that is accessible.

Java programs that use SWT as the GUI toolkit are more accessible than programs that use Swing. For any .net programming Visual Studio 2005 is used as it is very accessible using JAWS.

For C & C++ programming Cygwin with GCC as the compiler and EMACS or VIM as the editor is used. Braille display is used where punctuation is needed, like in IF statements, where there are lots of nested parentheses, and JCL, where punctuation is important.

MSAA and UIA

MSAA

MSAA is the same as the IA Accessible interface. This interface is meant for disabled people. It is used in most cases as an implementation method of UI Automation. However this interface does not have the capability to absorb all aspects of UI Automation, as it only provides the name, type, positions of the target elements. It does not expose other functions like class name, orientation, or the operation supports like window move.
Therefore, Microsoft aims to provide a dedicated interface for UI Automation.

UI Automation Architecture
With UI Automation, the core component is loaded into the accessibility tools and application process. The core component is able to do cross-process communication providing higher level services such as searching for elements by property values, and enable bulk fetching or caching of properties, which provide better performance than the

Microsoft active accessibility implementation.
UI Automation includes proxy objects that provide UI information about standard UI elements such as USER controls, USER menus, and common controls. It also includes proxies that help UI Automation clients to get UI Information from Microsoft Active accessibility services.

Interoperability between Microsoft Active accessibility based applications and UI Automation based applications

The UI Automation to Microsoft Active accessibility bridge enables Microsoft Active accessibility clients to access UI Automation providers by converting the UI Automation object model to a Microsoft Active accessibility object model.

I Accessible2API

IAcessible2 is a new accessibility API which supports Microsoft's earlier work on MSAA. IAccessible2 was created to produce a usable and accessible open document format (ODF) based office suite for the Commonwealth of Massachusetts. IAccessible2 is an interface engineered to provide accessibility, allowing application developers to use their investment in MSAA while providing an assistive technology access to rich document applications such as the IBM Workplace productivity editors and Firefox.

The additional function includes support for rich text, tables, spreadsheets, and Web 2.0 applications. IAccessible2 has been made compatible with UNIX accessibility APIs to allow efficient multi platform development.

The Microsoft active accessibility API, MSAA was released in 1995 and was a long needed advance of the state of the art at that time, which allowed application developers to provide engineered solutions to the problem of providing accessibility on the Windows platform.

After the release of MSAA, progress continued to be made on other platforms. Work was done on Java when the Java accessibility API was developed jointly with IBM and Sun Microsystems. This was further improved by openoffice.org when the UNO Accessibility API was developed. A major requirement for IBM and other vendors is the ability to create applications for multiple platforms.

Comparison with the UNIX ATK
Of the several API'S examined, the UNIX ATK has several advantages. It has features that encompasses the others; it is a general purpose for multiple application types. It also has several advanced features to support new kind of applications. The ATK Action interface has support for multiple actions on a single control. Though multiple actions on a single control seems overdone, many of us have experience with a browser back button that can either single step through prior pages or show a history. By enabling multiple accessible actions on a single control, the rich semantics of this kind of control can be shown to the assistive technology user.

Open Standards
For IAccessible2API to be used by everyone, it must be standardized and that standardization must be open for review and improvement. IBM has donated IAccessible2API specifications to the Linux foundation. Participation in this group is open to everyone.

ARIA

Web accessibility is about making web content accessible to people with disabilities. People who are disabled use assistive technologies to interact with the content. Assistive technology processes the content and presentation and allows it to be accessible to the user and allows the user to interact with the content in a different way than was originally designed.

To achieve this aspect the software must understand the semantics of content. Semantics is the knowledge of roles, states, and properties that apply to content as a person would understand them. For example if a paragraph is semantically identified, assistive technology can interact with it as a separate unit from the rest of the content knowing the exact boundaries of that paragraph. New technologies often overlook the semantics needed for accessibility and intended semantics of those technologies are often misused by authors. Elements that have one meaning defined in the language are used with a different meaning intended to be understood by the user. For example, web application developers create collapsible tree widgets in HTML using CSS & JavaScript even though HTML lacks an appropriate semantic element. To a non-disabled user, it will look like a collapsible tree widget, but without the appropriate semantics, the tree widget cannot be operable by a disabled person.

ARIA

The incorporation of WAI-ARIA shows a way for an author to provide proper semantics for custom widgets to make those widgets accessible, usable and interoperable with assistive technology. This specification identifies the types of widgets and structures that are recognized by accessible products. This allows elements with a given role to be understood as a particular widget regardless of any semantic inherited from the implementing technology.

Roles are a common property of accessible APIs that assistive technology uses to provide the user with effective presentation. The roles taxonomy includes interaction widgets and elements denoting document structure. Information about mapping of roles to accessibility APIs is provided by the WAI-ARIA User Agent Implementation Guide. Roles are element types and should not change with time or user actions.

States and properties are used to declare important attributes of an element that affect and describe interaction. They enable the user agent or operating system to properly handle the element even when the attributes are dynamically changed by client side scripts (programming). For example alternative input and output technology such as screen readers, speech dictation software, and on screen keyboards must be able to recognize and communicate various states (disabled, checked, etc) to the user.

AXSJAX

AJAX techniques have helped web developers create live applications within web browsers. The AXSJAX Framework builds accessibility features into those applications so that users of assistive technologies like screen readers and self voicing browsers can get the same level of interactivity that is available for Web 2.0 applications.

Accessibility Goals

Its accessibility goals are to
Discover and codify design patterns for access-enabling AJAX applications.
Serve as a test bed for implementers of adaptive technologies in extending their tools to handle web 2.0 applications.
Help discover and fill in the gaps in the various standards that deal with the accessibility of AJAX applications.
The long term goals for AXSJAX will be user based. The initial release gives information about the type of end user benefits that can be enabled via such a framework. The goal is to create a healthy community built on an open framework for advancing the accessibility of Web 2.0 applications.

DOJO

DOJO is an open source DHTML toolkit written in JavaScript. It builds on several contributed code bases (nWidgets, BurstLib, f(m)), which is why it is known as a unified toolkit.

DOJO aims to solve some long standing historical problems with DHTML, which prevented mass adoption of dynamic web development.

Features

DOJO has a feature that enables a user to easily build dynamic capabilities into web pages and any other environment that supports JavaScript. The user can use the components of DOJO to make web sites more usable, responsive and functional. With DOJO the user can build dependable user interfaces, prototype interactive widgets, and animated transitions. It is also possible to use the lower level APIs and compatibility layers from DOJO to write portable JavaScript and simplify complex scripts. DOJO's event system, I/O APIs and generic language enhancement is the basis of a powerful environment. The DOJO build process helps the user to optimize JavaScript for deployment by grouping sets of files together and reusing those groups through profiles.
DOJO does all of these things by compressing capabilities into a very small core which provides the package system. When a user writes scripts with DOJO he can include little or much of the available APIs to suit his needs.

Flash and Flex

FLASH

Flash player is a cross platform browser plug in that enables people to experience the Web. Over 99 per cent of Internet users use Flash.

Features

Flash has the following features:

1. 3D Effects: 3D Effects make for richer interfaces. Fast extremely lightweight and simple to use 3D tools in Adobe Flash CS4 Professional software makes motion that was previously accessible only to expert users via action script language available to everyone.
2. Custom filters and effects: One can create high performance real time effects for cinematic experiences that engage users. With the new Adobe filter pixel bender, the same technology behind many filters and effects in Adobe After Effects software, these dynamic and interactive effects can be used both in production with the effects CS4 and live with Flash player 10.
3. Advanced text support: A new flexible text engine brings print quality publishing to the web. One can gain control over text layout using text layout framework.
4. Dynamic sound generation: Use enhanced sound APIs to generate audio and create new types of audio applications, such as music mixers and sequencers, real time audio for games, and other applications.
5. Drawing API: Perform runtime drawing easily with restyleable properties 3D APIs and a new way of drawing complex shapes without having to code them line by line.
6. Hardware acceleration: Use the hardware processing power of the graphics card to paint SWF Files into the browser and accelerate compositing calculations of bitmaps, filters, blend modes and video overlays.
7. Vector data type: Use new typed array class for better performance efficiency and error checking of data.
8. Dynamic streaming: Show video with streams that can automatically adjust to changing network conditions.
9. Speech audio codec: Take advantage of the new high fidelity and open source speech voice codec.

FLEX

Flex is a free and open source framework for building highly interactive and expressive web applications that can run on all major browsers, desktops, and operating systems. It provides a modern, standards based language and programming model that supports common design patterns. MXML, an XML language, is used to describe UI layout and behaviors and Action Script 3, a powerful object oriented programming language is used to create client logic. Flex also includes a rich component library with more than 100 proven extensible UI components for creating rich internet applications as well as an interactive Flex application debugger. RIAs

created with Flex can run in the browser using Adobe Flash player software or on the desktop on Adobe AIR, the cross operating system runtime. This enables Flex to run consistently across all major browsers and on the desktop. Using AIR, Flex applications can now access local data and system resources on the desktop.

Silverlight

Silverlight 4 offers a full range of powerful capabilities to business application developers, bringing the best of .NET platform to browser based experiences. Silverlight provides an ideal platform for developing and deploying modern business applications for diverse applications.

Business application development: New features for application developers
There is comprehensive printing support enabling hardcopy reports and documents as well as virtual print view. There is a full set of forms and controls with over 60 customizable, styleable components.

The WCF RIA service introduces enterprise class networking and data access for building n-tier applications. There is localization enhancement with bi-directional text, right to left support, and complex scripts and 30 new languages. The .NET common runtime (CLR) enables the same compiled code to be run on the desktop and Silverlight without change.

Enhanced data binding support increases flexibility and productivity through data grouping, editing and string formatting within bindings. Managed extensibility framework supports building large composite applications. There is an exclusive tooling support for Silverlight, new in Visual Studio 2010.

Developer tools
There is a fully editable design surface for drawing out controls and layouts. There is a rich property grid and new editors for values.
The technology has drag and drop support for data binding and automatically creating bound controls such as listbox, datagrid. Easy to pick styles and resources make a good looking application based on designing resources built in the expression blend. There is built in project support for Silverlight applications and an editor with full intellisense for XAML & C# & VB Languages.

Features
Silverlight 4 offers a richer and more interactive experience. It is already in use as a platform for building rich experiences for applications and pure media scenarios.

Some of the features are:
Ffluid interface enhancement which advances application usability through animation effects.
Allows webcam and microphone to allow sharing of video and audio for chat and customer service purposes.
Video and audio capability that can capture RAW and video, without the requirement of server interaction.
Enablement of a wide range of end user interaction and communication scenarios, for example video conferencing.

Moonlight

Moonlight is an open source implementation of Silverlight meant for Linux and other UNIX/X11 operating systems. In September 2007, Microsoft and Novell announced a technical collaboration that will include access to Microsoft's test suites for Silverlight and distribution of a media pack for Linux users that will contain licensed media codecs for video and audio.

The goals of Moonlight are:
1. To run Silverlight applications on Linux.
2. To provide a Linux SDIC to build Silverlight applications.
3. To reuse the Silverlight engine that has been built for desktop applications.

DAISY and MathML

Readers with print disabilities have used audio books for a long time. First introduced on cassette tapes for leisure reading, audio books have also been used for educational purposes. With the adoption of the DAISY Standard, digital talking books have become the de facto standard and content production on CDs has been gradually replacing the cassette tape medium. DAISY books may contain audio and/or text, as well as images.
One main problem of conventional audio books and paper Braille books affecting educational content is that mathematics and other formulae were treated as either text or images. Hence, there was not enough structure information to enable accessible technology to present the formulae appropriately via audio or Braille. Since the formal approval of the MathML-in-DAISY Specification in February 2007 as the first extension to the DAISY Standard, it is now possible to produce and use books that present mathematical content in a synchronized and structured and therefore accessible way.

The DAISY/NISO Standard

DAISY is an acronym that stands for Digital Accessible Information System. The term is used to refer to a standard for producing accessible and navigable multimedia documents. In current practice, these documents are digital talking books, digital text books, or a combination of synchronized audio and text books.

DAISY is a globally recognized technical standard to facilitate the creation of accessible content. It was originally developed to benefit people who are unable to read print due to a visual impairment, but it also has broad applications for improved access to printed material and other media in the mainstream. The DAISY Standard has been evolving over the last several years and has been officially recognized by an American standards-making body in 2005. Whereas books produced in the DAISY 2.02 standard are the most common ones by far, the use of math is only possible in the new DAISY/NISO Standard that was introduced in 2005. This new standard is officially called "ANSI/NISO Z39.86-2005" but commonly known as “DAISY 3”.

The DAISY Consortium has been selected by the National Information Standards Organization (NISO) as the official maintenance agency for the DAISY/NISO Standard, officially, the ANSI/NISO Z39.86, Specifications for the Digital Talking Book. A more thorough description of the DAISY/NISO Standard is given in Reference 6, below.

The MathML Standard

MathML is a W3C recommendation. The W3C is the world-wide organization that creates the standards for the Web. The MathML specification is, as a consequence, a normative document, which allows MathML to be highly compatible. Also, it was created by the Math Working Group composed of people from several countries and diverse scientific fields, so MathML takes into account the needs of many different professions, countries, and uses.

MathML is a so called “XML” (eXtensible Markup Language) language. This means that new features can be added as needs arise – see, for instance, the Arabic mathematical notation – or, can become deprecated if experience shows they are useless. Finally, MathML can be used in combination with other Web languages. As a bonus, MathML can easily be created with existing formula editors and be exported to or imported from computer algebra systems like Maple and Mathematica. It could be processed by search engines, therefore providing multiple benefits to the user. The use of so called “presentation MathML” is provided for DAISY/NISO, in contrast to “content MathML”.

An example of the formula "- a/b" expressed in presentation MathML is: <math xmlns='http://www.w3.org/1998/Math/MathML'> <mrow> <mo>-</mo> <mfrac> <mi>a</mi> <mi>b</mi> </mfrac> </mrow> </math>

As you can see, no one would want to read or write MathML directly. The use of additional tools is therefore necessary.

One of the biggest advantages of XML is that it has to be well-formed, so that if you open a tag you have to close it later on. In this way, malformed MathML may be spotted immediately during the validation process; inconsistencies are therefore avoided.

DAISY and MathML

The MathML extension is the first extension of the DAISY specification. The approach taken makes use of the existing extension mechanism specified by Z39.86-2005.

There are many problems associated with the use of images by authors and readers with and without visual disabilities when working with digital documents containing math. These include: • the inability to magnify the image or change its colors • fixed speech (based on alt text) that cannot be tailored to an individual's needs • no local navigation and exploration of the mathematical structure • no synchronized highlighting of active parts of the image and audio • inability to be translated to a Braille math code

MathML offers a solution to these problems. Because it is an XML application and has been designed to work with XHTML, using MathML in Z39.86-2005 was the direction that the MathML Modular Extension Working Group pursued.

MathML is not directly read. Especially for a blind person using a Braille display, the DAISY player has to convert MathML into a notation suitable for that person. Currently, there are literally dozens of different math notations used worldwide. The use of LAMBDA, LaTeX and Nemeth is planned by different organizations working on DAISY players. Using MathML within DAISY documents allows for unified and well-defined storage, while the presentation of the math content to the user is dependent on the player used.

The modular MathML extension is meant to encourage advanced MathML players to provide a rich experience when reading mathematics. However, this extension also recognizes that mathematics may not be a focus for all vendors and provides a fallback mechanism. For the common case of an audio only player, a predefined audio rendering is provided. There are no local navigation points within that rendering, which is something an advanced MathML player might provide. An advanced MathML player could allow a user to explore the structure of the expression tactilely using a refreshable Braille display and/or with audio without having to listen to the expression in its entirety. A future version of the DAISY MathML specification may add finer SMIL granularity within the math audio stream. For players that do not support MathML, an alternate image is provided as part of the MathML. Basic MathML players must either recognize MathML enough to locate the image reference provided on the MathML element, or they must support XSLT, which is a language for transforming XML documents into other XML documents, and apply a supplied transform indicated in the metadata of the DTB Package file.

The MathML-in-DAISY Specification therefore groups players into 3 categories: • Players that do not comply with this specification. These players know nothing about MathML. They do not extract the altimg and/or alttext from a <math> tag nor do they apply a stylesheet to transform the math to an image group. They ignore MathML and use only the audio as their fallback behavior. These players are referred to as MathML-unaware players. • Players that conform to this specification but cannot natively render the MathML. They fall back to using either the XSL transform or grab the alttext or altimg attributes from the <math> tag. These players are referred to as Basic MathML players. • Players that natively support MathML. They therefore offer the ability to magnify the

equation or change its colors, the tailoring of the speech to an individual's needs, the ability to navigate and explore the mathematical structure, synchronized highlighting of audio and text, and the ability to translate to a braille math code for use on a refreshable braille display. These players are referred to as Advanced MathML players.

Current status

The MathML-in-DAISY extension was formally approved and is therefore ready for use.

As new products and services are developed by DAISY Member organizations, they are announced on the DAISY Consortium Web site, and MathML capabilities are specifically tracked.

Summary for students (users)

If students want to use digital books to learn math, physics or chemistry, DAISY books with MathML are suitable. The first books are now becoming generally available. Until then, students should keep themselves informed and ask their libraries about digital math books and get new advanced MathML DAISY players.

Summary for teachers (producers)

Teachers should ask software vendors about DAISY production tools with math capabilities.

Summary for libraries and publishers

Libraries and publishers should make themselves comfortable with DAISY books and MathML. Exploring the references and starting producing and testing DAISY books without math will help them get a feel for the issues at hand. They should get new production tools with math capabilities as soon as they are available, and make sure that all computers in the library are equipped with DAISY reading software. Conferences or meetings on DAISY and MathML are a good way to learn more.

Tools

Reading MathML with Speech:

MathPlayer plugin for Internet Explorer (available now): www.dessci.com/mathplayer/

gh MathSpeech (available soon): www.gh-mathspeak.com/

Dolphin EasyReader with math (available soon): www.yourdolphin.com/

DAISYReader with math (available soon): www.iddw.org/

[edit] Reading Math in Tactile Hard Copy:

DotsPlus from MS Word and MathType using TSS (available now): www.ViewPlus.com/products/

Nemeth Braille from MS Word and MathType using TSS (available May, 2008): www.ViewPlus.com/products/

Scientific Word and Latex to math Braille Duxbury DBT (available now): www.DuxburySystems.com/

Index WinBraille with Math (available soon): www.indexbraille.com/

XML to math Braille (available soon): www.jjb-software.com/

Translations of MathML to/from International Braille Codes:

LAMBDA project (in development): www.lambdaproject.org/
Accessible Applications for Authoring and Manipulating Math:
WinTriangle (in development): wintriangle.sourceforge.net/downloads.htm
ChattyInfty MathML editor (available soon): www.inftyproject.org/
Henter Math arithmetic and algebra (now): www.hentermath.com/
MathType mainstream math editor version 6 for MS Word and other Windows applications is quasi-accessible by input/output of Latex: www.dessci.com/
TeX Conversion
Scientific Word Latex source supported by DBT(available now): www.mackichan.com/
Latex to math braille Duxbury DBT (available now): www.DuxburySystems.com/
Latex to MS Word converter (available now): www.chikrii.com/products/tex2word/about/
MS Word to braille with TSS software (available May): www.viewplus.com/
LaTeX2Tri TeX to Triangle converter (now): www.latex2tri.com/
JAWS scripts for TeX EMACSpeak (now): emacspeak.sourceforge.net/
OCR of Math from Paper Copy
Infty math OCR (available now): www.inftyproject.org/
Other
MathTalk voice input for Scientific Notebook (available now): www.metroplexvoice.com/
Audio Graphing Calculator (available now): www.ViewPlus.com/products/braille-math/AGC/
Design Science low vision/mobility accessibility (in development): www.dessci.com/accessibility/
NIMAS to XHTML+MathML conversion tool: http://nimas.cast.org/about/resources/conversion_tool.html
Making Diagrams Accessible:
ViewPlus embossers (available now): www.ViewPlus.com/products/
ViewPlus IVEO software (available now): www.ViewPlus.com/products/
Washington Tactile Graphics Project (available soon): tactilegraphics.cs.washington.edu/

Vector Graphics

Scalable Vector Graphics (SVG) is a language for describing two-dimensional graphics and graphical applications in XML. It is a text-based graphics language that describes images with vector shapes, text, and embedded raster graphics. It enables Web developers, designers, and users to move beyond the limitations of HTML and create robust visual content and interactivity through a simple

declarative programming model. Industry applications of SVG include mobile authoring, print based on XML page description including variable data printing, Web applications, and Geographic Information System (GIS) mapping. SVG was introduced as an open standard by the World Wide Web Consortium (W3C) in 1999 for publishing animation and for interactive applications using vector graphics on the Web. In 2004, a vast majority of the mobile phone industry chose SVG as the basis for its graphics platform. SVG builds upon many other successful standards such as XML (SVG graphics are text-based and thus easy to create), JPEG and PNG for image formats, DOM for scripting and interactivity, SMIL for animation and CSS for styling.

SVG is a royalty-free vendor-neutral open standard developed under the W3C (World Wide Web Consortium) Process. Adobe has taken a leadership role in the development of the SVG specification and continues to ensure that its authoring tools are SVG compatible.

Authoring tools

The SVG format is entirely XML-based and offers many advantages to developers and users alike. With SVG, you can use XML and JavaScript to create Web graphics that respond to user actions with sophisticated effects such as highlighting, tool tips, audio, and animation.

Adobe Illustrator CS2

SVG authoring tools are an important feature in Adobe® Illustrator® software. SVG is a vector format that describes images as shapes, paths, text, and filter effects. As with any vector format, the resulting files are compact, and users can magnify their view of an SVG image onscreen without sacrificing sharpness, detail, or clarity. In addition, SVG provides superior support for text and colors, which mean users, will see images as they appear on your Illustrator art board. Within Illustrator, you can:

* Open and save standard and compressed SVG files
* Apply SVG Filters
* Work with SVG slices and set optimization options using Save For Web
* Turn any piece of artwork into a template for data-driven graphics using the Variables palette
* Add interactivity with the SVG Interactivity palette
* Customize your graphics with Compact Embedded Fonts (CEF)
* Add rich typography

* Augment type (for example, kerning, line spacing, type on a path)
* Design with transparencies and gradients
* Add URLs to objects of any size and shape
* Apply Styles and Swatches
* Combine raster and vector elements in one image
* Adobe GoLive CS2

With Adobe GoLive CS2 software, you can produce Web pages that include SVG files created in Illustrator, and you can create SVG Tiny (SVG-t) files that are optimized for mobile devices. Within GoLive, you can:

* Add commonly supported JavaScript (SVG actions) or custom JavaScript to integrate with server-side code, such as JSP or PHP
* Automatically track links in Illustrator SVG files. If a link destination moves, GoLive prompts you to update the link
* Store subsets of fonts and preserve Illustrator-specific data in SVG files. GoLive automatically opens Illustrator to provide access to advanced optimization options
* Work with slices established in Illustrator SVG files by using Smart Illustrator objects. You can assign links to slices and optimize them independently
* Select and add interactivity to layers in SVG Tiny files using the groundbreaking new visual SVG Editor. Then you can deploy these SVG Tiny graphics to mobile devices that support SVG-t

Applications of SVG in industry

Mobile

In 2001 the mobile phone industry chose SVG as the basis for its graphics platform. Many leading companies joined the SVG effort to produce the SVG Tiny and SVG Basic profiles, collectively called SVG Mobile and targeted at resource-limited devices such as mobile handsets and PDAs. The SVG Mobile specification was adopted by 3GPP as the required graphics format for next-generation phones and multimedia messaging (MMS). Already there are SVG-enabled handsets shipping worldwide. SVG Mobile is primarily used for messaging in applications such as greeting cards, diagrams and animations.

Print

The combination of rich graphical features, comprehensive text support and resolution independence in SVG produce a format suited to printing. Leading print hardware companies are currently developing the SVG Print specification: a version of SVG specifically suited to hard-copy output. Being based on XML, SVG Print fits neatly into existing XML workflows. That is, organizations which have a data processing pipeline that supports XML can insert SVG Print capabilities easily into their publishing workflow, enabling dynamic document generation. SVG Print also integrates with common job description formats such as PODi's PPML and CIP4's JDF.

Web Applications

Web-based applications are increasing in popularity. Developers are often limited by browser incompatibilities and missing functionality. With powerful scripting and event support, SVG can be used as a platform upon which to build graphically rich applications and user interfaces. With SVG, the application developer gets to use a collection of open standards. They are not tied to one particular implementation, vendor or authoring tool.

Design and Interchange

SVG is well suited to the high-end graphical design market common in the Aerospace, Transportation, Automotive and Telecommunication industries. The extensibility of XML allows SVG diagrams to have embedded metadata in proprietary formats without affecting the presentation.

GIS and Mapping

Geographic Information Systems have very specific requirements: rich graphics features, support for vector and raster content and the ability to handle a very large amount of data. SVG is well-suited to this market and many GIS systems provide SVG export. SVG is a perfect complement to the OpenGIS consortium's GML format. GML, also XML-based, describes geographical elements such as rivers and roads. It can be converted into SVG using an XML pipeline for online display.

Embedded Systems

Most embedded systems have severe resource limitations, including smaller screens, limited memory and reduced processing capability compared to typical desktop systems. The SVG Mobile specification was designed for such devices and allows for the

development of graphical user interfaces for embedded systems. In its support for input events and scripting, devices can use an SVG frontend for control and monitoring, such as a control system for industrial devices.

Making PDF Accessible

When we talk about accessibility of the material on the net or derived through any electronic form, it generally means that various screen readers / magnifiers and other types of assistive technologies, designed especially for the people with vision impairment should be able to present that in an easy and accessible way.

With respect to the screen reader programmes, it is not only that these screen readers allow the visually impaired to listen to what is coming on the screen. Most of the screen readers available in the market today offer their users a number of in-built shortcuts through keyboard for easy navigation. Therefore, in order for any screen reader to be able to present the screen information in accessible form before the users, there are a number of parameters which are essential to apply when the text has to be designed and formatted.

With the ceaseless popularity of the internet based applications and information that has grown over the years, PDF (portable document format) has undisputedly emerged as one of the most convenient formats for posting documents over the internet. In large part this popularity rests upon the versatility of PDF documents. Fonts, formatting, colours, and graphics of any source document can be preserved in a PDF document irrespective of the operating platform and the application under which the file originally was created. In addition, many authors and publishers prefer converting materials to PDF for the security protections offered by this format. Unlike traditional documents that are read and produced by word processors, PDF files can be loaded and viewed one page at a time. In other words, the computers load each page individually, instead of the entire document in case of a large file as in traditional word processing programmes.

For these reasons alone, PDF files have become perhaps the most extensively used format today for digitizing print-based materials and this way of creating and presenting documents is certainly going to be an integral part of the Internet for the foreseeable future. With this in mind, learning to create accessible PDF files should be a key component to the project of creating an accessible digital world.

Problems with PDF Accessibility
One of the main reasons PDF files are not accessible to people with vision impairment is that most of these types of documents are drawn from images in order to keep a visually accurate facsimile of the original document, which simply means that publishers often

create PDF files from scanned images. Such image-based PDF files contain no tags or marked text for screen readers to recognize, unless the image has been run through an OCR, no screen reader programme would be able to read that out.

Furthermore, before the release of the various applications in the Acrobat 5.0 family, PDF files contained no real text, but were merely graphical representations of a page. In addition to posing a variety of problems for disabled and non-disabled users alike, this made PDF documents impossible for people using screen-reading technologies to access any of the information contained within a PDF document.

Improvements

However, with the release of the latest versions of Adobe reader / Acrobat Reader, Adobe started incorporating several accessibility features into their product, allowing users to read PDF files with screen readers, view documents in high contrast mode, zoom and resize text to fit any size view, and enabled basic keyboard navigation. These developments benefited a large sector of the disabled population. In addition several plug-in and features within the Acrobat Capture Pack made it possible to create accessible documents from scanned images. Moving print-based data from the hardcopy page into an accessible format via an optical character recognition function is a powerful tool, though a quick and accurate conversion remains dependent upon the clarity and layout of the hardcopy.

Continuing Issues

Despite the immense progress in this area, however, many PDF documents on the internet still remain inaccessible, for most PDF documents currently being placed on the internet have been created with little attention to accessibility and are thus mostly inaccessible. Further, most of these documents have not been updated since the release of the latest versions of Acrobat / Adobe. In order for these documents to be accessible, these older documents need to be tagged and marked up for accessibility.

It must be distinctly understood that whether in HTML, Adobe PDF, or some other format, creating accessible documents requires much more than simply representing the original document accurately. Sighted people can look at a printed page and easily discern the difference between titles, subtitles, columns of text, headers, footers, and so on. Visual clues, such as location of the text on the page, bold text, and large font sizes help them determine the structure of a document so they can read and navigate it easily. Unfortunately, assistive technologies such as screen readers don’t depend on these visual clues. They must instead rely on the underlying computer-based information to provide that same structure. As a consequence, making documents accessible depends on two things:

Authoring the original documents so that they contain not just content (such as the text in the document) but also information about the structure of the content (such as how the text flows within the page and from page to page).

Using publishing tools such as Adobe Acrobat software and Adobe PDF technology that can retain and encode both the content and the structure so that it can be interpreted by assistive technology.

Problem Sites and Importance for Education

There are hundreds of such sites in India itself mostly the government sites, e.g.: www.edudel.nic.in, www.bankofindia.com where almost all the main circulars are given in scanned image, some of them even with hand writing which in any case cannot even be run through any OCR to ensure their accessibility. Making PDF documents accessible today has become more urgent that ever before because most of the people with vision impairment in higher studies would depend upon the relevant materials drawn from some authentic sites such as J-Store, Sage Publication online etc This is because libraries, archives, an assortment of other public and private organizations have been making documents available through PDF or TIF image formatting. While more recent PDF files can be rendered accessible to screen readers with real text, much of the information being archived on the Internet does not contain such text-based information.

How to make PDF files accessible

It should be born in mind that In order for a PDF document to be accessible it must contain real text and be tagged and marked up for accessibility. In case it is not possible to post an accessible PDF document over the internet, effort should be made that these documents be provided with an alternative format such as word or HTML etc. Image-based PDF documents generated from a scan of a hardcopy or paper document are completely inaccessible for people using screen readers. These image-only files consist only a bit map of the image and thus have no searchable text. Updating such documents to meet accessibility standards requires scanning the image with OCR software and, depending on the complexity of the document may require a comprehensive editing. If the documents are created and written as a text documents with a popular word processing programme, converting the file to HTML or keeping it in the original word processor format is probably the most accessible option. Remember that it is almost always a good idea to offer different format options, e.g. providing, say, MS Word, Word Perfect, and PDF versions of documents. Of course, for the more intricate and complex documents, this may not be a feasible option, since fine-tuning each file would be more than a little labor-intensive. Although PDF documents are not automatically accessible, there are some important strategies that can be implemented without a lot of extra effort. As with creating accessible HTML code, it is important to begin to think about accessibility at the outset of creating a document. Fortunately several advances have recently been made that promise a more universally accessible future for PDF document access. Perhaps the most notable improvement in Acrobat Reader (the free application available for download from Adobe.com), Adobe Standard, and Adobe Professional is the addition of an accessibility checker. This feature allows users to quickly check the degree to which any PDF file meets accessibility standards. If programmes like Microsoft Word are being used to create

documents, one must certainly start with using real headings and not just "bold" or large fonts, adding Bullets or numbers to any lists, using regular columns (by going to "Format" in the menu bar and than choosing "Columns") rather than tabs to create columns of text.

Usable Access

Usability vs. Accessibility

Usability is an umbrella term which covers accessibility also under it. We say a website is user-friendly if it is easy to navigate. It is usable if the users find the information they search for in your website. Accessibility refers to the access to a website. Generally, the term “accessibility” is used in a sense to mean user-friendly for the persons with disabilities. If your website can be accessed with the help of a screen reader, your website will be considered accessible generally. It is a fact that images, frames and flash content will spoil the accessibility of your website. But, the present trend is to avoid images and concentrate on the information a website provides which is disabled-friendly also. So, we can say that both the concepts overlap with one another. If your website is accessible, it is definitely user-friendly and it will definitely reach out to a wide audience. Your website is usable and accessible if a person with disability finds easy to navigate through it, is able to learn from it and enjoys it as well. It is important to mark the content of a webpage with proper navigation elements such as Heading, quotes, skip links, form labels etc, giving description to images, text annotation to audio / vedio contents. The same notion applies to the portable devices also. Since most of the devices like mobile phones have become almost a substitute for computers, whatever applies to the design of a good website can be applied here also. If a person with a disability is able to use or enjoy the services offered, by a company independently, we can say that the device is accessible. The features like tactilely discernible keypad, voice commands and so on are great developments in the attempts to make mobile phones accessible and user-friendly also.

Disability and the Law

The “disability statutes” came about only from the year 1995. Till then, the Constitution held fort and provided remedy and relief to persons with disabilities when their rights were violated or denied.

Over the past sixty years of India’s independence, legal attitude towards the disabled has undergone a paradigm shift. In the formative years, disability was viewed as a tragic pitiful situation needing charitable interference from the state. Even the new Indian Constitution manifests a negative policy mind-set of society as far as the rights of the disabled are concerned. The Constitution in its Part III which deals with fundamental rights does not explicitly prohibit discrimination on grounds of disability. One of the rare

references to disability in the entire Constitution can be found in the non-enforceable article 41 which directs the state within the limits of its economic capacity and development, to “make effective provision for securing the right to work, to education and to public assistance in cases of unemployment, old age, sickness and disablement, and in other cases of undeserved want. With the passage of time, it became increasingly clear that India cannot afford the high costs of excluding the population of the persons with disability from the mainstream.

1981 was declared the International Year of Persons with Disabilities. Then in December 1982, the General Assembly adopted the World Programme of Action concerning the disabled and for implementing the recommended activities, 1983-1992 was proclaimed as the United Nations Decade of Disabled Persons. Finally, the Standard Rules for the Equalization of Opportunities for Persons with Disabilities was adopted by the General Assembly in 1993 on the basis of the experienced gained during the historic Decade of 1983-1992. Although the Standard Rules are not compulsory, their purpose is to emphasize the responsibility of the states in removing obstacles that prevent persons with disabilities from exercising their rights and freedoms.

Realizing the urgent need of enhancing the plight of the disabled, the state began to take steps to bring about a positive social change. A major breakthrough for the cause of the disabled in India came in the year 1980 when the policy makers for the first time thought “in terms of equality, instead of institutionalisation, in terms of inclusion in place of exclusion”. Ever since, a spate of legislations such as the Mental Health Act, 1987, the Rehabilitation Council of India (RCI) Act, 1992 and the National Trust for Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities Act, 1999 have been passed with the esteemed objective of the protection and development of persons with disabilities. Besides the Juvenile Justice (Care and Protection of Children) Act, 2000, which facilitates, interalia, the integration of persons with disabilities into mainstream society, there are a number of beneficial labour legislations such as the Workmen's Compensation Act, 1923, the Employees' State Insurance Act, 1948 and the Public Liability Insurance Act, 1991, which protect and promote the rights of persons disabled during the course of employment.

The Persons with Disability (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 provides for education, employment, creation of barrier free environment, social security, etc. The National Trust for Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disability Act, 1999 has provisions for legal guardianship of the four categories and creation of enabling environment for as much independent living as possible. The Rehabilitation Council of India Act, 1992 deals with the development of manpower for providing rehabilitation services.

However, a large number of disability activists and the organisations working for the rights of persons with disability have got together and have proposed several amendments to The Persons with Disability (Equal Opportunities, Protection of Rights and Full

Participation) Act, 1995. Many allege that the Act passed by the Indian Parliament in 1995 does not align with the United Nations Convention for Rights of Persons with Disability (UNCRPD) that calls for a rights–based approach. The need of the hour is to have a comprehensive legislation which will ensure rights for mainstreaming the persons with disability in the general society.

The issue of copyright for books

Technology today has enabled the 'print disabled' to expand their horizons far beyond what were traditionally considered within their reach. Accessible technology in the form of the various Screen Readers, Magnifiers, OCR (Optical Character Recognition), DAISY format books, on-screen keyboards and many more have made the printed word accessible.

However in India, one important barrier that remains by way of accessibility for the print disabled is the Indian Copyright Act. The Indian Copyright Act -1957 does not explicitly allow for conversion and distribution of reading material in alternative formats so that persons with disability can access. Right to Read is a fundamental right for all individuals enshrined through the various fundamental rights guaranteed within the Constitution of India as also the Persons with Disability Act, 1995 and National Policy for Persons with Disability, 2006.

The Indian Copyright Act, 1957 however has yet to be amended to keep up with international standards to make this right a reality for persons with print disability in India. Laws of over 50 countries (e.g. Copyright exceptions within copyright laws in the United States, United Kingdom and European Union among others).have already been amended to bring in appropriate modifications. The international community's joint efforts are also reflected in the WIPO Treaty for Improved Access for Blind, Visually Impaired and other Reading Disabled Persons, 2008. These efforts have recognized the discrepancy between the conventional Copyright legislation and its negative impact on the print disabled community and have worked around the same.
Thus, the print disabled community is experiencing a "Book Drought" caused due to this lack of access on a law front by the Copyright Law of India.
On the other hand, technological developments have gone well ahead of the legal framework. Thanks to major strides in the computing and digital fields we are able to open many a window of opportunity to the visually challenged and other print disabled persons that previously did not exist. They can, for instance, listen to a synthesized voice read out from an e-Book either on the computer or in fact in an MP3 or WAV format on a CD. What is more, low vision persons can, with the assistance of screen magnifiers, read previously inaccessible material. This is over an above the traditional way of reading a book that a visually challenged person previously could hypothetically employ e.g. through Braille, the book being read out to them, or even a cassette recording of the same.

This dream however remains a distant one unless the print disabled persons enjoy full access to knowledge and the written word. The barrier of being unable to read the hard copy of a printed book by virtue of the disability is the fundamental obstacle in their quest for self-actualization. Unfortunately, the large numbers of titles needed are just not available in e-format on account of copyright restrictions. This results in unfair deprivation.

In India, where less than 0.5 per cent of printed material is available in e-format, it is imperative that the law makes it easier to access copyrighted works.

The issue of copyright for software

In the last two decades we have seen a computer revolution, advancements in computer hardwares and availability of thousands of software programs to automate our day-to-day and business tasks. Internet has emerged as a global medium which drives global economic development. Internet provides new trademark and branding opportunities for conducting business globally and making it accessible to the consumers world-wide at affordable price. At the same time, it has also created new opportunities for various kinds of Intellectual Property Rights (IPR) infringement, disputes, cyber offences etc.

India’s growth in the internet space has been commendable. India has also made tremendous growth in Information and Software Technology and is having compounded growth of more than 25% every year.

The increasing use of Information Technology (IT), however, brings with it new challenges and threats. Amongst the most significant is the security threat, including data theft, piracy, hacking, identity theft, violation of intellectual property rights, etc. Given the commercial importance and potential of IT in India, there is a need for special efforts to fight such illegal activities. In order to keep the legal regime abreast with this change in the society, the Indian Parliament went about legislating the Information Technology Act, 2000. This article attempts to provide an insight to the major issues being faced by India in the cyber space.

After the advent of Internet most of the corporate Intellectual Property are held in the digital form as it provides affordable access of all the IPR resources to the public at large. However, internet has also made infringement of IPR , in particular copying of Copyright material easy and simple.

India has specific legislations to deal with various kinds of IPR infringement however these legislations are not equipped to deal with

some of the modern day copyright violations. The Copyright Act, 1957 prohibits reproduction of the copyrighted work in any material form including the storing of it in any medium by electronic means, by any unauthorized person but is incapacitated to deal with illegal duplication, importation, distribution and sale of pirated music as it becomes difficult to trace the location of information.

In this scenario, where sharing of information among people has become the major function of the internet, the peer-to-peer file sharing services provided by various websites, linking, deep linking, framing and other innovations which have changed the way people share information over the world wide web, have given rise to a legal controversy. While the users downloading music, software, computer games and other copyrighted material are held liable for direct copyright infringement.

The protection to computer software is derived out of two Acts, the Indian Copyright Act, 1957 and the IT Act, 2000. While the Copyright Act grants protection to the computer program as it is granted to other forms of copyrighted work, the technological and complex nature of the computer programs calls for technically effective protection.

The Indian Copyright Act, 1957 accords a special status to computer software as compared to other forms of copyrighted work. The Copyright Act regards the computer programs as literary works, and in addition to the general exclusive rights provided to other literary works, it grants extraordinary exclusive rights to the owners of the computer programs like right to sell or offer for sale, and the right to give on commercial rental or offer for commercial rental. The Act has also exempted computer programs from 'fair dealing exception' (i.e. private use for research, criticism or review of that work or any other work) which is available in case of other copyright works.

The IT Act, 2000 provides for punishment for tampering with the 'source code' of a computer program but this protection applies to computer source codes 'which are required to be kept or maintained by law for the time being in force'. Hence, the protection accorded by the IT Act is only for 'source code' of computer programs of government agencies and the 'source code' of computer programs of private users still stand unprotected.

The Indian Information Technology Act reaffirms India's commitment towards building a knowledge-based society and keeping in pace with the rest of the world by providing a legal framework within which such society can flourish. While the Indian Government has taken its first step in regulating the cyber crimes by legislating the IT Act 2000, the legal regime on Information Technology in India is still in its nascent stage. There exist numerous grey areas and loopholes in the Act which need to be looked into and also the accelerated pace of technological development has raised many unprecedented issues that do not find express solution in the existing Act. The issues relating to intellectual property rights on internet, spamming, cyber squatting, cyber stalking, credit card frauds, data

protection and privacy on the net need to be addressed. Following the footsteps of United States and EU which have adopted specific legislations for data protection and privacy, India Government is also in the process of formulating laws to tighten its legal regime over the issues relating to data protection and privacy to bolster its offshore credibility. The government has taken into account the modern ways of cyber crimes, violation of data protection norms and prepared the Draft Information Technology Amendment Act 2006 addressing issues relating to electronic contracts, breach of confidentiality and privacy, child pornography, e-commerce frauds like Phishing, identity theft, sending offensive mails, in order to bring a comprehensive legislation to protect the rights of the netizens. This will go a long way in making Internet and cyber space safer, people friendly and commercially more viable.

Proprietory and open source softwares

Proprietary Software

The term “proprietary”, in terms of software, creates both confusion and controversy among the free software communities, companies and users. There are free software communities such as Free Software Foundation and Open Source Initiative who relate the term proprietary with the software packages which are neither free nor open source which is partly true. In relation to software, proprietary means an authority given to its copyright owner to have a control over the usage, modification or the redistribution done by others.

Proprietary software packages are always related with the term “closed-source” whose source code is not available for the public use. Although most of the proprietary software packages do not publish their source code but source-available proprietary software packages also exist.

Restrictions are enforced by the proprietor on the over usage and excessive modification in the software. Two types of restrictions can be enforced by the owner on proprietary software—legal and technical. Common Technical restriction includes the release of closed-source program which are only computer-readable that is in binary format and preservation of human-readable source code. Legal restriction includes copyright under any restrictive software licence or patents. The third party has to sign a non-discloser licence agreement to access the source code. But it is not necessary to enforce certain legal obligations to make software proprietary. Any software which is an open source or comes under a permissive licence can become proprietary by making available for the distribution without the source code.

Despite a considerable difference between proprietary and commercial software, the industry as well as the free software community confuses and interchanges both the words. Both, proprietary and free software can be distributed at no cost or for a fee. But, the difference lies in the distribution and amount to be charged. In the case of proprietary software, it depends on the proprietor the whether the proprietary software can be distributed or not and what would be the cost. While in terms of free software, anyone, who has a copy of the software, can decide the charge for program or service. Well known examples of proprietary software include

Microsoft Windows, Adobe Flash Player, iTunes, Adobe Photoshop, Google Earth, Mac OS X, Skype, WinZip and some versions of Unix.

Open source software

In general, open source softwares are known for the availability of their source code for the users to modify according to their understanding and requirements. The best advantage of the open source software is that number of minds is involved in the development of these programs. Open source software packages have gained immense popularity in terms of usage for the organizational profitability and work efficiency. Internet has played a vital role in spreading awareness about these kinds of programs.

The Open Source Initiative uses the term open source to qualify a software program as the open source software. A software does not require just making available the source code but it includes many things. Adherence to the following criteria makes a program open source software:

The licence should not prohibit any person or group from redistributing or giving away the software as a component of an aggregate software package or it will not require any royalty or fee on the redistribution.

The program must include the source code as well as the compiled form. The source code must be in the preferred format so that the user can modify.

The licence must allow them to be modified and distributed under the same licence.

The licence must permit to use the different name or version after the modification.

The licence must not discriminate with any person or group.

The licence must not restrict the usage of the software for any specific task.

Access to educational materials

Recently India has passed a landmark bill “Right to Education” providing free and compulsory education to all children aged 6 to 14, which is a definitely a great step. But at the same time we need to look into access to educational material for students with medical needs and with print disability. One of the major issue the disabled students studying in schools, colleges and universities are facing is availability of their course and reference material in an accessible and adoptable format(s).

Access Methods

With the recent innovations in technology, the options for accessing print information have changed dramatically. The switch from analogue to digital technology provides various choices to print disabled students for reading materials. As well, the development of software programs targeted for specific disability groups or tasks opens up new methods of reading and writing.

Some of these innovative developments include refreshable Braille technology, screen readers, screen magnifiers and text to speech programs that read electronic text (E-text), digital hardware and software programs for reading E-text, talking dictionaries and thesaurus programs, and portable systems for example, Alpha Smart Dana, BrailleNote, CD and MP3 players, and CCTV (closed circuit television). Also the advance development in the optical character recognition (OCR) software programs that produce greater accuracy in translating the digital scanned image into text. These programs are now tailored for the specific needs of users who are low vision or blind, or have learning difficulties; both groups approach reading in different ways, so the software programs reflect that distinction.

The traditional way for the blind to access course material is in a special format like Braille. But at the higher level of education Brailling of all the course material is practically impossible because of its volumes, cost and lack of printing facilities for timely deliveries.

Access Issues

The other important issue is that there is hardly any accessible content available for subjects like mathematics and science. Even software programs are not fully automated in the convergence process of maths and science printed books into accessible e-format if one opts for this process.

The copyright law also restricts students in format conversion and sharing of accessible contents with other students who can benefit from it. One of the direct sources for getting e-format books is from publishers, but they are not aware of this potential user group and are not legally bound to provide such content.

Achieving Access

There are few resource centres and college / universities libraries taking initiatives in an accessible content creation from their disabled students.

Also they have facilities and technologies that students can use for reading, writing, searching information. The computes loaded with accessible softwares and hardware devices allow students to read accessible books, surf the internet for research, get the printed word converted into e-text, etc.

To elaborate more on how the access to education materials can be achieved the following are the universal access methods that should be followed by all stakeholders.
Broad scale availability of materials in a timely manner;

Access to material in the preferred format or production style;
Access to several types of adaptive technology for example, computer, speech synthesizer, screen readers, large-print software, Braille displays, talking dictionaries including a thesaurus;

Proper training on the technology.
A central repository of all books in an accessible format needs to be established so that there is no duplication of efforts. Cell phones can now access the internet. In addition to computers, cell phones can also be used to access reading material for the blind from a central repository through the internet.

It is imperative to ensure that students with print disabilities have the ability to access materials that are so easily accessed by their non-print-disabled counterparts. All educational institutions have a duty to accommodate to ensure that all students have access to course materials. In order to facilitate this institutional responsibility and duty, legislation must be written with the broadest access possible to support educational institutions and production agencies in making printed academic material available to students with print disabilities in preferred formats in a timely manner.

Materials provided must be made available in a timely manner to ensure that students who cannot use standard print can pursue college and university education on a level playing field, with equal access to all the tools of learning.

Publishers should make their books readily available in accessible, useable, complete electronic formats, at a reasonable price.

Professionally produced books and other learning materials in all formats should be made more widely available for sharing between schools, libraries, provinces and jurisdictions.

Professors, teachers and instructors must be willing to support the learning needs of all of their students, including those with print disabilities. Reading lists and academic requirements for each course of study must be established with sufficient lead-time to allow materials to be rendered accessible to students in formats of choice at the beginning of each semester.

Accessibility does not end with required readings. Students with print disabilities must be able to participate in all aspect of campus life and must have access to other types of materials, including course calendars, handbooks and campus newspapers.

Professors and instructors must become more understanding of and familiar with the requirements of students with print disabilities in their classrooms. Depending upon the school, this may necessitate the delivery of faculty training/workshop sessions involving students and disability service centre staff.

The Internet is being used by educational institutions and faculties for course work. University and college websites must be fully accessible, in particular for those who use screen-reading software.

To make full use of technologies, students with print disabilities must be provided with professional training in the use of their equipment

Access to educational institutions

Higher education has become necessary as it opens many doors of opportunities for us. It improves the quality of life and acts as an important economic driver. It has been a little more than half a century since the government of India has taken initiative to facilitate Indians with a number of universities and colleges. Today, the literacy rate in India has risen up to the 2/third of the total population. However, 40% of the total population is still illiterate. The only reason behind this illiteracy is lack of awareness and less or no access to educational institutions.

According to the 2001 census, only 59.4% of rural population is literate whereas the literacy rate of urban population is 80.3%. Almost all the universities and colleges are located in urban areas because of which only people living in urban areas are able to get the full benefit of these higher educational institutions. When we talk about rural areas, rural students usually have to migrate to urban areas, a task which involves significant financial issues. Some drop the idea of higher education and some opt for distance learning.

Here are some factors behind the lack of access.

The Fee Structure
Some colleges/universities relax fees for minorities and persons with disabilities. However, some do not. As a result, some manage to qualify, but some fail to do so. The government should design the education system in such a way that in every college/university, the minorities and persons with disabilities should be relieved of the fee paying problem. The government has attempted to improve the access to higher education among women. Various educational institutes have been set up exclusively for them. They even have seats reserved in the existing institutes and get concessions in their fees.

Reservations
Considering the fact that education is a means of bringing about socio-economic transformation in a society, the government has taken several measures to improve the access to education to the marginalized sections of the society. Reservation is one such measure. Under law, some reserved seats are allotted to the minorities, out of which, 7.5% is given to schedule tribes (ST), 15% for schedule castes (SC), and 27% for other backward classes (OBC) which includes persons with disabilities also.

Scholarships
Some universities/colleges also distribute scholarships to deserving candidates. The government should provide scholarships to students of rural areas who are talented and have the caliber but cannot afford to obtain higher education. Sometimes, the students are even unaware of these scholarships so to overcome this situation, every college must have a help desk.

Distance Education
Students who are unable to join regular colleges opt for distance learning. However, the colleges that provide distance learning to the students have a long way to go. Students prefer distance learning as it is cost effective and timesaving. But studying through correspondence is also problem, as there are not enough books available, and the induction classes are also a mere formality. To make distance learning more accessible, online classes should be organized at timely intervals. Usage of pod casting, wikis, blogs and other interactive tools will make educational institutions more accessible to students of rural areas and to the students who cannot join regular colleges for unavoidable reasons.

Making documents accessible

Accessible documents

In most circles, accessibility usually refers to either web accessibility or physical space accessibility. We have also heard of application accessibility (think MSAA) and Java accessibility (the Access Bridge). However, there is a critical everyday component called document accessibility which deals with making day-to-day documents read better especially when using assistive devices. This article will explain what document accessibility includes and will explain how to implement it. Microsoft Word will be used as an example since it is one of the most common word processors on the market. There are other word processors such as Write from Open office. The techniques for document accessibility remain the same and are technology neutral. The examples are given for illustrative purposes.

Styles

The essential component of good document accessibility is the use of styles. Styles allow the computer to programmatically determine what text of that style does. For example, if you have a heading marked with a heading style, then the computer can take that text and add it to a table of contents. Internally, word inserts Meta commands into the documents when you add styles. These commands are not usually visible to the user. In word 2007, you can use the “quick styles” button to access a list of frequently used styles. The list can be restricted to show the styles present in the current document etc. there is also the styles dialogue box. As of this writing, if using a screen reader, you may have some difficulty in closing the styles dialogue box. Use the f6 key to cycle to the document. Barring this, explore using the mouse cursor for the “close” button of this dialogue.

Color

Another crucial accessibility related item is color. Color must never be the only way of representing information since everyone cannot detect color. If you do need to use color, include a comment in the document explaining your usage of color.

Contrast and Font

Contrast and the kind of font also play a crucial role in making a document easy to read. Proportionally spaced fonts are easier to read.

Images

As in web pages, whenever using images, ensure that you tag them with suitable alternative text. If using a screen reader when inserting images, ensure that it is set to report graphical objects so that you can right click on the graphic and then add the relevant alt text. In word 2007, the option to add alternative text is found in the “alt text” tab of the “size” dialogue box.

Tables

Another area to take into account is the correct use of tables. Several authors use tables like forms or to lay out text. This is incorrect usage. Text can be laid out using the appropriate style and or correct positioning techniques. For example, for indenting text, a style like “normal indent” can be used. If you have to use the tab key, do not use multiple tab stops. This is because there could translation difficulties with translating that document into other formats such as Braille. Also, when making tables that span pages, repeat the header rows on every page. Word can do this automatically if the relevant options are set.

Equations

When it comes to writing equations in word, use the full featured editor called math Type. The equation editor is a lesser version of math type.

Accessible Forms

It is important to add relevant help text to the controls of the form. Again, positioning and text labels play a crucial role. In terms of positioning, ensure that when using a combo box also known as a drop down, leave three spaces to the right of it before you can put any text. Do not hesitate to add descriptive text to the form and in the help for every control. When it comes to white space, use it judiciously. Do not use white space to indicate carriage returns or force page separations.

A special note on the trust center

The trust center is where you can adjust the security settings of Microsoft office. When using adaptive technology such as speech-recognition, you may have to lower the macro security level. This means that you should not permit the opening of untrusted Word documents.

Spreadsheets

When designing spreadsheets, ensure that you put relevant column and row headings. Many assistive devices can track these headings and report them to the user so that the user is always aware of the context in which he is operating. Also, be judicious in the use of blank rows and columns to align text. Many people create spreadsheets to mimic the look of a paper chart. Use the alignment features to align text and as with word processors, format the text using styles. If dealing with large spreadsheets having complex formulae, use named ranges so that they are easier to understand for everyone. Also, be careful with column and row alignment. The text and or numbers in the columns and rows must not be obscured. When creating objects on spreadsheets like text boxes, ensure that you have appropriate descriptive messages explaining what is expected to be entered in these boxes. Also, for graphs, ensure that you make

descriptive titles not only to the chart but also to the axes. Where required, have descriptive legends. If creating add-ins and other custom macros, ensure that the controls to access these macros and add-ins are accessible from the keyboard or the menu. Many authors place buttons on a custom toolbar and a user of adaptive technology has to expend considerable time and effort to access these macros and or add-ins. Also, in the documentation for these macros, include a section on accessing them via the keyboard and mouse. Finally, all the application accessibility guidelines about aligning controls properly and the use of well labeled custom controls apply here too since a lot of spreadsheets are programming environments and are often used as such.

Presentations

There are several elements that can make it difficult to access presentations. For instance, untagged graphics, poor contrast, the imbedding of text as graphics and the use of uncaptioned video. No one strategy is effective for making presentations accessible. Use the default layouts of the presentation program. The default place holders such as those for the slide titles, the body etc., are accessible to adaptive devices. Also, be especially careful about the flow of text. The text on a slide is read in the order which it was added so add text in the order in which you want it presented. When adding graphical objects, use the notes pane or its equivalent to describe the object. Also, ensure that you add alternative text tags to all multimedia objects. When using video, captioning must be present. If this is not possible to do, then written transcripts of the video should be provided to the audience who cannot access it.

Portable document format (PDF)

Most PDF documents are created in other applications such as Microsoft Word. The source document must be accessible to begin with. Then, the conversion process should retain this accessibility. When converting from Microsoft Word 2007 to PDF, do not print the file to a PDF printer sine that wont retain the heading styles etc. use the Microsoft “save as PDF” utility to convert the document to PDF. The same applies to other Microsoft office products. In some cases if you are converting a complex document, you may need to retag the PDF in Adobe Acrobat Professional. Another accessibility barrier with PDF files is their security settings. Secured PDF files are accessible but certain practices such as disabling the cursor and disabling the speaking aloud of PDF files should not be used since they render the PDF inaccessible.

Benefits of accessible documents

1. Accessible documents are well formed and can be used to create accessible web pages.

2. They also carry over to other formats since Word is able to export the document based on its’ structure.

3. The Meta data in accessible documents could help classify them in document management.

Business Case

The Web is increasingly an essential resource for many aspects of life: education, employment, government, commerce, health care, recreation, social interaction, and more. The Web is used not only for receiving information, but also for providing information and interacting with society. Therefore, it is essential that the Web be accessible in order to provide equal access and equal opportunity to people with disabilities. Indeed, the UN Convention on the Rights of Persons with Disabilities (2006) recognizes Web accessibility as a basic human right.

While accessibility focuses on people with disabilities, it also benefits older users, mobile phone users, and other individuals, as well as organizations. Older users with age-related accessibility needs are an increasingly important customer base for most organizations, as the percentage of older users is increasing significantly. Organizations with accessible websites benefit from search engine optimization (SEO), reduced legal risk, demonstration of corporate social responsibility (CSR), and increased customer loyalty.

Organizations can realize substantial return on investment (ROI) that offset any costs of implementing Web accessibility. In order to be willing to make the initial investment, many organizations need to understand the social, technical, and financial benefits of Web accessibility, and the expected returns. The justification to commit resources to a project is often called a "business case". Business cases usually document an analysis of a project's value in meeting the organization's objectives, the cost-benefit analysis, and the expected outcomes.

Factors in a Business Case for Web Accessibility

The different aspects of the business case for Web accessibility are presented in detail in the following pages:

Social Factors addresses the role of Web accessibility in providing equal opportunity for people with disabilities; the overlap with digital divide issues; and benefits to people without disabilities, including older people, people with low literacy and people not fluent in the language, people with low bandwidth connections to the Internet, people using older technologies, and new and infrequent web users.

Technical Factors addresses interoperability, quality, reducing site development and maintenance time, reducing server load, enabling content on different configurations, and being prepared for advanced web technologies.

Financial Factors addresses the financial benefits of increased website use, for example, from engine optimization (SEO); direct cost savings; considerations for initial costs and on-going costs; and ways to decrease costs.

Legal and Policy Factors addresses requirements for Web accessibility from governments and other organizations in the form of laws, policies, regulations, standards, guidelines, directives, communications, orders, or other types of documents.

To help develop a customized business case, each of these pages starts with questions to help identify how the factors apply to a specific organization.

Permission to Use

Developing a Customized Business Case

An effective business case focuses on the organization's objectives and motivations. Certain aspects of the value and outcomes of Web accessibility are more important to one organization than another, based on its particular situation. For example, one organization's motivation might be to demonstrate social responsibility by being inclusive of people with disabilities, while another organization's primary motivation might be technical quality and meeting international standards.

Just as organizations' objectives and motivations vary, so do their business cases for Web accessibility. A customized business case for a specific organization will have different content and style, and incorporate different aspects with different emphasis, focused on that particular organization.

Examples of How Factors Differ Across Environments

Examples of different motivations that organizations have for adopting accessibility and how those can be integrated into a customized business case are provided below:

A corporation might emphasize: financial gains and cost savings from increased web use due to increased potential market share, search engine optimization (SEO), and increased usability reducing risk of legal action, high legal expenses, and negative image public relations benefits of demonstrating corporate social responsibility (CSR) benefits of an inclusive workplace that supports employees with disabilities increased productivity from supporting and retaining older employees and their experience

A government ministry or agency might emphasize:

laws and policies that require public services are available to all, such as anti-discrimination legislation or information and communications technology (ICT) policy demonstration of social responsibility and provision of information and services that are accessible to all citizens savings from improved server performance and decreased site maintenance benefits from enabling people with disabilities and older users to interact with them online instead of more costly ways

An educational institution might emphasize:

number of students, faculty, or staff with disabilities in educational settings as a social responsibility consideration benefits of Web accessibility to students with different learning styles, older computer equipment, or low bandwidth Internet connections benefits to

older employees who may be experiencing age-related impairments, an increasing percentage of employees as the workforce ages legal or policy requirements
A non-governmental (non-profit) organization (NGO) might emphasize: social responsibility factors, such as the organization's commitment to human rights, including the right to information organization's interest in ensuring that its materials are available to all of its potential audiences supporting older people with age-related impairments who may be donors
A web design business might emphasize: competitive advantage and financial benefits of being able to meet increasing requests for accessible web design and development
technical benefits and long term financial benefits to clients of providing sites according to web standards public relations benefits of being able to support clients' interests in demonstrating social responsibility
A small to medium-sized enterprise (SME) relying on e-Commerce might emphasize:
positive impact on search engine optimization (SEO) from accessibility improvements importance of an increasing market among people with disabilities and older people who may significantly benefit from accessible online shopping increased general usability and trustworthiness of online shopping interfaces from improved accessibility reduced risk of legal action and negative publicity from not complying with anti-discrimination legislation
While your business case may emphasize a few aspects, it is also important that you include other aspects. For example:
An organization with a clear legal requirement for Web accessibility might still need a solid cost/benefit analysis to get management to commit sufficient resources for an effective Web accessibility program.
Some commercial organizations might be more responsive to a social responsibility argument than to a standard cost/benefit analysis when committing to Web accessibility.

Accessibility versus Usability

Accessibility has come to mean whether a website is disabled-friendly or not. If a website is full of flash images and if it takes a lot of time to download, it is at least partially inaccessible. The users will definitely search for alternatives to get the information they want.

If a website is easy to navigate with assistive devices, but there is nothing relevant in it, it is also not usable. We can say that a website is user-friendly if it succeeds in satisfying the needs of everyone in society regardless of any disability.

There is no need to forbid the use of JAVA script or any other technology make your website easy to download or to add any attraction. But it is necessary to make sure that it provides relevant content and to also provide an alternative format to explore your website. In this way, the website will be accessible and usable also.

1. Easy to learn:
If what you describe is beyond the grasp of the users, they will turn to other websites for help. So, make sure that whatever you say in your website is simple, easy to learn and easy to remember
2. Easy to use:
If your website takes much time to download to a computer, the users will definitely avoid it because none of us have the time to wait for a single website to open. They have many alternatives. Everything depends on your targeted audience and a user-centered design will definitely help you.
3. Easy to remember:
If your website contains several similar links, users will find it difficult to remember and it will badly affect the traffic to your website.
4. Easy to navigate:
If users make a mistake while using a product, it might not be their fault. So, if a product inadvertently makes them repeat a certain kind of mistake, they may not return to your website.
5. Enjoyable:
People generally use a particular website or device because they enjoy using it. If your website fails to provide content which satisfy and gives them pleasure, you are sure to lose.

Accessibility for Nations
Policy and Legislation

United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)

United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), which came into force in May 2008 and requires signatories to ensure the full enjoyment of human rights and equality under the law by those with disabilities. Many of the rights of persons with disabilities affirmed in the convention mirror those found in other UN Conventions, but others are specific to the UNCRPD. Among the guiding principles of the convention is accessibility. By signing the Convention, states pledge to "enable persons with disabilities to live independently and participate fully in all aspects of life" by, among other things, "promot[ing] access for persons with disabilities to new information and communications technologies and systems, including the Internet."[1] The emphasis on accessibility represents a deliberate paradigm shift in the conceptualization of disability in international human rights law, from a

[1] United Nations Convention on the Rights of Persons with Disabilities, Article 9. http://www.un.org/disabilities/convention/conventionfull.shtml

model of exception to a model of inclusion. Whereas once disability was defined within a "difference" paradigm which tried to find special and alternative arrangements for persons with disabilities, the UNCRPD invokes a social model of disability rights that focuses instead on the state's responsibility to make society accessible to all persons on an equal and non-separate basis.[2] About half the signatories of the Convention are also signatories to the Optional Protocol that was drafted in conjunction with the UNCRPD. States signing the Protocol thereby enable individuals or groups within their jurisdiction to present claims of violations of the provisions of the Convention to a UN committee tasked with conducting an investigation into the complaint and issuing recommendations to the state.

Biwako Millennium Framework

The Biwako Millenium Framework is a regional framework for action towards an inclusive, barrier-free and rights based society for person with disabilities in Asia and the Pacific. The framework was developed by the Economic and Social Commission for Asia and the Pacific in October 2002, during the Decade of Disabled Persons 1993-2002. The Framework seeks to foster sub and inter-regional cooperation for action, based on established targets and strategies, as set out in the document. The framework has 7 priority areas, 21 time bound targets, 17 strategies and 3 mechanisms.

The target groups of the framework are self-help organizations of persons with disabilities, women with disabilities, early detection, early intervention and education. Target areas of the framework include training and employment, including self-employment, access to built environments and public transport, and poverty alleviation through capacity-building, social security and sustainable, and finally, access to information and communications, including information, communication and assistive technologies. Action targets are set within each of these areas.

With reference to ICT, there are six targets laid out. First, by 2005, persons with disabilities should have at least the same rate of access to the Internet and related services as the rest of citizens in a country of the region. Secondly, International organizations (e.g., International Telecommunication Union, International Organization for Standardization, World Trade Organization, World Wide Web Consortium, Motion Picture Engineering Group) responsible for international ICT standards should, by 2004, incorporate accessibility standards for persons with disabilities in their international ICT standards. Third, governments should adopt, by 2005, ICT

[2] Tara J. Melish, The UN Disability Convention: Historic Process, Strong Prospects, and Why the U.S. Should Ratify, 14 NO. 2 Hum. Rts. Brief 37.

accessibility guidelines for persons with disabilities in their national ICT policies and specifically include persons with disabilities as their target beneficiary group with appropriate measures.

Fourth, governments should develop and coordinate a standardized sign language, finger Braille, tactile sign language, in each country and to disseminate and teach the results through all means, i.e. publications, CD-ROMs, etc. Fifth, governments should establish a system in each country to train and dispatch sign language interpreters, Braille transcribers, finger Braille interpreters, and human readers, and to encourage their employment. Finally, governments should halve, between 1990 and 2015, the proportion of persons with disabilities whose income/consumption is less than one dollar a day.

Review of the framework takes place at various levels, and it will remain in force until 2012. While the framework does have 62 member states, the framework is not legally binding.

Accessibility Policy and Frameworks in Different Countries

USA

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) requires that covered entities furnish appropriate auxiliary aids and services where necessary to ensure accommodations for individuals with disabilities, unless doing so would result in a fundamental alteration to the program or service or in an undue burden to the covered entity.

In 1996, the U.S. Department of Justice issued a policy ruling that stated that ADA Titles II and III require State and Local Governments and the business sector to provide effective communication whenever they communicate through the Internet.

Rehabilitation Act Amendments

In June 2001, the United States federal government enacted regulations regarding equal access to information technology for people with disabilities. Specifically, on August 7, 1998, Public Law 105-220 enacted the Rehabilitation Act Amendments of 1998, which

significantly expands and strengthens the technology access requirements of Section 508 of the Rehabilitation Act of 1973 (Section 508).

Section 508 establishes accessibility requirements for any electronic and information technology that is developed, maintained, procured, or used by the United States federal government. It requires that all U.S. government agencies "ensure that…federal employees with disabilities…have access to and use of information and data that is comparable to the access of those without disabilities." It also requires that federal agencies developing Web sites ensure that citizens with disabilities have equal access to the information on those Web sites.

Web and IT Accessibility

Currently, many US states are looking at Web and IT Accessibility policies and ways to refine and improve them. Some states had accessibility policies in place before Section 508 while others did not. Many states are changing accessibility policies to reflect the requirements of Section 508. Some are taking a combined approach by keeping their core policies and adding further accessibility "guidelines." Some states see Section 508 merely as a starting point and want to add further requirements based on W3C initiatives.

There is no uniform methodology by which all states create and implement IT accessibility policies. Some states have scrambled to put together IT accessibility policies, especially in the area of Web accessibility. Programmers simply need guidelines by which they can build accessible websites. It is a new frontier for some states that are attempting to move toward accessibility while addressing the outcry from people with disabilities.

Accountability and Implementation

It is unclear to what extent states will be held accountable to Section 508 legislation. The spirit of Section 508 was originally applied to federal agencies, government contractors, and others receiving federal money. Many disability advocacy groups have attempted to hold states accountable to Section 508 because they receive federal funding through the Assistive Technology Act. Thus far, states have not been in full compliance in regard to Section 508 regulations.

Slowly but surely, states are addressing IT accessibility not just through policies, but legislatively, as well. Currently 22 states have IT accessibility laws and 5 states are presently in the preliminary stages of drafting legislation, issuing executive orders, or writing

policies. One state has an executive order in place and four states have accessibility standards suggested from their top IT administrators; however, no actual legislation is in place.

Many states had IT accessibility legislation on the books prior to the 508 standard. More commonly, these states only addressed accessibility for persons who were blind. Some states are moving to modify legislation and draft amendments to bring their legislation up to Section 508 standards.

On a positive note, states that are looking to adopt Section 508 are doing so for increased usability system-wide. Nationwide, state information technology offices are looking at policies, training, and support to successfully implement Section 508 requirements from a usability standpoint. States are finding that their usability is greatly improved when accessibility is implemented correctly.

European Union

At the European Council in Lisbon in March 2000, Heads of State and the Government of the European Union launched a strategy to prepare the EU for the challenges of the new century. This has become known as the "Lisbon Strategy". The objectives set at Lisbon – higher growth, more and better employment and greater social inclusion – were ambitious and Information and communication technologies (ICT) were identified as playing a key role in achieving them.

In response to this, the European Commission launched the eEurope initiative in June 2000 with the aim of accelerating Europe's transition towards a knowledge-based economy, and to realize the potential benefits of higher growth, more employment and faster access for all citizens to the new services of the information age.

eEurope

The first phase of eEurope was the eEurope 2002 Action Plan, which comprised a total of 64 targets to be achieved by end 2002. The majority of these were successfully completed, and in June 2002, the European Council launched a second phase, eEurope 2005, which focused on exploiting broadband technologies to deliver online services in both the public and private sector. The mid-term review of the eEurope 2005 Action Plan has confirmed that its main targets are valid until end 2005.

Challenges

The European Commission's view of the challenges that need to be addressed in a European Information Society strategy up to 2010 are set out in a Commission communication on "Challenges for Europe's Information Society beyond 2005: Starting point for a new EU strategy", adopted on 19 November 2004. This communication highlights the need to step up research and investment in information and communication technologies (ICT), and to promote their take-up throughout the economy. ICT should be more closely tailored to citizens' needs and expectations, to enable them to participate more readily in socially fulfilling and culturally creative virtual communities. The Commission communication identifies a number of challenges that will remain relevant for Europe's future Information Society policy, such as electronic inclusion and citizenship, content and services, public services, skills and work, ICT as a key industry sector, interoperability, trust and dependability and ICT for business processes.

Public consultation

The European Commission has launched a public consultation on how best to make information and communication technologies (ICT) available to all, including the disabled and the elderly. This consultation suggests introducing new legislation to remove the technical challenges and difficulties faced by some EU citizens when trying to use electronic products or services such as computers, mobile phones or the Internet. The public consultation focuses on three areas identified by the Commission as key to promoting what it defines as 'e-accessibility': public procurement, certification, and the use of legislation.

United Kingdom

Public Transport
Accessibility Plans

In the United Kingdom, the Department for Transport has mandated that each local authority produce an Accessibility Plan that is incorporated in their Local Transport Plan. An Accessibility Plan sets out how each local authority plans to improve access to employment, learning, health care, food shops and other services of local importance, particularly for disadvantaged groups and areas. Accessibility targets are defined in the accessibility plans, these are often the distance or time to access services by different modes of transport including walking, cycling and public transport.
Public Service Vehicles Accessibility Regulations 2000
Part 5 of the Disability Discrimination Act 1995 (DDA 1995) allows regulations to be made requiring all new land-based public transport vehicles - trains, buses, coaches and taxis - to be accessible to disabled people, including wheelchair users. Regulations

covering buses and coaches, the Public Service Vehicles Accessibility Regulations 2000 (PSVAR), have been made and cover all new buses and coaches introduced into service.

Blue Badge Scheme

The Blue Badge Scheme provides a range of parking concessions for people with severe mobility problems who have difficulty using public transport. The badge enables holders to park close to where they need to go. The scheme operates throughout the UK, and is administered by local authorities who deal with applications and issue badges.

Railways for All

The Railways for All Strategy explains what Great Britain's railway industry is doing to improve access for disabled people. It describes what is being done to improve information, stations and trains and explains how the £370m Access for all funding will be used to improve access at stations.

Access to aviation and shipping

Access to aviation and shipping is governed by international laws and standards. Since 2007, European law has given rights to disabled people when traveling by air. This will ensure a consistent and seamless service from airlines and airports across Europe. Similar European law protecting disabled people when travelling by ship is expected in the future.

Policies for Making Websites Accessible

Disability Discrimination Act

The Disability Discrimination Act 1995 (the DDA), was introduced with the intention of comprehensively tackling the discrimination which many disabled people face. The main part of the DDA that applies to websites and requires them to be accessible came into force on 1 October 1999. Further changes were made to the Act in 2005 which required certain employers and service providers previously exempt from the Act (such as the police and small employers) to comply with the Act and therefore make their websites accessible.

Websites may be covered under the employment provisions of the Act, for example, they may be a means of advertising jobs or there may be an intranet which staff needs to use. Under the Act an employer is obliged to make reasonable adjustments where a "policy criterion or practice" places a disabled person at a substantial disadvantage.

Websites will most commonly be covered when they constitute the provision of a service, or they are related to education. The Code of Practice Rights of Access: services to the public, public authority functions, private clubs and premises, includes the example of accessible websites as an example of auxiliary aids and services required under the Act.

Service providers are required to provide auxiliary aids and services where this would enable or make it easier to use a service. Service providers are required to change practices, policies and procedures which make it impossible or unreasonably difficult to access a service. This may impact upon procedures that a service provider expects customers to follow on its website which are not accessible, for example security procedures.

Examples of inaccessible websites which may contravene the Act in the area of service provision include:

• It may be unlawful for a website to have links on that is not accessible to a screen reader • The application forms for bank accounts on a bank's website may be in a PDF format that cannot be read by a screen reader • Public transport timetables on a transport website are not in a format accessible to screen readers. • The size of text, colour contrasting and formatting of a local authority website might make it inaccessible to a partially sighted service user • An online retailer changes its security procedures without considering the impact of blind and partially sighted customers that use screen readers. This has the affect of excluding people from making purchases on the website.

Service providers are only expected to make "reasonable" adjustments. "Reasonable" is not defined in the Act, but the Code of Practice does give some guidance on this, and indicates that it will depend upon:

• The type of service provided • The type of organisation you are and resources available • The impact of the discrimination on a disabled person.

A disabled person who believes they have been discriminated against by a service provider can apply to the County Court for an order that the service provider makes their website accessible and compensation for "injury to feeling" for the discrimination they have faced.

Education

The Special Educational Needs and Disability Act 2001 (SENDA) establishes legal rights for disabled students in pre- and post-16 education by amending the DDA to include education. The Act ensures that disabled students are not discriminated against in education, training and any services provided wholly or mainly for students. This includes courses provided by further and higher education institutions and sixth form colleges.

It is unlawful to treat a student "less favourably" for reasons due to disability. If an individual is at a "substantial disadvantage" due to the way in which a body provides its educational services; responsible bodies are required to take reasonable steps to prevent that disadvantage. This may include: • changes to policies and practices (these are the only changes required in pre-16 education) • changes to course requirements or work placements • changes to the physical features of a building • the provision of interpreters or other support workers • the delivery of courses in alternative ways • the provision of material in other formats.

Canada

Canada has a combination of Web accessibility standards and human rights legislations which advocate and stipulate accessibility requirements. The applicability of the Guidelines is to all government departments and ministries and agencies but not to any private organizations. Canada has also established mechanisms for updating of the Guidelines and for monitoring adherence to the standards.

Canada has one important set of standards known as the Common Look and Feel Standards for the Internet 1.1 under which it has adopted much of the WCAG 1.0. It comprises of four parts, namely: Part 1: Standard on Web Addresses, Part 2: Standard on the Accessibility, Interoperability and Usability of Web sites, Part 3: Standard on Common Web Page Format, and Part 4: Standard on Email. The standards also address additional accessibility issues not covered by the Web accessibility initiative. Federal institutions had to comply with these standards by the end of 2002.

These are standards and Guidelines that remained in effect till December 31, 2008. The Treasury Board of Canada, under these standards, has adopted the WCAG 1.0 Priorities 1 and 2 checkpoints. The standards also address additional accessibility issues not covered by the Web accessibility initiative. These standards were superseded by CLF 2.0.

The new Common Look and Feel Standards for the Internet (CLF 2.0) were developed to reflect modern practices on the Web, changes in technology and issues raised by the Web community over the past six years as well as to improve navigation and format elements. The standards were rewritten to eliminate duplication and conflict with other Treasury Board policy instruments and were reformatted to improve their structure and organization.

These standards were approved by Treasury Board ministers on December 7, 2006 and these are mandatory for all institutions represented in Schedule I, I.1 and II of the Financial Administration Act with a two-year deadline ending December 31, 2008, for the conversion of existing sites. Web sites launched after January 1, 2007, must conform to these new standards. These Guidelines

include Standard 1.1 - W3C Checkpoints, Standard 1.2 - Document Technologies, Standard 1.3 - Alternate Formats, Standard 1.4 - Text Equivalent, Standard 6.8 - Validation; Guideline 1.1 - HTML 4.0; and Guideline 6.1 - Cascading Style Sheets.

The standards note that where best efforts cannot make the content or application accessible - that is, where a document cannot be represented in XHTML 1.0 Strict or a language described by World Wide Web Consortium (W3C) Recommendations — the institutions must include an accessibility notice on the same page, immediately preceding the inaccessible element(s), that informs site visitors on how to obtain accessible versions including print, Braille, and audio, and also include an Accessibility Notice on the "Help" page(s) of the Web site.

Providing accessible versions other than accessible XHTML is a "last resort" measure. It is not intended to be a convenient method of avoiding the often-minimal effort necessary to make Web pages or Web applications accessible.

The CLF Standard respects universal accessibility Guidelines by employing a validation methodology to assess the accessibility, interoperability and usability of its Web sites. All sites must be tested with a variety of browser software, platforms and technologies to ensure that Web pages remain accessible and interoperable. Validating Web pages on either existing and future sites against XHTML 1.0 Strict document type definition (DTD) or a similar format that is a recommendation of the W3C will ensure they are syntactically correct. The World Wide Web Consortium provides validation methodology which is followed. Testing with site visitors, current or potential, is also critical and must cover ease of use, navigation, comprehension and user satisfaction. For the purposes enforcing the CLF 2.0, an institution is any organizational entity listed under a unique title in Schedules I, I.1 and II of the *Financial Administration Act*.

Other than these standards, Canada has many human rights legislations which advocate accessibility and other offices and reports which deal with the issue. The **Employment Equity Act** and the **Policy on the Duty to Accommodate Persons with Disabilities in the Federal Public Service** do not apply directly to the public but, rather, to candidates for employment with or employees of the federal government. Nevertheless, they do incorporate the principle of the duty to accommodate and the need to remove barriers to the full social and economic integration of persons with disabilities.

Section 2 of the **Canadian Human Rights Act** states that the purpose of the Act is as follows: “[...] to give effect [...] to the principle that all individuals should have an opportunity equal with other individuals to make for themselves the lives that they are able and wish to have and to have their needs accommodated, consistent with their duties and obligations as members of society, without being hindered in or prevented from doing so by discriminatory practices [...].” Among the 11 prohibited grounds of discrimination is

disability. Human rights jurisprudence has established key principles to be followed in devising appropriate accommodation. The most important of these is that accommodation must, to the extent possible, to maximize the dignity of the person(s) receiving the accommodation; and to ensure that accommodation is as similar as possible to the services provided to people without a disability.

One of these is section 15 of the Charter of Rights and Freedoms, which states that “every individual is equal before the law” and that one of the prohibited grounds of discrimination is “physical disability.” In light of the legal requirements noted above and the jurisprudence, it is clear that if federal departments and agencies make print documents available to the general public, they must have services in place to ensure that persons who cannot read print material are accommodated through comparable alternative means of communication. The duty of accommodation short of undue hardship is a fundamental principle of human rights law, especially with regard to the special needs of persons with disabilities. The duty to accommodate is required to the point of “undue hardship.” Canadian courts have yet to fully define the limits of undue hardship, but they have clearly put a very high value on the obligation of accommodation. Other important Sections are sections 5 and 6 of the Canadian Human Rights Act, which state that access to goods, services and facilities must not be denied to any individual on the basis of a prohibited ground of discrimination.

The **Communications Policy of the Government of Canada** is the official Treasury Board of Canada Secretariat (TBS) policy governing how federal departments and agencies carry out their responsibilities to communicate with Canadians. This policy is issued under the authority of the Financial Administration Act (FAA), section 7, and applies to all institutions identified in schedules I, I.1 and II to the FAA.

The province of Ontario has a strong legal framework for promoting accessibility. The newly enacted **Ontarians with Disabilities Act,** 2001, is "to improve the identification, removal and prevention of barriers faced by persons with disabilities and to make related amendments to other Acts." Section 6 of the ODA states: ‘The Government of Ontario shall provide its Internet sites in a format that is accessible to persons. Section 1 of the **Ontario Human Rights Code** also states that every Ontario resident is entitled to equal treatment as regards the provision of goods, services and facilities. All of this means that if you provide goods or services to the public, you must provide them equally to all people, and not deny them to someone on the basis of their disability. Some Canadian colleges and universities are adopting Web accessibility policies and Guidelines. For example, the **University of Victoria's Web policy** states, "All official UVic Web sites should be accessible to users with disabilities." Uvic Web Accessibility Guidelines addresses how to implement its policy.

Industry Canada's Assistive Devices Office also works with the private sector, such as telecom companies and banking institutions, encouraging them to enhance the accessibility of their products, systems and services.

With regards to monitoring and implementation, deputy heads of all the institutions are responsible for implementation in their respective institutions. Consistent with the requirements above, deputy heads will monitor adherence to this standard within their institutions, taking direction from Treasury Board's 'Active Monitoring Policy, Evaluation Policy and Policy on Internal Audit'.

At a minimum, the institution assesses the following:

- Compliance with the Web Content Accessibility Guidelines 1.0 Priority 1 and Priority 2 checkpoints of the World Wide Web Consortium (W3C) Web Accessibility Initiative;
- Use of and conformance to XHTML 1.0 Strict and CSS 1.0 as baseline technologies;
- Where presenting the content in XHTML 1.0 Strict or other language described as a W3C recommendation is not possible, the availability of accessible alternate versions and Accessibility Notices;
- Where multiple formats are offered, a text indication of the format, file type and size is provided for each format and a link to any specialized software required; and
- Sufficient contrast between textual elements and background colours or images.

The Treasury Board Secretariat will monitor compliance with all aspects of this standard in a variety of ways, including but not limited to assessments under the Management Accountability Framework, examinations of Treasury Board Submissions, *Departmental Performance Reports* and results of audits, evaluations and studies.

South Africa

According to the Council for Scientific and Industrial Research (CSIR), there are approximately 4 million people with disabilities in South Africa. While access to information, services and the ability to communicate effectively is a key need, existing devices and software that allow disabled people to interact via computers "are prohibitively expensive and have not been designed with the South African context in mind".

An anti-discrimination clause in the National Constitution of 1996, which includes disability policies to be implemented, builds the legislation on accessibility in South Africa. The government's policy is described in a White Paper, the Integrated National Disability Strategy of 1997.

The National Accessibility Portal

The National Accessibility Portal (NAP), an initiative led by the CSIR's Meraka Institute, is working to change this, using assistive technology to enable people with disabilities to access and share information online in an affordable way. The NAP initiative was conceptualized and developed by the Meraka Institute in partnership with a representative group of disabled persons' organisations and the Office on the Status of Disabled Persons in the Presidency. The Meraka Institute released the latest version of the National Accessibility Portal, NAP 3.0.0, in October 2008. It contains inclusion of South African Sign Language (SASL) on the interface, which aids the navigation process for deaf people. It also provides SMS-based query facility, as well as an interactive voice response (IVR) system via the telephone.

NAP is unique in the sense that it caters for people across the entire spectrum of disability. Few local websites do include accessibility features for disabled persons, but these are mostly aimed at people who are visually impaired. To expand the accessibility to the websites for other category of disabilities, NAP was initiated.

While deaf people in developed countries are mostly literate, deaf people in developing countries such as South Africa often struggle with literacy in terms of the written language. This makes it difficult for them to access information and navigate their way through a website.

To sum up, it can be said in the South African context that some policies have not been fully enforced. For example, building regulations to ensure accessibility are often ignored. More effort and dedication is needed to make this progress on disability related legislation a reality in the lives of people with disabilities. One of the most important issues that need to be dealt with is the allocation of resources to implement with concrete actions and changes the legislation that government bodies have created. Disability issues as viewed by governments and society have changed positively, now the work must continue to accomplish a more unified society worldwide.

Japan

Japan does not have any legislation around accessibility but has specified its accessibility policies for both Web and other electronic infrastructure in the form of industrial standards. These standards are applicable to both national and local government agencies but do not have any legislative backing for implementation. Japan has also faced additional difficulties on account of the complexity of the Japanese language and script as compared to English. Japan is a signatory to the UNCRPD.

Japan has advanced several initiatives over the years to lay down standards for Web accessibility. These have been complicated by the nature of the Japanese language which, as a phonetic language with a large number of characters, is not as suited to the WCAG Guidelines, which are more oriented towards alphabet based languages like English. Japan does not have any legislation covering accessibility, but the Guidelines for accessibility have been laid down in the form of an Industrial Standard by the Japanese Standards Association.

In November 2001, the International Organization for Standardization (ISO) and the International Electro-technical Commission (IEC) jointly issued "ISO/IEC GUIDE 71: Guidelines for standards developers to address the needs of older persons and persons with disabilities." In 2004, building on ISO/IEC GUIDE 71 and JIS Z 8071, the Japanese Industrial Standard for Web accessibility was released, called **JIS X 8341:** Guidelines for older persons and persons with disabilities—information and communications equipment, software and services." Although the JIS is not legally binding, and its Guidelines are subject to substantial interpretation, it did attract a great deal of attention when it was first passed.[3]

Currently, five components of JIS X 8341 have been issued: Part 1 (JIX X 8341-1: 2004) "Common Guidelines" (May 2004), Part 2 (JIS X 8341-2: 2004) "Information processing equipment" (May 2004), Part 3 (JIS X 8341-3: 2004) "Web content" (June 2004), Part 4 (JIS X 8341-4: 2005) "Telecommunications equipment" (October 2005), Part 5 (JIS X 8341-5: 2006) "Office equipment" (January 2006). The JIS X 8341-3 was expected to function as a basis to ensure the Web accessibility of government websites in the central and local governments in Japan. However, the Ministry of Internal Affairs and Communications found a widespread lack of understanding of and respect for the JIS X 8341-3 among the local governments in Japan and in December 2005 further proposed "Operational Models to Improve Accessibility of Public Web sites" in order to supplement the JIS X 8341-3.

However, the Guidelines on Web content accessibility announced in Japan so far have no legislative backing or power of enforcement, only indicating objectives to which web designers voluntarily strive to achieve, and therefore, have not received sufficient attention. Furthermore, there is no effective Japanese-compatible validation tool for accessibility and due to the innate differences between the English and Japanese languages, it is not possible to conduct an appropriate evaluation of Japanese Web contents using WCAG1.0. These circumstances have made it difficult to create accessible Japanese web pages. In order to improve the current state of Web content accessibility, the Ministry of Public Management, Home Affairs, Posts and Telecommunications and the Communications Industry Association of Japan (CIAJ) have created the "Web Accessibility Working Group." Its major activities are to discuss a new accessibility evaluation method, which takes into consideration the info-communications environment and unique characteristics of the Japanese language. Also to develop an accessibility evaluation system, which can be used in Japanese and is made to match the needs of the Japanese language and improve Web contents by implementing the newly developed evaluation system.

[3] Kazuhito Kidachi, Web Content JIS Compliance, available at http://www.mitsue.co.jp/english/column/backnum/20040625a.html.

In order to determine more accurately, whether or not an HTML document conforms to WCAG1.0, the working group decided to apply the Techniques for Accessibility Evaluation and Repair Tools (AERT) as a complementary document to WCAG1.0. Though AERT is still a working draft, it specifies the algorithm for evaluating whether or not an HTML document conforms to WCAG1.0. However, the evaluation standard specified in AERT assumes that the text is written in the English alphabet. Therefore, if it is applied to Web contents written in Japanese, appropriate evaluation or repairs are not possible. Such problems led to the need for a new standard taking into consideration the unique characteristics of the Japanese language.

In January 2006, the Headquarters issued the "**New IT Reform Strategy**," as a new general policy program of the IT society in Japan and as a successor of the e-Japan Strategy. One of the key policy issues of this new Strategy of 2006 is "an IT society that adopts universal design." Concrete measures to realize "universal design" included "the creation of Guidelines for the standardization of labelling and methods of operation of devices and terminals" and the "promotion of user-friendly Web sites." The problem is that due to the emphasis on "universal design" in this new strategy, the issue of the accessibility of electronic government recedes into the background.

Besides the general policy programs such as e-Japan and the New IT Reform Strategy, several basic policy programs also clarify the necessity of Web accessibility of an electronic government. For example, the Basic Programme for Persons with Disabilities, issued by the Cabinet Office in 2002, declares that the Guidelines for designing accessible telecommunication equipment for persons with disabilities should be standardized by JIS. This statement is realized through the formulation of the abovementioned JIS standards.

New Zealand

New Zealand has several strong legal and policy requirements on agencies to make their websites accessible. Governmental departments need to respond to a mix of legislation and cabinet directives, as well as international obligations on the government as a whole.

A set of specific Guidelines called NZ Government Web Standards and Recommendations specifically deal with Web accessibility. These Guidelines mandate compliance by public sector websites with the standards prescribed, which are based on the WCAG Guidelines. Earlier, the State Sector Act, 1988 ensured that public service systems were accessible to disabled employees, including Intranets and computer applications. The New Zealand Bill of Rights Act, 1990 and Human Rights Act, 1993 oblige the government to "reasonably accommodate" persons with disabilities.

The e-government initiative of New Zealand consists of a number of different standards, strategies, guidelines, and resources related to electronic information. The scope of the e-government initiative extends well beyond that of Web accessibility, but it does include a Web accessibility policy as well, which is referenced within a larger set of Web guidelines. The Web accessibility policy states that all public sector websites "*must* deliver services in a way that is accessible to the people it serves". In general terms, the Guidelines state that Web content must be adaptable to different user circumstances and preferences, and be accessible to people with disabilities. Specifically, the guidelines lay down that content developers must design content in accordance with WCAG 1.0 Guidelines.

In terms of standards, New Zealand has the Government Web Standards and Recommendations v1.0 2002, revised in 2007, and v2.0, revised in 2009. New Zealand Government Web Standards and Recommendations apply to any website that is intended for the public and financed by the public through the crown or through public agencies. This covers all Public Service Departments, New Zealand Police, the New Zealand Defence Force, Parliamentary Counsel Office and the New Zealand Security Intelligence Service. Web sites that are intended for a limited or specialist audience may not be intended for public use. Such sites should nevertheless make every effort to comply, in order to be accessible to the specialist audience. This extends to websites that are internal to an agency (Intranets). The NZ standards are also WCAG compliant.
In terms of legislation, the State Sector Act of 1998 arguably puts responsibility on the public service to ensure its systems are accessible to disabled employees, including Intranets and computer applications. As the Act states in section 56(2), "for the purposes of this section, a good employer is an employer who operates a personnel policy containing provisions generally accepted as necessary for the fair and proper treatment of employees in all aspects of their employment, including provisions requiring—and in section (h), recognition of the employment requirements of persons with disabilities. In compliance with the New Zealand Disability Strategy, departments of the government are required to implement the New Zealand Disability Strategy, as directed by Cabinet. Objective 6 of the Strategy states to "foster an aware and responsive public service 6.5 - make all information and communication methods offered to the general public available in formats appropriate to the different needs of disabled people". It is generally accepted that government is obligated under the New Zealand Bill of Rights Act and the Human Rights Act to reasonably accommodate disabled people. Part 1A of the Human Rights Act applies in particular to the public service. It requires generally that government does not discriminate on the basis of physical disability or impairment, as outlined in these Acts.

Australia

Australia has a generic legislation in the form of a Disability Discrimination Act, 1992 (DDA, 1992) which covers Web accessibility through advisory notes that supplement the DDA, 1992, and is applicable to both public and private sector organizations. In addition, Australia also has Guidelines for minimum website standards and accessibility case laws, and is a signatory to the UNCRPD. All

governments in Australia also have policies and Guidelines that deal with accessible public websites. A benchmark Australian case provides additional guidance on the subject. The legislations, Guidelines and the case law are as follows:

The focus on Web accessibility in Australia has largely come as a result of the Australian **Disability Discrimination Act** of 1992 (DDA, 1992) prohibits discrimination on the ground of a person's disability in many areas of public life and includes several statements which could directly apply to Web accessibility. Under section 24 it is unlawful for a person who provides goods, facilities or services to discriminate on the grounds of disability by refusing to provide the other person with those goods or services or to make those facilities available to the other person; or in the terms or conditions on which the first-mentioned person provides the other person with those goods or services or makes those facilities available to another person; or in the manner in which the first mentioned person provides the other person with those goods or services or makes those facilities available to the other person.

Created in 2002, the **World Wide Web Access: Disability Discrimination Act Advisory Note** contains specific Guidelines for website authors and designers on what exactly the requirements of the DDA are in this area and how compliance can be achieved—who the DDA applies to and what Web services should be accessible. These advisory notes are intended to assist people and organizations involved in developing or modifying Worldwide Web pages, by making clearer what the requirements of the DDA are in this area, and how compliance with them can be achieved. These notes do not have direct legal force, nor do they substitute for the provisions of the DDA itself. However, the Commission and other anti-discrimination agencies can consider these notes in dealing with complaints under the DDA. The advice provided here should also make it far less likely that an individual or organization would be subject to complaints about the accessibility of their Web page.

The Notes considerably emphasize the fact that where a feature does not itself provide equal accessibility, an effective accessible alternative should be provided, unless this is not reasonably possible. The Commission's view is that organizations who distribute content only in PDF format, and who do not also make this content available in another format such as RTF, HTML, or plain text, are liable for complaints under the DDA.

Developments in standards, protocols and technologies used on the Internet take place at a very rapid rate. These notes are therefore, not designed to be exhaustive, or to provide technical advice about current practices. In considering any complaints about access, the Commission would take into account the extent to which a service provider has attempted to utilise the best current information and advice wherever it can be found.

Though the Guidelines in themselves do not have a legal force, advice is provided therein, about how Web designers and website owners can avoid disability discrimination without sacrificing the richness and variety of communication offered by the Internet. Moreover, they are considered when dealing with complaints launched under the DDA.

Guide to Minimum Website Standards, 2000 (Revised April 2003), is designed to assist the Australian Government departments and agencies to implement the government's minimum website standards. The **Better Practice Guide** on Internet Delivery Decisions

published by the Australian National Audit Office is of particular interest to Australian web designers. Component 9 of this document deals with Web accessibility, and provides a concise and easy-to-read summary of the main principles of accessible web design.

A rather famous case that might have been a pre-cursor of these advisory notes and Guidelines is **Maguire v. Sydney Organizing Committee for the Olympic Games** (2000). Bruce Maguire was successful in suing the Sydney Organizing Committee for the Olympic Games (SOCOG) for not making their website accessible.

For monitoring, the Human Rights and Equal Opportunity Commission (HREOC) has responsibility for promoting the objectives of the Disability Discrimination Act, 1992, and provides advice about the implications and monitoring of the Act for website operators. Agencies are required to be familiar with the document from HREOC called: *World Wide Web Access: Disability Discrimination Act Advisory Notes*.

In considering a disability discrimination complaint about World Wide Web accessibility, the Commission would take into consideration the extent to which the best available advice on accessibility had been obtained and followed. The Commission encourages web designers to use expert information that is kept up to date with World Wide Web publishing and access challenges and solutions.

There are a number of evaluation tools and techniques that web designers can employ to test the accessibility of their sites. However, there is no real substitute for user-testing, and designers should, wherever possible, involve users of assistive technology in the testing and evaluation of the accessibility of their websites.

Another useful resource for web designers is "Bobby", a software tool that checks Web pages for accessibility, reports on problem areas, and suggests possible improvements. *Bobby* and other automated evaluation tools are not a substitute for user testing but they do allow web designers to get a sense of how accessible their pages are.

There is also a Productivity Commission enquiry that was initiated by the Australian Government to evaluate the effectiveness of the Disability Discrimination Act, 1992, which published its findings in 2004.
The Act allows for and the Commission encourages service providers to prepare Action Plans indicating the provider's own strategies for eliminating discrimination in its services. Relevant terms of such an Action Plan are required to be taken into account in considering a complaint against a provider that has submitted its Action Plan to the Commission. These Guidelines may assist service

providers in preparing Action Plans in relation to their Worldwide Web presence. The Commission also has materials available on the process of preparing an Action Plan and (subject to resource limits) may be able to provide further advice in this respect on request.

India

While India has legislations generally aimed at prohibiting discrimination of Persons with Disabilities, there is an urgent need for policy formulation to ensure accessibility of IT products and services in general and Web accessibility in particular. India needs to develop an action plan coupled with policy formulation and a plan for legislation to ensure universal Web accessibility. Given the place of prominence that India has in the field of IT products and services, it is only just that the country takes tangible steps to enable a significant proportion of its population to participate in this medium.

India has generic legislation on disability in the form of the Persons with Disabilities (Equal Opportunities, Protection of Rights & Full Participation) Act which was enacted in 1995 with the objective of ensuring equal opportunities for people with disabilities and their full participation in nation building. However, there is no accessibility specific legislation or policy as yet.

India has a phenomenally large percentage of disabled persons: conservative estimates approximate that six per cent of the population has a disability, while an additional 34 per cent of the population is illiterate and an additional 77 million are elderly. The largest democracy in the world cannot afford to exclude this significant a chunk of its population from participating in the life of the country, which is increasingly intertwined with the Internet.

Such exclusion is contrary to the Constitution of India which guarantees its citizens a right to receive information. The Freedom of Speech and Expression enshrined in Art. 19(1)(a) is inclusive of the right to receive information. This right extends to receiving speech that is of a commercial nature as well. The equality clause of the Constitution demands that differently circumstanced people are to be treated differently, to assert their equal worth and to enhance their capabilities to participate in society as equals.

The disabled do not have a special right to information. However, the information available to the rest of the population must similarly be available to the disabled. The right to receive information is effective only when such information is available in formats that can be accessed. Information in such special formats is rarely provided. Consequently, people with disabilities are deprived of the information available on the Internet, while the rest of the population enjoys access to the same. In Mr. X v. Hospital Z it was observed that government services cannot be denied to an individual on the basis of his disability. Therefore, insofar as online services maintained by the Government are concerned, failure to make their content accessible to the disabled clearly vitiates the Constitutional guarantees of the Right to Information and Equality.

Though India does not currently have a formal accessibility policy in place yet, work on creating an overarching accessibility policy for the country has been initiated and is in progress. The obligation on the Government of India is not limited to ensuring access to Internet services provided or maintained by the government alone. There is an obligation on the Government of India to act

proactively in order to ensure that the disabled are not excluded from cyberspace. India is a signatory to the United Nation Convention on the Rights of Persons with Disabilities, 2006 (UNCRPD) and the Biwako Millennium Framework towards an Inclusive, Barrier-free and Rights-based Society for Persons with Disabilities in Asia and the Pacific, 2002. Both these instruments obligate member states to act proactively in order to secure the rights of the visually challenged to equal access to information and the Internet. The Biwako Millennium Framework recognizes the Right to Information and Communication as a basic human right. Information and Communication has been defined as including, "the Internet, including Web, multimedia content, Internet telephony and software used to create Web content."

Since, there is currently no accessibility specific Indian legislation, case laws established by Supreme Court of India rulings in *Vishaka v. State of Rajasthan*, AIR 1997 SC 3011 and T.N. *Godavarman Thirumilpad v Union of India*, (2002) 10 SCC 606, have now led to the settled position of law that international conventions and norms are to be read into domestic laws in the absence of enacted domestic law, to the extent that there is no inconsistency between them. It is now an accepted rule of judicial construction that regard must be had to international conventions and norms for construing domestic law when there is no inconsistency between them.

The 1995 Persons with Disabilities Act is silent on the Rights of persons with disabilities in the digital world. In *Javed Abidi v Union of India* AIR 1999 SC 512 the Supreme Court observed that the object was to create a barrier-free environment for persons with disability and to make special provisions for the integration of persons with disabilities into the social mainstream apart from the protection of rights, provision of medical care, education, training, employment and rehabilitation. Therefore, clearly the aforementioned international law obligations do not contradict any municipal law. In fact it furthers the object of the Persons with Disabilities Act of 1995. Consequently, the aforementioned international law mandates flowing from the Biwako framework and UNCRPD create a domestic law obligation on the state to secure access for the disabled to cyberspace.

Further, Article 41 of the Constitution of India requires the state to make effective provisions for securing public assistance in the event of disablement. The National Policy for Persons with Disabilities (see para 51 viii) also provides that the Government shall take proactive steps to ensure a disable friendly IT environment.

Given that accessible websites hold untold promise for those with all manner of disabilities to engage in all aspects of modern society, a Web accessibility initiative would significantly buttress India's current disability policy and legal apparatus and improve its adherence to its international legal commitments. India's signing in 2007 of the UNCRPD is an important first step, implying its commitment to facilitating Web accessibility. However, while India's legislations and policies for persons with disabilities are all designed to promote access and inclusion reflecting the broad approach of the UNCRPD, they do not include any measures that specifically address Web accessibility.

The Persons with Disabilities Act of 1995 seeks to improve access of persons with disabilities to education, employment, transportation, and life services among other things. The National Trust for Welfare of Persons with Autism, Cerebral Palsy, Mental

Retardation and Multiple Disabilities Act of 1999 seeks to generally empower persons with the named conditions to "live as independently and fully as possible" and to ensure the "realization of equal opportunities, protection of right and full participation of persons with disabilities." The National Policy for Persons with Disabilities, originally drafted in 1993 and minimally updated as of 2006, is similarly broadly targeted towards facilitating the integration of disabled persons into society by focusing on human resource development and education, employment, accessibility in built environments, and equal opportunity for sports, recreation and cultural activities, among other things. While each of these initiatives embraces the contemporary social model approach to disability, placing the onus on the state to remove barriers between society and the disabled, none of them is tailored to the Internet era. As modern life is increasingly suffused by the Internet, the government will be increasingly unable to fulfil its mandate without facilitating an accessible Web.

Ireland

While Ireland has formulated several policies and programmes dealing with Web accessibility for the disabled, there is no specific legislation that directly covers this area. Ireland has national Guidelines on accessibility of IT products and services which in the specific case of Web accessibility, essentially adopted or incorporated W3C WCAG 1.0 without substantive change. Applicability of Guidelines is primarily to the public sector and is again not mandatory. The mechanism for monitoring is more recognition based with awards for excellence in ensuring accessibility certified by a third party audit.

There is currently no Irish law that specifically covers the area of Web accessibility. The Equal Status Act and Employment Equality Act come closest, but both lack effective enforcement mechanisms. Sub section 4 of the Equal Status Act defines discrimination affecting people with disabilities in terms of access to services: "For the purposes of this Act, discrimination includes a refusal or failure by the provider of a service to do all that is reasonable to accommodate the needs of a person with a disability by providing special treatment or facilities, if without such special treatment or facilities it would be impossible or unduly difficult for the person to avail himself or herself of the service." Thus, prima facie, the Act would appear to cover discrimination in the provision of online and Web based services. However, to date, there is not much specific case law which might clarify this.

However, one relevant case in this context is Martin O'Sullivan vs. Siemens[4] where O'Sullivan was a visually impaired applicant for an IT Support job with Siemens. He requested an application form in electronic format but was not accommodated. He appealed to the Equality Tribunal and then the Labour Court, where he was awarded £12, 000 in damages on the grounds that "*the failure of Siemens*

[4] http://list.universaldesign.ie/pipermail/ceud-ict/2007/001366.html

to make reasonable accommodation in the selection process, and the consideration which Siemens gave to his disability in deciding on his application, constituted a single consolidated act of discrimination". The court also found that *"Martin O'Sullivan was denied an opportunity to undertake an integral and otherwise essential part of the selection process because of his disability. This meant that the whole selection process was tainted with discrimination".*

The Employment Equality Act, 1998 effectively includes disability as one of the grounds of discrimination. The Employment Equality Act also covers the provision of accessible technologies to employees. However, like the Equal Status Act, only accommodations that cost a nominal amount are required. There has never been a test case of this requirement.

The Disability Act appears to be more comprehensive but is unclear in its meaning. It references making electronic information accessible to persons with a vision impairment to "whom adaptive technology is available" – this is narrow in scope in that many other people apart from people with a vision impairment benefit from an accessible Web and many people with vision impairment do not rely on adaptive technology, rather the settings in their browsers to assist them with accessing Web content. Section 27 of the Act provides that: "Where a service is provided to a public body, the head of the body shall ensure that the service is accessible to persons with disabilities". Section 28 of the Act provides that: "Where a public body communicates in electronic form with one or more persons, the head of the body shall ensure that as far as practicable, the contents of the communication are accessible to persons with a visual impairment to whom adaptive technology is available".

In addition to disability discrimination legislation, various policies and programmes have been brought forth over the years such as the "New Connections - A Strategy to realise the potential of the Information Society" and the "National Programme for Prosperity and Fairness" deal directly with web accessibility for the disabled. Some of the

Discrimination Legislations are as follows:
The **National Disability Authority's Code of Practice**, a government order designed to facilitate implementation of the 2005 Disability Act, directs public bodies to aim at achieving "Double-A level conformance with the Web Accessibility Initiative's (WAI) Web Content Accessibility Guidelines". Section 27 of the Code of Practice advises public bodies to "build accessibility into the procurement process as a criterion" in order to meet the requirements of the Disability Act. The NDA has also issued the Public Sector Procurement Regulations 2006, which implements the EU Procurement Directive 2004/18/EC. The Directive states that: "Contracting authorities should, whenever possible, lay down technical specifications so as to take into account accessibility criteria for people with disabilities or design for all users. The technical specifications should be clearly indicated, so that all tenderers know what the requirements established by the contracting authority cover."

The NDA has also published three other resources to assist with compliance with WCAG. First, is the "IT Accessible Procurement Toolkit" provides assistance to IT procurers to include accessibility as a criterion in the tender document and provides guidance on assessing accessibility in tender responses as well as in the developed product before sign-off. The toolkit provides specific advice on Web sites and applications as well as Web authoring tools. Next, the "Web accessibility techniques" documents contain advice including best practice examples, code samples and video clips of real users for Developers, Designers and Content creators. "Auditing Web Accessibility" provides general advice on how to get the most out of auditing a website for accessibility, reaching a certain level of accessibility and maintaining this level over time. (http://www.universaldesign.ie/useandapply/ict/webaccessibilityauditing)

In 2002, a study of Web accessibility in Ireland was also carried out by the Research Institute for Networks and Communications Engineering at Dublin City University. The study assessed a sample of 159 public and private sector websites against the internationally accepted Web Content Accessibility Guidelines (WCAG 1.0) published by the Web Accessibility Initiative (WAI). It was found that 94 per cent of the websites failed to meet the criteria required to achieve the minimum level A compliance. None achieved the recommended AA compliance.

In April 2004, accessibility consultants Ennis Information Age Services assessed the websites of 30 randomly selected Government Departments and agencies. Only one was found to be AA compliant. Although 24 of the 30 sites indicated an awareness of the WAI guidelines, only three displayed the WAI logo and two of these did so inappropriately, as they were actually found to be non-compliant. In July 2004, a study by IQ Content benchmarked 40 Irish e-Government sites. The survey found that many organizations showed an awareness of the issue of accessibility but few demonstrated adequate skill in its implementation. There was a clear lack of real understanding of the spirit of the WAI Guidelines, so that attempts at making sites technically compliant often did not translate into real accessibility improvements for people with disabilities.

The General public policy on the Information Society was administered by the Information Society Policy Unit (ISPU) in the Department of the Taoiseach (Prime Minister), with advice from the Information Society Commission. This has since moved to the Department of Communications Energy and Natural Resources under the banner of the "Knowledge Society" and e-Inclusion[5].

Some of the Policies and Programmes on Web accessibility in Ireland include the NDA's "National Programme for Prosperity and Fairness" and "New Connections - A Strategy to Realise the Potential of the Information Society". The Irish Government policy does specify Web accessibility. The document New Connections - A Strategy to realise the potential of the Information Society, published in March 2002 recognises the importance of providing online services in a way that makes them accessible to all citizens, including those with disabilities. This document directly refers to the European Union e-Europe 2002 recommendation that all public sector

[5] http://www.dcenr.gov.ie/Communications/Knowledge+Society

websites are required to be WAI (level 2) *[sic]* compliant by end-2001.This deadline has long passed and the target is nowhere near being reached.
In terms with monitoring and implementation, complaints under laws on "Employment Equality" and "Equal Status" are dealt with (in the first instance) by the Equality Tribunal. The National Disability Authority has developed an Excellence Through Accessibility award which can be given to public sector organizations on successful completion of a third party audit. The criteria for the award cover three areas – buildings access, quality customer services and accessibility of Information and Communication Technologies (ICT). ICT includes websites.
The Disability Act requires each public body to have an "Enquiry Officer" through whom any complaints under the Act are dealt with in the first instance. Complainants not satisfied with the outcome are entitled to bring a complaint to the office of the Ombudsman.
The NDA has a role in monitoring complains with the Disability Act and Code of Practice. However, this is currently done through public bodies filling out a survey. The section dealing with Web accessibility is essentially a self declaration of conformance with WCAG.

Italy

Italy has enacted a legislation that requires public services and information to be accessible, provides for adequate IT working instruments and equipments to be provided to PWDs and stipulates that public procurement of ICT goods and services should always keep accessibility as a consideration. The Guidelines apply to national and local public bodies and to private subjects, if they are concessionaries of public information or services, and to public transport and telecommunications companies. Italy has assigned the duty to monitor the enforcement of legislation and Guidelines to a ministerial council and a central agency. Further, they are also tasked with tracing the accessibility criteria for the development of IT systems in public administration, and introducing the issues relating to accessibility in public personnel training programs. The central agency also plays an important part in monitoring the enforcement of accessibility policies in the processes of public ICT procurement.

Italy is the only country studied, other than Germany, which has signed and ratified both the UNCRPD and the Optional Protocol and has several Guidelines and initiatives around accessibility, both in terms of Web accessibility as well as IT infrastructure. During 2003, the European Year of People with Disabilities, the Italian Government chose to address the topic of e-Accessibility through a body of legislative Acts which, at the moment, is made up of a law (No. 4/2004, also known as the "Stanca" Law), containing the general principles, and two decrees, containing the implementation regulations and the technical accessibility requirements respectively. This body of laws provides that public services and information should be accessible, that disabled people should be

provided with adequate IT working instruments and equipment and the public procurement of ICT goods and services should always take accessibility into consideration. The laws are as follows:
Law 4/2004 **"Provisions to support the access of the disabled to information technologies**" is the principal legislation on Web and information technology accessibility for the disabled in Italy. It states that the government protects each person's right to access all the sources of information and their relevant services, such as information technology (IT) and data transmission instruments. More specifically, the provisions are applicable to public administrations, economic public agencies, regional municipal companies, public assistance and rehabilitation agencies, transport and telecommunication companies in which the state has a shareholding and to ICT services contractors. Article 4 states in particular that when purchasing ICT goods and services, signing contracts regarding their development and maintenance or carrying out competitive tenders, the accessibility requirements must always be taken into consideration. It also contains the commitment to provide disabled workers with adequate IT equipment in order to allow them to work efficiently.

These Guidelines for both usability and accessibility of web sites of the public administration are in line with the recommendations and directives on accessibility of the European Union and those suggested by international regulations, namely the WCAG 1.0. The Minister for Innovation and Technologies is to provide by decree the guidelines that will describe the technical requirements, the different levels of accessibility, and the technical methodologies to verify the accessibility of Internet websites and the assisted evaluation programs. The law also holds that the Presidency of the Council of Ministers, Department for Innovation and Technology, and the support of the National Organism for ICT in the Public Administration will help to monitor the application of the present law. Ultimately, regions, autonomous provinces, and municipalities are responsible for overseeing the use of the provisions of this law.

The Decree of the President of the Republic, March (No. 74) "**Enforcement Regulations for Law 4/2004 to promote the access of the disabled to information technologies**" goes further into the topics regarding the implementation of the provisions of Law 4/2004. Web sites must not only be barrier-free but also simple, effective, efficient and they must satisfy the user's needs. Private subjects must necessarily apply for an accessibility assessment made by a member of the evaluators' list in order to obtain the accessibility mark. Public agencies and bodies instead may autonomously assess their compliance with the accessibility requirements and with the provisions of the law, in adherence to the principle of self-government.
The Ministerial Decree, July 8th **2005 "Technical Rules of Law 4/2004"** is mainly made up of annexes which contain the technical Web accessibility requirements, the methodology for the evaluation of Web sites and the requirements for accessible hardware and software. The Italian law 67/2006 **"Provisions for the judicial protection of persons with disabilities, victims of discrimination**" introduces into the Italian legal system some provisions for the judicial protection of individuals with disabilities. It is one of the laws that the Italian Parliament has enacted as to implement the European Union law principle set out at Article 13 of the Treaty of

Amsterdam, which states the principle of fight against discriminations, either based on sex, race, ethnic origin, religion, personal beliefs, handicaps, age or sexual preferences. Law No. 67/2006 aims to grant disabled persons the same rights actually enjoyed by non-disabled persons. Law No. 67/2006 provides disabled persons with a general remedy against discrimination, and that such remedy adds up, and does not derogate, those other provisions containing different forms of protection.
The following recommendations and directives on Web accessibility preceded the above legislations. These directives either invited public agencies to comply with the Web Content Accessibility Guidelines (WCAG) 1.0 or gave specific suggestions on how to develop accessible Web pages.

- March 2001 - Directive n. 3/2001 by the Ministry of Civil Service: "Guidelines for the organization, the usability and the accessibility of Public Administration Web Sites".

- September 2001 - Circular Letter by the Authority for Informatics in Public Administration: "Criteria and instruments to improve the accessibility of Web Sites and computer programs for disabled people".

- May 2002 - Directive by the Presidency of the Council of Ministers: "*Information on the use of the '.gov.it' domain*".

In terms of monitoring and implementation, law 04/2004 assigns the duty to monitor the enforcement of the Law to the Presidency of the Council of Ministers (Department for Innovation and Technology) and to CNIPA. This applies especially to central public agencies. These two agencies must also trace the accessibility criteria for the development of IT systems in public administration, and introduce the issues relating to accessibility in public personnel training programs. On the other side, the Regions, the autonomous Provinces and Municipalities are responsible for the enforcement of the provisions of the law by local authorities.

CNIPA also plays an important part in monitoring the enforcement of accessibility policies in the processes of public ICT procurement. One of its institutional duties is in fact to give advice on any relevant public ICT project or contract signed by central agencies. Taking such advice is compulsory but not binding and one of the checkpoints is the compliance of the project with government laws, directives and policies. Other checkpoints include comparing the project with the priorities and goals of the administration, assessing the internal coherence with other projects of the administration comparing the project with similar initiatives by other administrations, and updating the solution to the state of the art.

Germany

Germany has many regulations covering accessibility for the disabled and is one of the most advanced nations in this regard. Germany is one of the few countries that have signed and ratified both the UNCRPD and the Optional Protocol and its regulations cover accessibility of both Web and other electronic infrastructure. It also has provisions for regular review of its legislation.

Germany's disability legislation is in the form of an Equal Opportunities Act for disabled persons and covers Web and electronic accessibility through regulation in the form of a federal ordinance. The Federal Republic of Germany's **Act on Equal Opportunities for Disabled Persons**, which came into force in 2002, is an expansive anti-discrimination law. It essentially obliges the Federal authorities to ensure barrier-free environments in the broadest sense of the word. The Act renders discrimination against persons with disabilities illegal, aiming to ensure equal participation of persons with disabilities in the life of German society and to enable them to lead self-determined lives, whilst duly taking account of their special needs. The Act also specifically addresses Internet accessibility, stating: "Public authorities shall technically design their Internet presentations and the graphic user interfaces which they make available and which are presented by means of information technology gradually in such a way that they may generally be used by people with disabilities without restrictions."

The key regulation for Web accessibility in Germany is the Barrier-Free Information Technology Ordinance (BITV). It mandates that all Federal government web pages and websites which are publicly accessible must be in conformity with its priority standards. It bases its standards on the WCAG 1.0 Guidelines, though the states' level of referencing the WCAG in their own versions of the BITV is non-uniform. Most states do, however, have a version of the BITV. The BITV mandates that private web pages of private companies have the obligation to begin negotiation with registered organizations for handicapped people to generate "targeted agreements" that regulate which measures will be undertaken by the private company to implement the BITV. However, the BITV makes it mandatory only to conduct negotiations, not necessarily to come to a result. Finally, under the BITV registered organizations for handicapped people have the right to take legal actions against any federal administration to not compliant to the federal BITV.

Section 5 of the BITV deals with the evaluation of the effectiveness of the Ordinance. It provides for the regular review of the Ordinance, taking into consideration the technological development. It gives a time line of not more than three years for the evaluation of the effectiveness of the Ordinance.

Also, the Act on Equal Opportunities for the Disabled Persons provides for the appointment of a Commissioner for the Interests of Persons with Disabilities by the Federal Government and defines his/her responsibilities and powers.

Korea

Korea offers an excellent example of an Asian country with a measurable action plan to bridge the digital divide which has also enacted overarching legislation that is applicable to public and private sector over a period of time starting with Government agencies in the first phase. Korea also has a comprehensive well structured policy addressing various facets including development of ATs and increasing awareness of Web accessibility requirements. Korea has established a set of Guidelines covering accessibility of IT products and services in general including Web accessibility requirements in particular. Further, Korea has established a mechanism for measurement and evaluation of implementation progress.

The Korean Government has been conducting accessibility research since 2005 with an aim to improve Web accessibility of government Web sites, increase awareness of Web accessibility and develop policies for Web accessibility in Korea. There are two main authorities charged with responsibility of bridging the digital divide. One is the Ministry of the Public Administration and Security. The other is the National Implementation Society Agents. Further, there are several advisor groups. In 2002, Korea enacted Guidelines to improve accessibility for handicapped People with Disabilities and elderly to the IT services and IT products, to improve accessibility in Korea.

The 2007 **Korea Disability Discrimination Act** is quite comprehensive in scope. It provides information access rights, provides reasonable accommodations in IT and communication and also defines the role of the governmental agencies which are bound to reaching Web accessibility obligations between 2009 and 2015. These institutions include government agencies and their subsidiary, universities and colleges, major hospitals, private corporation, etc and culture & art corporation. The Web accessibility obligations laid down in this are intended to apply to both private and public sector gradually by 2015 as per the current roadmap, starting with government agencies and subsidiaries in 2009.

The 2009 **National Informatization Act** in Korea specifically covers ICT access and usage for PWDs and the elderly. This Act mandates governmental agencies to respect Web accessibility standards, provides for assistive technology and ICT for PWD, promotes ICT access environment for PWDs and elderly people, and provides ICT learning opportunities for the underprivileged. In effect, the Act also establishes the "National Information Society Agency (NIA)"

Korea's National Standard of Web Accessibility Guidelines is based on the reference Guidelines: Section 508 ∮1194.22 & W3C WAI WCAG 1.0 & W3C WAI WCAG 2.0 Draft Version (2003. 6).

Outside of Korea's legal framework, there are many ICT accessibility guidelines and programs. One area of interest is the

development and supply of assistive technologies for PWDs. Since 2004, the government has provided support to develop assistive technologies in order to exchange pure technologies for products since 2004. About 20 products were developed (magnification, screen reader, et cetera.) and other assistive devices such as screen readers and Braille display were given substantial government subsidies.

Another area is ICT accessibility forums. In 2002, **Information and telecommunications Accessibility Promotion Standards Forum** was formed**.** The purpose of this forum is to promote accessibility to ICT products and services through sharing the relevant information among developers, scholars and other groups. The activities of this forum include information sharing, research and development, international cooperation and participation of international standards organizations (ISO, W3C), and the promotion of public awareness on accessibility issues through seminars and the Internet.

Korea has developed various **ICT accessibility standards** since 2005. In Korea there are two national standards. One is the Internet Web Content Accessibility Guideline of December 2005 and the second is the Automatic Teller Machine Accessibility Guideline 1.0 of October 2007. And especially in Korea, there is the Internet Web Contents Accessibility Guidelines consisting of 4 Basic Principles 14 Checkpoints. This is based on the Reference Guidelines: Section 508 ∮1194.22 & W3C WAI WCAG 1.0 & W3C WAI WCAG 2.0 Draft Version (2003. 6).

Research initiatives on ICT accessibility in Korea include an environmental scan of ICT accessibility and use by persons with disabilities, investigating the status of Web and IT products' accessibility and compliance, surveys on awareness of Web accessibility and other research on ubiquitous accessibility.

One initiative in area of **increasing awareness of ICT accessibility** is operating Web accessibility education programs for public servants and the web developers. In 2008, 2491 persons participated in the education programs compared to 226 in 2005. Another initiative is the development of Web accessibility evaluation tools: 2003: "A-Prompt" Korean Version and 2005: KADO-WAH (Web Accessibility Helper). Other initiatives include operating Web accessibility certification programs since 2007and holding seminars about ICT accessibility as well as cooperating with agencies and companies such as UN-ESCAP, Microsoft, and TRACE Center, et cetera to increase ICT accessibilities.

Philippines

The Philippines provides an example of a Web accessibility regime in a developing Asian country. Though it currently lacks

legislation or policy addressing Web accessibility, The Philippines is currently striving to make progress towards that end in a manner that it feels is tailored to its specific context. The Philippines is making progress towards developing a policy and enacting legislation for Web accessibility. The Philippine Web Accessibility Group (PWAG) is tasked with overseeing and implementing relevant programs on accessible ICT. PWAG together with concerned government agencies has begun formulating an official set of Philippine Web Accessibility Design Recommendations based on a distinctly Philippine web accessibility regime rather than adopting the WCAG. The PWAG aims to develop standards that they feel are calibrated to the country's needs and capabilities.

In 2003, the Philippines also sponsored an UN-supported workshop on Accessibility of ICT for Persons with Disabilities. This workshop produced documents that answer the relevant accessibility and technology questions of developing nations. They are the Manila Declaration on Accessible ICT, and the Manila Accessible ICT Design Recommendation. The purpose of the declaration was to include accessible information as a human right, while the recommendation is a set of threshold level functional specifications for accessibility of technology. Co-developed by the United Nations and Cynthia Waddell, one of the chief architects of the U.S. Section 508, the recommendation is a set of best practices tailored to developing countries. Though these initiatives lack the force of law, many organizations in the Philippines adopt their provisions voluntarily.
Originally founded as a government-affiliated ad hoc working group in 2006, the Philippine Web Accessibility Group (PWAG) is now formalized and government-supervised through the Department of Social Welfare and Development-National Council on Disability Affairs (DSWD-NCDA) and the National Computer Centre-Commission on Information and Communications Technology (NCC-CICT). The PWAG is now tasked with overseeing and implementing relevant programs on accessible ICT in the Philippines. It fosters dialogue among activists, web designers, academics, the government and other relevant actors in the field; evaluates Web sites for accessibility; and together with concerned government agencies (NCDA and NCC-CICT) has begun formulating an official set of Philippine Web Accessibility Design Recommendations.
The PWAG seeks to develop a distinctly Philippine web accessibility regime rather than adopting the WCAG. Using the Manila Accessible ICT Design Recommendation as a basis for the development of standards, the PWAG aims to develop standards that they feel are calibrated to the country's needs and capabilities. Consulting with policymakers, webmasters, and persons with disabilities, the PWAG has developed a separate vision of

Web accessibility:
We asked the question, *'what is accessibility in the Philippine context?'* The answers were different from those of the developed nations. They were also different from those of the other developing nations… The dominant Information and Communication Technologies used are cell phones and short-message systems (SMS). Only a small fraction of the population is using computers, and almost nobody uses or can afford screen readers…Through collaboration, we have a clear idea of the balance between the needs (and

wants) of persons with disabilities, and what Web producers can reasonably and economically build. We will be basing our standards on that balance.
The sense of the PWAG is that adopting the WCAG would be more costly than necessary given the above context, and as such costs would prohibit actual compliance. The PWAG has realized though that accessible web design actually saves money when it is adopted in conjunction with new Web development. Remediation of old websites imposes more costs. As such the PWAG recommends adopting accessible designs primarily in conjunction with website design, redesign, or update.

Singapore

The Government of Singapore has been later than most in the Asian region in developing a national infrastructure for persons with disabilities. Singapore currently lacks legislation or national policy regarding disability and its' National Office on Disability is still within the developing stages of its Enabling Master Plan 2007–2011. Consequentially, issues of Web accessibility have not been sufficiently addressed.

However, potentially positive steps have been made by the Web Standards Group of Singapore (WSG) and the Infocomm Development Authority of Singapore (IDA). The Web Interface Standards (WIS), passed by the IDA in 2004, serve currently as a working set of standards and guidelines for Singapore Government websites and online services. While these standards aim foremost to create an aesthetic consistency across government websites, they also recommend that government websites be accessible. However, accessibility has not been made a requirement of government sites and remains an ineffective recommendation.

The WSG of Singapore does provide an important platform from which future developments on Web accessibility can take form. Their celebration of the few accessible websites in Singapore and active lobbying indicates a slow, yet imminent paradigm shift among web-developers in Singapore. Criticisms of the IDA's WIS have also forced the standards into several review processes. Assurance by the IDA of a pending review of the WIS against the W3C's WCAG 2.0 has recently been given. A Web Accessibility Handbook, developed by the Minister of State for Ministry of Health and Transport, was also published by the Disabled People's Association of Singapore. However, this publication is not featured on any government site.

Sri Lanka

Sri Lanka has an extensive legal framework and national infrastructure for the protection of the rights of persons with disabilities. Together, the 1996 Right of Persons with Disabilities Act No.28 and the 2003 National Disability Policy provide comprehensive

coverage, including issues of electronic accessibility. Amendments to the Right of Persons with Disabilities Act were made in 2003, although none of these amendments were made to develop a Web accessibility regime. The National Disability Policy, in sections 13 and 14, assert the need to make information and communication technologies, and adaptive technologies, more accessible and affordable. Freedom to information is guaranteed under Section III (16) (1) of the Constitution and the National Council for Persons with Disabilities also works to advance the rights of persons with disabilities in Sri Lanka.

While the need to ensure accessibility to ICTs is outlined in legislation and policy, to date, no Web- specific accessibility legislation or policy has been introduced. A working group of designers, programmers and entrepreneurs called the World Wide Web Sri Lanka (W3LK), asserts that work on developing web standards for Sri Lanka was in process. However, this Google group appears to have been inactive since late 2006. Several NGOs, such as the Sri Lankan Federation of the Visually Handicapped (SLFVH), have also raised concerns about the need for Web accessibility. As a signatory of the UNCRPD, it is critical that the Sri Lankan government fulfills its obligations as set out in the convention by creating its own national framework for ensuring Web accessibility.

Thailand

Thailand has formulated a strategic action plan for achieving Web accessibility as well as promotion of local ATs. Thailand has also developed Web accessibility guidelines based on a modified version of WCAG intended to be promoted in the public and private sector. These measures do not have the force of legislation at this time.
Thailand has also incorporated Web accessibility priorities into its general telecommunications policy. It features an action plan for bridging the digital divide and an indigenous set of Web accessibility standards. In consultation with web developers Thailand developed its own national Web accessibility guideline, the **Thai Web Content Accessibility Guidelines** (Th-WCAG), for web developers which were in effect a modified version of Level 1 of WCAG2.0. Though lacking the force of law, the intent was to promote these guidelines in both the public and private sectors.

The Ministry of Information Technology (MICT) has also developed the Bridging the Digital Divide Strategic Plan (2008-2010) as its roadmap for promoting Web accessibility and research and development of the local assistive technology industry. The Plan seeks to increase Web accessibility, develop an assistive technology industry, and to increase access channels and personnel related to assistive technology and related technologies.

The goals of the Plan include: obtaining sufficient funding from the public and private sector for reducing the barriers of accessing information, redesigning government websites based on the MICT's web accessibility standards, establishing an assistive technology

industry, and providing training to persons with disabilities in the use of assistive technologies. The MICT laid out four Strategies and 16 projects to achieve these goals, but as yet, data on their implementation and effectiveness are lacking.

Business Websites

Most policy interventions have thus far focused on the accessibility of public web sites, and to date there are no examples of direct legislative obligations for eAccessibility of business websites. However, in a few countries, there is mention of business websites in accessibility legislation, even if not imposing direct obligation. In addition, anti-discrimination legislation has been widely interpreted to also cover business websites and has led to some positive actions. However, reliance on indirect legislation can sometimes be problematic.

Example 1: Italy

In Italy, the 'Stanca law' is the main accessibility legislation1 which, inter alia, imposes eAccessibility related obligation on public web sites owners. In addition, the law includes statements encouraging non-public web site owners to comply with the requirements imposed on public web sites owners, but without imposing mandatory requirements on them (Article 6). Private parties maintaining a web site are also able to participate in an eAccessibility related certification scheme set out in the law.

Example 2: Germany

In Germany, the accesibility legislation 'Barrierefreie Informationstechnik-Verordnung' (BITV) passed in 20022 stipulates the right of registered disability organizations to call upon private sector companies or relevant umbrella organizations to enter into structured negotiations. This is in attempt to reach a "target agreement" ("Zielvereinbarungen") which will define technical measures to be undertaken by the private company to assure adherence to the BITV. Before a target agreement can be reached, there are several key elements which have to first be addressed. First, the parties of the "target agreement" must be identified, including the scope and duration of the agreement itself. Next, minimum requirements must be developed, outlining how changes will be made to ensure accessibility. Lastly, a deadline or time plan by when the minimum requirements is assigned.

All "target agreements" reached under the auspices of the BITV are to be published on a dedicated web site. Overall, 12 target agreements have been reported this far. Of these 12, two instances explicitly address web accessibility. The agreements are concluded on a case by case basis and agreed targets may vary accordingly. Since its introduction in 2002, target arrangements have not been

used to a large extent to engage private organisations in negotiation. The registered disability organizations appear to lack the capacity to enforce wider implementation of web accessibility with help of this instrument. However, the government has announced support, which may add teeth to the process.

Example 3: The United States

In the United States, courts have ruled both positively and negatively on the ADA's applicability to business websites. The Act guarantees equal opportunity for individuals with disabilities in public accommodation, employment, transportation, state and local government services, and telecommunications, and guidance from the Department of Justice suggests that government websites should be accessible. However, making a website accessible is not specifically required by law in cases where equivalent access to a program can be provided in some other way. Therefor, it is unclear to what extent specific actions are taken in this regard. For example, the Southern District of Florida held in Access Now, Inc. v. Southwest Airlines, that the airline's website was not a "place of public accommodation" under the ADA, and thus dismissed plaintiff's complaint. The court found the website did not fit into the definitional paradigm of "public place" because it did not have a bricks and mortar equivalent. Therefore, the courts believed they had no authority to expand the explicit rights enumerated in the ADA to exclusively to private online spaces under Title III.

However, the 2007 decision of the federal district court of Northern California concluded that Title III does also apply to the services of a place of public accommodation, and not merely services in a place of public accommodation. Following this and the subsequent certification of a California class (for purposes of the California Unruh Act and ADA Title III), and a national class (for purposes of Title III), The corporate entity Target and the National Federation of the Blind (NFB) reached a settlement in August 2008. The settlement, in part, requires Target to make its website accessible subject to the standards/criteria of the NFB Nonvisual Accessibility Certification program and monitoring by NFB, without admitting liability. These standards draw from Section 508 and W3C's WCAG's, but focuses primarily on non-visual accessibility. No one standard emerges as a uniform rule; however, the ADA does appear to apply when there is a nexus between the website and a business with a physical location. That is, the website may be considered part of a public accommodation when it is not solely an online business, but rather a business of physical manifestation.3

Learning Points

In general, business web sites have so far remained largely unaddressed by any direct eAccessibility related legislation. Non-specific anti-discrimination legislation seems to be the main legislative approach to ensuring the accessibility of business web sites, and in only a relatively small number of countries to date. Some examples show that this approach can be successful on a case-by-case basis,

although the example from the US shows that reliance on such an approach can sometimes be problematic. More generally, such an approach typically leads to case-by-case impacts and is not the most effective way to bring about permanent change.

Sources: G3ICT's e-Accessibility Toolkit for Policy Makers

Self Service Terminals

The scope and depth of coverage given to self service terminals varies quite extensively. Terminal accessibility is touched upon by an EU Directive (article 1, para 1), but for the most part, non-legislative measures such as action plans and guidelines are most prominent to date. While the direct policy interventions on self-service terminal accessibility in Europe is comprised primary of non-legislative measures, a few EU countries do give some attention to ATM accessibility as part of their general anti-discrimination legislation framework. However, there is no direct obligation imposed on manufacturers or manufacturers of such equipment. Outside the European Union, notably in the US, equality legislation explicitly includes automated teller machines (ATMs) within its scope and has implemented specific guidelines/standards for this. The topic has also been given some policy and industry attention in Australia and in Canada in terms of developing voluntary technical standards.

Example 1: Portugal

Disability-related legislation adopted in 2004, Law 38/2004, sets out a general legal basis for rehabilitation and participation of people with disability. In 2006, a National Plan for the Promotion of Accessibility (PNPA) between the eyars 2007-2015 was also adopted. Inter alia, the action plan includes a commitment to ensure that automatic teller machine (ATM) interfaces, information kiosks, systems of selling transportation tickets, as well as public Internet spaces can be accessed by people with disabilities, notably persons with vision and hearing impairments, as well as wheel-chair users (Action 2.5 c). This measure was to be executed over a 24 month period, starting in February 2007.

Example 2: The United States

The Americans with Disabilities Act (ADA) adopted in 1990 is the landmark civil rights law in the United States protecting persons with disabilities from discrimination in employment, public services, and by private businesses. In summary, the law guarantees equal opportunities for individuals with disabilities in public accommodations, employment, transportation, State and local government services, and telecommunications. The ADA and ABA Accessibility Guidelines for Buildings and Facilities , developed by the US Access Board specify access requirements for a wide range of facilities in the public and private sectors covered by the law.

The Board’s guidelines detail how accessibility is to be achieved in new construction and alterations, and provides specifications for various building elements and spaces, including entrances, ramps, parking, restrooms, telephones, ATMs, alerting systems among others. In general, they contain two types of requirements for accessibility, so-called 'scoping' and 'technical' requirements. With respect to ATMs, the scoping requirements (section 220) stipulate that where automatic teller machines or self-service fare vending, collection, or adjustment machines are provided, at least one of each type provided at each location shall comply with the technical requirements set specified in the guideline (section 707). If a bank provides both interior and exterior ATMs, each such installation is considered a separate location. Accessible ATMs, including those with speech and those that are within reach of people who use wheelchairs, must provide all the functions provided to customers at that location at all times. For example, it is unacceptable for the accessible ATM only to provide cash withdrawals while inaccessible ATMs also sell theater tickets.

The technical requirements specified in the guidelines (section 707) address a wide range of user requirements which relate to different types of impairments, including provision of speech output. If an ATM provides additional functions such as dispensing coupons, selling theatre tickets, or providing copies of monthly statements, these must also be available to customers through speech output. Interactive transaction machines (ITMs) which are not ATMs, are not covered by the guidelines. However, for entities covered by the ADA, the Department of Justice –which implements the ADA, does provide additional guidance regarding ADA requirements and elements which are not directly addressed by them. Federal procurement law also requires that ITMs purchased by the Federal government must comply with standards issued by the Access Board under Section 508 of the Rehabilitation Act of 1973, as amended (section 707).

There has been a strong positive impact of the regulations, as talking ATMs are now commonly available across the United States for accessible by those with visual impairments. Further impact is also suggested as relevant case law has emerged. For instance, the National Federation for the Blind reached a settlement with ATM operators in the state of Massachusetts in the case of Commonwealth of Massachusetts v. E*Trade Access, Inc. A similar case, Marcovecchio v. Commerce Bancorp, was taken to the courts in New Jersey.

Example 3: Australia

The Australian Human Rights Commission (HREOC), an independent statutory organisation, was initially asked to investigate the implications for older Australians with a disability of new technologies in e-commerce and other government services. One of the outcomes of this initiative was the setting-up of a joint forum involving the Australian Bankers' Association (ABA) and HREOC to to

improve accessibility in the banking industry. This activity resulted in the publication of a set of industry standard in 2000 that aimed to improving accessibility of electronic banking services in general. Under the sponsorship of the ABA, representatives from the banks, other financial institutions, community groups, and retailers have developed Industry Standards for Electronic Funds Transfer at the Point of Sale (EFTPOS), Automated Telephone Banking, Internet Banking, and Automatic Teller Machines (ATMs). For accessibility of ATMs, the Standards set out guidelines and recommendations for the design, manufacture, installation and configuration of wall-mounted, stand-alone and enclosed ATMs and ATM sites. Certain requirements also apply to drive-through ATM sites. Levels of performance required to make such facilities usable by people with a range of access needs are specified. The Standard also specifies strategies that can be employed to meet users' requirements, and contains recommendations applicable to other parties who also provide provisioning and support services to financial institutions. Many of the recommendations relate to the physical facilities of the ATM, but others do extend to server-side back end processes and software modifications that would be necessary to provide specific levels of functionality.

The standards have been released for voluntary adoption by members of the Australian Bankers' Association and other financial institutions, but implementation is not legally binding requirement under the Commonwealth Disability Discrimination Act 1992 (DDA). Furthermore, nor do these standards require any institution to comply with the requirements of the Act, or any additional and relevant legislation. More positively, the Standard on accessible ATMs has been developed in consultation with interested parties with the objective of describing best practice in accessibility consistent with the DDA.

Therefore, an organization choosing to adopt the Standard may implement accessibility standards, will do so knowing they have evolved from community consultation with interested parties. The adoption of the Standard by financial service providers will also will carry some weight for adherence to the DDA and may provide a form of legal protection in form of a temporary exemption application with HREOC, on the basis of commitment to the standards. Where a financial institution commits to implementing the Industry Standard through an action plan, any individual or group may monitor implementation.

Example 4: Canada

The Canadian Standards Association issued a national standard for barrier-free automated banking machines in 2007. It describes technical requirements that are applicable to the design and manufacturing of wall-mounted and stand-alone ABMs and to ABM sites,. However, these technical requirements exclude drive-through ABMs. In particular, it addresses physical accessibility, multiple modalities of output (visual and audio) and multiple modalities of input (visual and tactile identifiable keys). In addition, a second national standard has been released with a focus on specifying minimum accessibility and usability requirements for self-service

interactive devices which are intended for public use in general. It specifies requirements for making both electronic and mechanical self-service interactive devices accessible to people with a range of physical, sensory, and cognitive disabilities.

Learning Points

As mentioned above, legal interventions concerning accessibility of self-service terminals have largely focused on ATMs rather than on self-service terminals in a wider sense. Furthermore, such interventions have come predominately in the form of voluntary, rather than legally binding, industry standards, as demonstrated in Australia and Canada. A different approach has been to alternatively impose a positive duty on ATM manufacturers by setting out technical standards and guidelines. This approach is taken under the wider general anti-discrimination framework,as seen in the United States.

Source: the G3ICT e-Accessibility Toolkit for Policy Makers

Computer Hardware/Software

There seem to be no clear examples of direct legislation or regulations imposing accessibility obligations on the computer hardware or software industries in any country. However, public procurement is the main vehicle for encouraging eAccessibility in these sectors. There have been a varied number of approaches taken to using public procurement as a vehicle for encouraging e-accessibility.

For example, an approach taken by Canada, Denmark, and others, has been the development of ICT public procurement toolkit, which are web-based applications which assist in informing the procurement process from an accessibility perspective. Alternatively, the United States has taken a legislative approach to accessible procurement through section 508 of the Rehabilitation Act, which prohibits federal agencies from purchasing electronic and information technology which is not accessible to individuals with disabilities. A dedicated chapter of the toolkit outlines the many different approaches to public procurement taken in different countries.

Source: G3ICT's e-Accessibility Toolkit for Policy Makers

Assistive Technology

With reference to Assistive Technology, many states in Europe have in place a public assistive technology delivery scheme. However, the scope of focus and range of technologies provided does vary considerably from country to country. No horizontal legislative measures or other co-ordination measures that address either public assistive technology services or the assistive technology manufacturing sector have yet to emerge.

Example 1: Denmark

A rather comprehensive approach to assistive technology delivery is illustrated in the case of Denmark, as the Social Services Act from 2002 stipulates rules for the provision of assistive devices. Responsibilities for providing assistive technologies are shared between municipalities and counties. While there is no complete list of assistive devices that can be provided, or a list of products considered to be assistive devices, an amendment of the act in 1998 provided distinction between three groups of these technologies. These three groups are classified as general equipment, consumer goods with particular value to users with disabilities, and assistive devices.

To encourage and enable employment among people with disabilities, the public employment service also provides various services and devices, such as a law for persons with disabilities in business. The service operates in a rather non-bureaucratic manner. There are no predefined lists of equipment that are provided, and the provision scheme is in principle open to any kind of technology, provided that it fits the stated purpose.

Source: G3ICT's e-Accessibility Toolkit for Policy Makers

Horizontal or non-sector-specific legislation

Parting from legislation which is ICT sector-specific, there are several examples of cross-sectoral and/or non-sector-specific approaches. These are cross-cutting in the sense that they cover, explicitly or implicitly, several ICT sectors within a single policy framework or measure. The first class of examples concerns laws that make explicit reference to ICTs and/or eAccessibility. The other class concern laws on disability equality themes, where the ICT/eAccessibility dimension becomes more implicit. Non-sectoral legislation that explicitly addresses eAccessibility matters can be found in several European countries. In the US, a number of laws which cut across different ICT domains have also been implemented. Implicit measures which do not make explicit reference to ICTs have also been implemented in a few countries and have had positive impacts on promoting eAccessibility.

Example 1: Spain

In Spain, the Law on Equal Opportunities, Non-Discrimination and Universal Accessibility of People with Disabilities (LINDOAU) covers a range of technologies, products and services related to the information society and social communications media. While LINDOAU is addressed to public authorities and civil society and has an almost universal scope, its implementation requires the adoption of subsidiary Royal Decrees in different fields (article 3). These include: Telecommunications and the Information Society; Urban Public Spaces, infrastructure and buildings; Transportation; Goods and services open to the public; and relations with public administrations.

The act identifies ICT's as a priority in the context of accessibility and provides a time-line for expected achievement of acceptable standards. The law provides two years for actors to achieve basic accessibility, four to six years in respect of new products and services and eight to ten years where there is a requirement for reasonable adjustments. It was later that the National Disability Council was established in 2006 under article 15 of LIONDAU, with the mandate of promoting the equality of opportunities and non discrimination of persons with disabilities. For this purpose the NDC then established the Specialized Permanent Office to provide of legal advice and counsel, study and analysis of complaints of discrimination, produce an annual report on the status of equality of opportunities, non-discrimination and universal accessibility of persons with disabilities, and to cooperate with judicial and administrative bodies in all relevant disability related matters.

The 2006 Royal Decree 1494 expands on Act 51 of 2003 and includes within its scope telecoms, information society and media. The requirement to meet basic levels of accessibility is developed in a number of fields, including mobile phones, public websites, ICT hardware, Digital TV, Media and covers TV audio visual content and Electronic Signature. In respect of ICTs, hardware used by public administrators is required to be accessible in accordance with the prescribed norms; UNE 139801:2003 and UNE 139802:2003. Under the direct mandate of LINDAU, an equal opportunities act which lays out infringements and penalties has been enacted, which potentially allows for penalties to be administered for breaches of the legislation in respect of accessibility. It also proposes administrative sanctions, but does not preclude criminal liability. Financial penalties fall into three levels of liability which can attract pecuniary fines from 300 euro to 1,000,000 euro. Further, an act on the recognition of Spanish sign language2 has been adopted in 2007. The act establishes a set of provisions for both the use of Spanish sing language (article 14) and the use of oral support communication measures (article 23).

Example 2: Austria

The Austrian law on Equal Opportunities of People with Disabilities1 was amended in 2006, and regulates anti-discrimination in relation to different parts of daily and working life. The law explicitly covers technical devices and information technology2. In particular, the law applies to all areas of federal government (including, for instance, governmental websites which also fall under the Austrian E-Government law) and to the access to public goods and services which are regulated by the federal government. The latter includes private consumer transactions (e.g. buying products from an online shop), and also public goods and services that are not related to transactions (e.g. information provision such as online train/bus/flight schedules, telephone hotlines, websites of private companies). The theoretical scope of the law as it relates to eAccessibility is rather wide, and covers many potential areas. With regards to web accessibility, the Web Content Accessibility Guidelines are also mentioned explicitly as an applicable standard for web accessibility in the law's commentary.

In the case of discrimination against a person with disabilities, the law calls first for an arbitration process conducted by the federal social authority (Bundessozialamt). The authority acts as a mediator and will present a proposal for arbitration to the suitor and the defendant. This process seems to work comparatively well so that arbitration processes usually do not last longer than three months on average. In 2007, about 40% of all arbitration led to an extrajudicial settlement, while 50% ended without such settlement. In the latter case this was supposedly often due to agreements made between suitor and defendant outside the arbitration process. This seems to be the solution preferred by many defendants in order to avoid both public notice and appearing in the official arbitration statistic. There have been several arbitration processes concerning e Accessibility related matters. These have mostly concerned the provision of sub-titles and sign language by TV broadcasters, accessibility of government websites and of online banking websites. Further information on those arbitration cases and their outcomes is currently not available.

Example 3: The United States

Section 508 of the Rehabilitation Act (as amended in 1998) applies specifically to ICT and the federal government.1 In particular, § 508 requires that ICT used by federal employees with disabilities is to be accessible. It however does not apply to “military command, weaponry, intelligence, and cryptologic activities” or to “equipment used only by service personnel for maintenance, repair, or similar purposes.”2 In terms of public procurement, the standards cover a wide spectrum of ICTs, including software applications and operating systems; web-based intranet and internet information and systems; telecommunications products; video and multimedia products; self contained, closed products; desktop and portable computers.

Public information, whether arising from federal, state, or local government, is generally required to be accessible in accord with § 508 and Title II of the ADA. Information provided online, on paper, over the telephone, on television or radio, or via others means

must be meaningfully available to persons with disabilities in a manner equivalent to that available to persons without disabilities. Many states have chosen to implement and enforce their obligations under Title II of the ADA by adopting, in part, the § 508 accessibility requirements for ICT. Malta

The Maltese Equal Opportunities Act (EOA) enacted in 2000, was inspired by the American Anti-Discrimination Act, the UK Disability Discrimination Act and the Australian Disability Discrimination Act. It covers six areas: education, employment, goods and services, access, insurance and accommodation. At present, ICT is made with reference to the first three listed focus areas, although not explicitly mentioned as such. Despite the absence of a direct reference to ICTs in the legislation, the act appears to be having an impact on eAccessibility.

The authority established under the legislation - the Equal Opportunities Compliance Unit within the National Commission Persons with Disabilities (KNPD) - has responded to complaints on eAccessibility issues by raising issues with providers and effecting mediation to settle agreements for improved eAccessibility. For example, negotiations were conducted to increase the accessibility provisions by the public TV broadcaster for news and another popular TV programme. The Commission has also worked with private companies in the mobile phone and banking sectors, and is currently working with various organisations to ensure their websites are accessible as well as with a bank in relation to ATM accessibility. It has also been proactive in seeking to ensure that several Government websites are accessible. Active involvement and engagement of NGOs in the implementation process seems to have been a factor in leveraging the legislation to cover eAccessibility issues.

Learning Points

Countries such as Spain, Austria, and the US, have been successful in introducing equality or other legislation that explicitly addresses eAccessibility matters in a cross-cutting manner. Alternatively, the case of Malta demonstrates that even where equality legislation does not explicitly refer to ICTs and/or eAccessibility as such, implicit reference may have positive impacts on promoting eAccessibility, to some degree. No uniform approach regarding either explicit or implicit approaches is apparent, and each approach presents a variety of strengths and weaknesses. With reference to the implicit approach as taken by Malta, factors such as a legislator committed to eAccessibility, and active involvement of NGOs in overseeing and enforcing these mechanisms, have influenced general legislation to also extend its scope to eAccessibility. However, the lack of specificity can present problems of interpretation when cases arise. More generally, reliance on an anti-discrimination approach alone seems not to be the most effective way to achieve systemic change. Both of these approaches, both explicit and implicit, vary in terms of scope and other legal characteristics in all

cases, and elements of the different approaches might prove useful for models of good practice. However, no single approach has yet to provide a comprehensive and effective horizontal approach.

Source: G3ICT e-Accessibility Toolkit for Policy Makers