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
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

Screen Reader Demo (DO-IT Center, U. Washington)
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
Universal Design Helps Everyone!

CLEARING A PATH FOR PEOPLE WITH SPECIAL NEEDS CLEAR THE PATH FOR EVERYONE!
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/)
- North Carolina Accessible Building Code, 1973
- Fair Housing Amendments Act, 1988
- Americans with Disabilities Act (ADA), 1990
CSC 333 Student, Fall 2004

Sina Bahram
Accessibility Consultant
B.S. Computer Science, 2007
M.S. Computer Science, 2011
ProofChecker

SAS® Enterprise Miner
CSC 116 Student, Spring 2010

Sean Mealin
Ph.D. Student
B.S. Computer Science, 2013
Accessible Battleship Game
Graph SKetching Tool (GSK)

Figure 6.36: Alien created by a blind user with GSK
Java Accessibility

Java Accessibility API
C# Accessibility

FIGURE 1-1  Simplified illustration of a UIA Provider and Client

Engineering Software for Accessibility
http://go.ncsu.edu/gsk

(multiplatform version under development by Matthew Meeks)
Legal Mandates

  - 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:

Very likely: 22%
Likely: 38%
Not likely: 40%

Base: US 18- to 64-year-olds

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

Age at Retirement

Incidence of Disability
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
Accessibility Guidelines

- Quick Reference Guide to Section 508 Requirements and Standards
  https://section508.gov/content/learn/standards/quick-reference-guide

- Web Content Accessibility Guidelines (WCAG) 2.0
  W3C Recommendation 11 December 2008
  https://www.w3.org/TR/2008/REC-WCAG20-20081211/

- Web Content Accessibility Guidelines
  https://en.wikipedia.org/wiki/Web_Content_Accessibility_Guidelines
Designing for Accessibility

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

• Engineering Software for Accessibility
Navigational Order

Looking at the timecard, we see that there are two visual containers in the UI: the grid, made up of columns for each day of the week, and the Data Entry box, which contains the Date, Hours, and Work Log fields. Because these items are grouped together, and the fields within the container are closely related, we must ensure that the order in which we map these items must follow one another logically. Following a general top-to-bottom, left-to-right scheme, Figure 2-5 shows the navigational order in which we will map the logical hierarchy.

**Figure 2-5** Navigational order for mapping the timecard’s logical hierarchy

Engineering Software for Accessibility
Accessibility Resources

• AngularJS
  – [https://docs.angularjs.org/guide/accessibility](https://docs.angularjs.org/guide/accessibility)

• Colour Contrast Analyser
Accessibility Testing

• Color
  – Is color used as the sole indication of a condition?
  – Is there enough contrast between foreground and background colors?
  – How do colors appear to someone who is color blind?
  – Are system preferences (eg., 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 top to bottom, left to right?