New Approaches to Accessibility

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What We’ll Do Today

• Disabilities
• Technology Trends
• MobileAccessibility Project
• Other Mobile Projects
Basic Data

• 650 million people world-wide are disabled
• 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

*STEM = Science, Technology, Engineering, Mathematics
Disabilities

• Vision
  – Blind
  – Low-Vision
  – Color Blind

• Hearing
  – Deaf
  – Hard of Hearing

• Speech
  – Ability to speak
  – Stuttering

• Mobility
  – Ability to walk
  – Ability to use hands/arms

• Cognition
  – Dyslexia
  – Short-term memory loss
  – Dementia

• Multiple
  – Deaf-blindness
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 and training for employment and everyday life.

• **Legal Model**
  – Disabled people are citizens who have rights and responsibilities like other citizens. Access to public buildings, voting, television, telephone, and education 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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Accessibility Innovations Matter

Innovations for People with Disabilities

Solutions for Everyone

- Telephone
- Personal texting
- Speech recognition
- Speech synthesis
- Electric toothbrush
Personal Texting by Deaf People

TTY used by deaf people in their homes circa 1970

Modern TTY with built-in acoustic modem

SMS texting
Speech Recognition for Hands Free Access

Ray Kurzweil introduced the first commercial large-vocabulary speech recognition software in 1987.

Mobile Speech Recognition
Built-in Accessibility

Windows 7 Magnifier

iPhone VoiceOver
Trend

Accessibility Solutions ➔ Mainstream Solutions
New Trend

Standard Programmable Platforms

Multi-function Accessibility Solutions on Standard Platforms

Laptops, tablets, notebooks, phones,… are programmable!!
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MobileAccessibility Project
bridge to the world for blind, low-vision and deaf-blind people

- Speech output
- SMS
- Web Services
- GPS
- Smartphone
- Braille Input/Output
Platform

• Sensors
  – Video camera
  – Microphone
  – GPS
  – Compass
  – Accelerometer

• Human input
  – Keyboard
  – Touch screen
  – Speech

• Output
  – Speech
  – Audio
  – Visual
  – Vibration
Alternative Platforms

iPhone

Windows phone
Color Identifier

“Green”

“Orange”

“Pink”

iPhone
Android
Currency Reader

“Twenty Dollars”

iPhone
Android
Blind Portraits
Chandrika Jayant

Portrait

Find Faces

Vibrate and Speak

“move the camera down”
Talking Barcode Reader
Chandrika Jayant
Tactile Graphics
Josh Scotland, Chandrika Jayant

\[ Y = X^2 + 1 \]
Appliance Reader
Chandrika Jayant, Tom Guo

It is 2:35 AM, at 29.8 Celsius, and 73% humidity.

http://www.mtixtl.com/productimages/oven/box-panel-300.jpg
GoBraille
Shiri Azenkot

Refreshable Braille Display, WiFi Enabled

Google Maps

OneBusAway

GoBraille Repository
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Ideal Group

http://ideal-group.org/sj131264/
Project Possibility

http://projectpossibility.org/index.php
Braille Notetakers

BrailleNote

Braille Sense
Braillenote with GPS
DeafBlind Communicator
VizWiz

• Bigham, Jayant, … (UIST 2010)
  – Take a picture and send it to humans with a recorded question.

“What does this street sign say?”
MobileASL
Eve Riskin, Jake Wobbrock, …
ASL communication using video cell phones over current U.S. cell phone data network

Challenges:
› Limited network bandwidth
› Limited processing power on cell phones
› Limited battery life
Research

- Computer Vision
- Multi-sensor integration
- Artificial Intelligence (AI)
- Human-Computer Interaction (HCI)