Computing for Everyone

CS4HS
2010

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The Message

• People with disabilities can do almost anything in almost any scientific field.
• People with disabilities are often highly motivated to pursue careers in accessibility research.
What We’ll Do Today

• Models of Disability
• Data
• Technology
• Accessibility Research
• Empowerment
• AccessComputing
• Discussion
Types of Disability

• **Visible**
  – Blind, Low Vision
  – Deaf, Hard of Hearing
  – Mobility
  – Developmental

• **Hidden**
  – Speech
  – Cognitive
  – Attention
  – Learning
Models of Disability

• Medical Model
  – Disabled people are patients who need treatment and/or cure.

• Education Model
  – Disabled youth need special education.

• Rehabilitation Model
  – Disabled people need assistive technology for employment and everyday life.

• Legal Model
  – Disabled people are citizens who have rights and responsibilities like other citizens. Accessibility to public buildings and spaces, voting, television, and telephone are some of those rights.

• Social Model
  – Disabled people are part of the diversity of life, not necessarily in need of treatment and cure. They do need access when possible.
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Basic Data

• 16% of US population to ages 15 to 64 is disabled.
• 10% of the workforce is disabled
• 5% of the STEM workforce is disabled
• 1% of PhDs in STEM are disabled
Demographics General Population

Source: U.S. Census Bureau, Survey of Income and Program Participation, 2002
Demographics Ages 14-21

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Technology

• Prosthesis
  – Augmentation to restore lost function. Call it a “cure.”

• Assistive technology
  – Popular in rehabilitation literature. Emphasis on the need for assistance.

• Access technology
  – Allows an activity that would be difficult to impossible to achieve without it. Emphasis not on restoring function, but on achieving an end goal by whatever means possible.
Important Examples of Access Technology

• Screen reader to access computers
• Advanced hearing technology
• Video phones to access communication
• Automated wheel chairs to access mobility
Built-in Accessibility

Windows 7 Magnifier

iPhone VoiceOver
Trend

Accessibility Solutions → Mainstream Solutions
Potential Trend

Laptops, notebooks, phones,... are programmable!!
Example: Digital Pen
Tactile Graphic

Digital Pen

Tactile Graphic

Josh Scotland, RL
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CHI “Disability” Search

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982 – 85</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1986 – 90</td>
<td>10</td>
<td>(4%)</td>
</tr>
<tr>
<td>1990 – 95</td>
<td>15</td>
<td>(5%)</td>
</tr>
<tr>
<td>1996 – 00</td>
<td>20</td>
<td>(6%)</td>
</tr>
<tr>
<td>2001 – 05</td>
<td>90</td>
<td>(23%)</td>
</tr>
<tr>
<td>2006 – 9</td>
<td>158</td>
<td>(20%)</td>
</tr>
</tbody>
</table>

CHI is the leading Human/Computer Interaction Conference in the world.
Other Conferences

• ASSETS
  – ACM
• ICCHP
  – Europe
• CSUN
  – Cal State Northridge
• ATIA
  – Industry Conference
• W4A
  – Collocated with WWW
VoiceDraw

2007-8 National Scholar Award for Workplace Innovation & Design, 2\textsuperscript{nd} place

MS Paint 9 hours

VoiceDraw 3 hours

Susumu Harada, Jeff Bilmes, James Landay
WebAnywhere

- Andrew W. Mellon Foundation Award for Technology Collaboration (2008)
- Microsoft Imagine Cup Accessible Technology Award (2008)
- W4A Accessibility Challenge Delegate’s Award (2008)

The text currently being read is shown in above the content in a high-contrast, magnified view to assist those reading along and those with low-vision.

The current content being read is highlighted so that users can more easily read along with WebAnywhere. This can also assist developers in tracking the order in which a user is reading the page.

By pressing this button (either with the mouse or keyboard) users turn on speech recognition mode which lets them control WebAnywhere with their speech.

Video

Web site

Jeff Bingham
Supple

CHI 2008
Best Paper Award

Krzysztof Z Gajos, Jacob O. Wobbrock and Daniel S. Weld.
called a pyramid.

And it’s categorized as TOP, MOP, and BOP. Or top of the pyramid, middle of the pyramid, and base of the pyramid.

And as you can see, the world’s population, about half of it is in the BOP, 2 billion or a little more than that is
Graphic Translation

Ladner, Comden, Jayant, Hahn, Renzelmann, Krisnandi, Scotland,…
Graphic Translation

location file

pure graphic

text image

Braille


text

y (0, 20)
x = 15
15
10
5
0
x
5
10
15
20
20
x + y = 20
(15, 0)
(15, 5)
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Design Concepts in HCI

• User Centered Design
  – Involve the user at every step

• Universal Design
  – Design for all users, if possible

Accessibility vs. Usability

• **Accessibility**
  – Tool that make it possible to do a task

• **Usability**
  – Tool that make is possible to do a task
  – Relatively easy to learn
  – Relatively fast to use

• **Example** – Audio Captchas
Accessibility vs. Empowerment

• Accessibility
  – Tool that make it possible to do a task

• Empowerment
  – Tool that makes it possible to do a task
  – Tool created by or configured by the person with the disability

• Examples
  – Variable speed speech in screen readers
  – Variable size large print in text enlargers
The Future of Empowerment

• Cell phones become an accessibility tools
  – Users download accessibility applications

• Social Accessibility
  – Mobile users get advice remotely on-demand when needed

• Persons with disabilities, with a superior education, control their own accessibility needs
Nicole Torcolini Story
Nemetex Nemeth Back-Translator Examples

Image of hand interlined Braille without Nemetex

Text created on a Braille notetaker

\[ \frac{\sqrt{12}}{2} \times \frac{2}{\sqrt{6}} = \frac{\sqrt{2}}{2} \times \frac{2\sqrt{6}}{6} = \frac{2\sqrt{2}\sqrt{6}}{12} = \frac{\sqrt{12}}{6} = \frac{2\sqrt{3}}{6} = \frac{\sqrt{3}}{3} \approx 0.577 \]

Nemetex Nemeth Back-Translator - Text to LaTeX

$8. \frac{\sqrt{12}}{2} \times \frac{2}{\sqrt{6}} = \frac{\sqrt{2}}{2} \times \frac{2\sqrt{6}}{6} = \frac{2\sqrt{2}\sqrt{6}}{12} = \frac{\sqrt{12}}{6} = \frac{2\sqrt{3}}{6} = \frac{\sqrt{3}}{3} \approx 0.577$

LaTeX to PDF

\[ \frac{1}{\sqrt{2}} \times \frac{2}{\sqrt{6}} = \frac{\sqrt{2}}{2} \times \frac{2\sqrt{6}}{6} = \frac{2\sqrt{2}\sqrt{6}}{12} = \frac{\sqrt{12}}{6} = \frac{2\sqrt{3}}{6} = \frac{\sqrt{3}}{3} \approx 0.577 \]
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Goal

An alliance to increase the number and success of individuals with disabilities in computing careers

Richard Ladner, PI
Sheryl Burgstahler, Co-PI & Director
Scott Bellman, Manager
Rob Roth, DHH Specialist
Terry Thompson, Technical Specialist
AccessComputing
Alliance Partners

• Gallaudet University
• RIT/NTID
• Microsoft
• Regional Alliances for Persons with Disabilities in STEM
• Broadening Participation Alliances
• ACM SIGACCESS
Strategies

• Direct student intervention
  – Summer academies, internships, enrichment
  – 450 students in 28 academies, 112 internships

• Capacity building
  – Workshops, curriculum, partners, departments
  – Web accessibility improved 50% over 4 years

• Dissemination
  – Knowledgebase, publications
  – 50,000 hits per month on knowledgebase
Web Design Course Curriculum

• Developed by AccessIT in collaboration with high school web design instructors
• 1,330 registered teachers worldwide
Model Summer Academy

• 9-week program for 10 students per year who are deaf or hard of hearing, 2007-2010
• Transition from HS to College
• Focus on building the capacity of students to succeed
  – Programming course for credit
  – Animation team projects
  – Role models
  – Career Building (networking, resumes, study habits)
  – Industry visits (e.g. Microsoft, Adobe, Google, Intel, Valve, Cray)

• Summer Academy Video
The Future

- Make sure new HS CS curriculum is accessible
- Work with k-12 enrichment programs to help make them accessible.
What you can do

• Join a Community of Practice
• Apply for a Mini-grant
• Host a Capacity Building Institute
www.washington.edu/accesscomputing
Share Your Experiences