Universal Software Accessibility

Computer Use for Everyone

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Computer users have a wide range of abilities...

- Hearing
- Mobility
- Vision
  - Blind
  - Visually Impaired
  - Color Blind
Color Blindness
(http://en.wikipedia.org/wiki/Color_blindness)

Normal      Deuteranopia    Protanopia    Tritanopia
CAPTCHA: Completely Automated Public Turing test to tell Computers and Humans Apart
Assistive Technology

• Hearing Impairment
  – Closed Captioning

• Mobility impairments
  – Switch
  – On-screen Keyboard
  – Speech Recognition

• Visual Impairments
  – Screen Magnifier
  – Screen Reader (JAWS, NVDA, VoiceOver)
    • Speech Synthesizer
    • Braille Display
Refreshable Braille Display
Universal Design

Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

–Ron Mace
Ron Mace (1941 – 1998)

- Bachelors Degree in Architecture, NC State, 1966
- Founded North Carolina State University Center for Accessible Housing
  - Now Center for Universal Design ([https://projects.ncsu.edu/ncsu/design/cud/](https://projects.ncsu.edu/ncsu/design/cud/))
- North Carolina Accessible Building Code, 1973
- Fair Housing Amendments Act, 1988
- Americans with Disabilities Act (ADA), 1990
Universal Design Helps Everyone!

Could you please shovel the ramp?

All these other kids are waiting to use the stairs. When I get through shoveling them off, then I will clear the ramp for you.

But if you shovel the ramp, we can all get in!

Clearing a path for people with special needs clears the path for everyone!
Legal Mandates

• Rehabilitation Act of 1973, as amended in 1998
  – Section 504
    • requires universities receiving federal assistance to provide equal access to students with disabilities.
  – Section 508
    • requires Federal agencies to make their electronic and information technology (EIT) accessible to people with disabilities.
    • mandates that most purchases of EIT by the federal government be accessible to disabled federal employees.

• Americans with Disabilities Act of 1990 (ADA)
  – outlaws discrimination in the private sector.
  – applied to National Federation of the Blind (NFB) vs. Target lawsuit. (Aug ‘08)
Economic Justification

Microsoft -- The majority of US working-age adults (18 – 64 year olds) are likely to benefit from the use of assistive technology:

![Pie chart showing the percentage of very likely, likely, and not likely to benefit from assistive technology among US working-age adults.](http://www.microsoft.com/enable/research/workingage.aspx)

Source: Study commissioned by Microsoft, conducted by Forrester Research, Inc., 2003

(http://www.microsoft.com/enable/research/workingage.aspx)
My Soapbox Has a Ramp
--Lisa Cook, former Accessibility Analyst, SAS Institute

Demographic Convergence

Life Expectancy

Incidence of Disability

Age at Retirement
Chapter 2

Background and Motivation

Software for the visually or hearing impaired—populations who have historically been neglected in terms of tech products—should be developed as a societal effort. This is just one of many research innovations that you are going to see...and not just for people with disabilities. With aging baby boomers in the U.S. at about 76 million, who will have vision or hearing deterioration, we think applications of the future need to take these users into consideration [16].

Frances West, Director Worldwide Accessibility Center for IBM
The Best of Intentions

The White House welcomes comments on how to improve the site's accessibility for users with disabilities. (http://www.whitehouse.gov/accessibility/)

According to Terrill Thompson, a Technology Accessibility Specialist at the University of Washington, “the problem with this form is that the labels appear beneath the fields they represent. This in itself wouldn’t be a problem if they had used accessible markup ... if screen readers have to guess, they tend to assume the text before the form field is the label...To fix this, all they have to do is add a <label> element with a "for" attribute, like this:

```html
<td class="fieldreq" id="ctl05_labeltxtFirstName">
<label for="ctl05_txtFirstName">First Name</label>
</td>
```

[66]
BakeryGUI Fix

```java
public class BakeryGUI {

    private JLabel lblReceipt = new JLabel("Receipt");
    private JTextField txtReceipt = new JTextField(15);

    public BakeryGUI () {
        lblReceipt.setLabelFor(txtReceipt);
    }
}
```
ProofChecker

SAS® Enterprise Miner
Accessible Battleship Game
Graph SKetching Tool (GSK)

Java Accessibility

Java Accessibility API
GSK#

Under development by Matthew Meeks
Designing for Accessibility

• Software Development Life Cycle
  – https://section508.gov/content/software-development-life-cycle

• Engineering Software for Accessibility
Accessibility Resources

• Guidelines
  – Web Content Accessibility Guidelines (WCAG) 2.0
    W3C Recommendation 11 December 2008
    https://www.w3.org/TR/2008/REC-WCAG20-20081211/
  – Quick Reference Guide to Section 508 Requirements and Standards
    https://section508.gov/content/learn/standards/quick-reference-guide
  – Web Content Accessibility Guidelines
    https://en.wikipedia.org/wiki/Web_Content_Accessibility_Guidelines

• Colour Contrast Analyser
  – https://developer.paciellogroup.com/resources/contrastanalyser/
Accessibility Testing

• Color
  – Is there enough contrast between foreground and background colors?
  – Is color used as the sole indication of a condition?
  – How do colors appear to someone who is color blind?
    Are system preferences (e.g., High Contrast) respected?

• Keyboard Accessible
  – Are all components accessible and operational solely through use of the keyboard?
  – Is there a visible focus indicator when a component has programmatic focus?
  – Does tabbing from component to component proceed in a way that makes sense, typically from left to right and top to bottom?