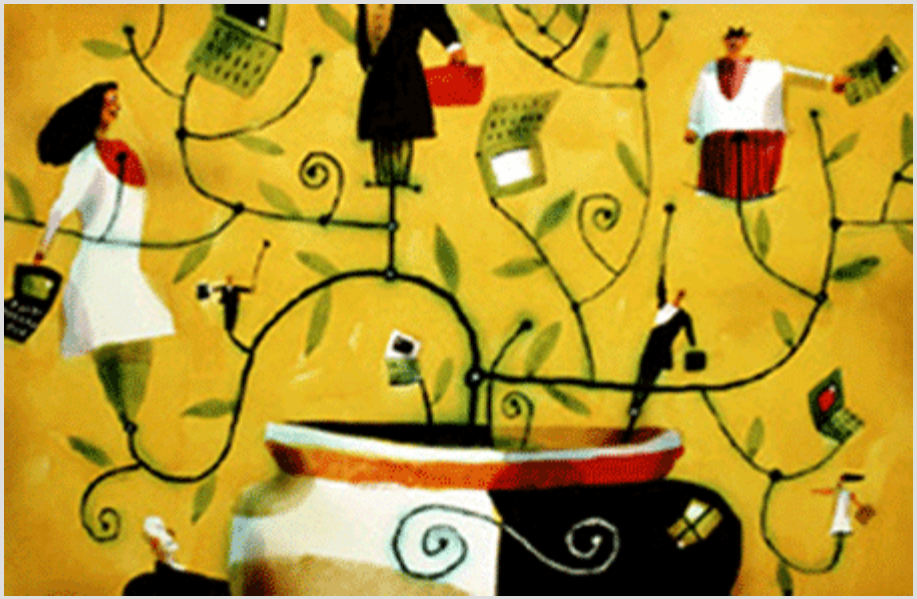
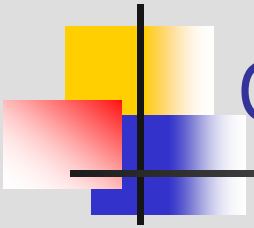
User-Centered Website Development: A Human-Computer Interaction Approach

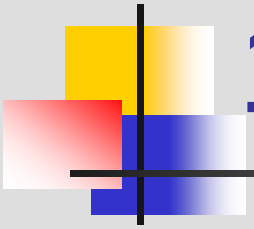


Daniel D. McCracken
City College of New York
Rosalee J. Wolfe
DePaul University
With a foreword by:
Jared M. Spool, Founding Principal,
User Interface Engineering
PowerPoint slides by Dan McCracken, with thanks to Rosalee Wolfe, S. Jane Fritz of St. Joseph's College, and Rhonda Schauer



Credits

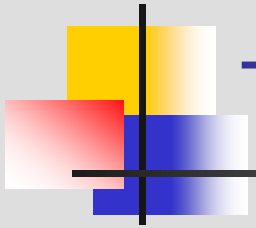
- Slides 12, 14, and 15: Courtesy of ALVA, Inc.
- Slides 19-24 produced with software from Vischeck Inc., and used by permission.
- Slide 30: Courtesy LC Technologies, Inc.
- Slide 34: Courtesy of Lori Smallwood.
- Slide 36: Courtesy of the DePaul American Sign Language Project.



12. Accessibility

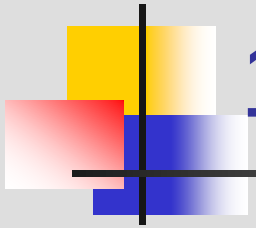
After studying this chapter you will

- Be aware of the major barriers to accessing the Web
- Become familiar with assistive technologies for improving computer access
- Know the guidelines and high-priority checkpoints from the W3C Web Accessibility Initiative
- Have been introduced to two recent assistive technologies
- Become familiar with several ways to evaluate the accessibility of a Web site



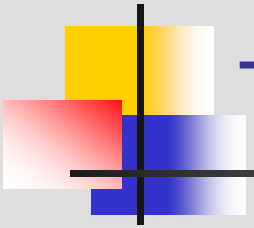
The goal

- “The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect.”
  - Tim Berners-Lee, W3C Director and inventor of the World Wide Web



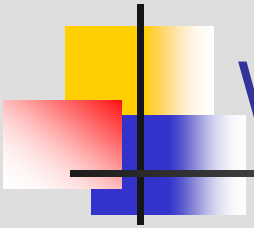
12.2 The Scope of the Challenge

- In the United States, over 8 million people are blind or visually impaired
- There were over 20 million deaf and hard of hearing people in the United States in 1994; of these about a million cannot understand any speech
- Over a quarter of a million Americans have spinal cord injuries
- About half a million Americans have cerebral palsy
- A third of a million Americans have multiple sclerosis



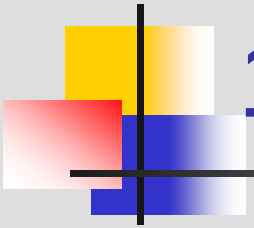
The effect of age

- Physical impairments, minor and major, become more common with the passing years
- More than half of the population in the United States over the age of 65 has some kind of impairment
- This is a rapidly growing group; in the year 2000, there were 34.8 million people over 65, a number projected to be 53.7 million by 2020



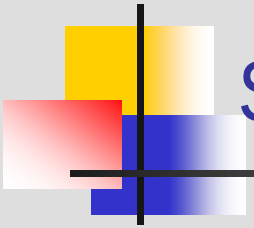
Where we stand

- Tim Berners-Lee's "everyone" is a big challenge
- People take the issue seriously, and progress is being made
- The Web can be used by people who:
  - Cannot move their hands—or who have no hands
  - Cannot speak
  - Are blind
  - Are deaf
- Not always simple, and often expensive so far, but it's an attainable goal—and the right thing to do



12.3 Issues Involving Vision

- Range
  - Total blindness
  - Impaired vision
  - Color blindness
  - Photosensitive epilepsy
- Technologies:
  - Screen readers
  - Braille
  - Descriptive audio
  - Don’t use tables in HTML to control layout; use tags to identify table cells and headers

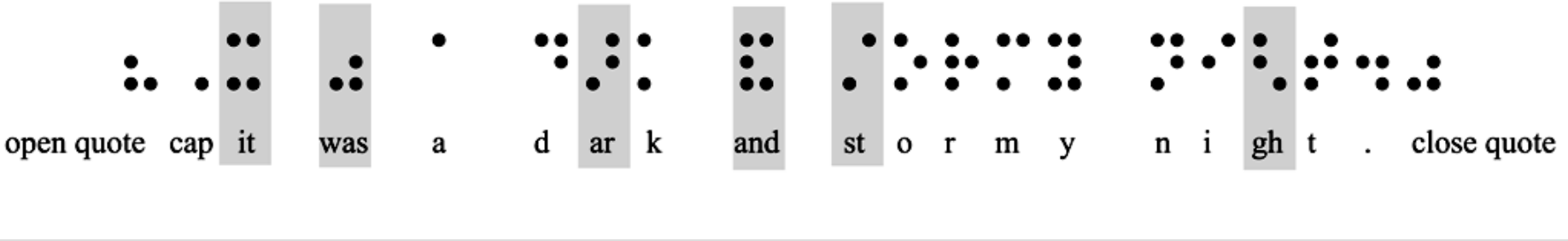


Screen reader

- Narrates (reads aloud) the text on the screen
- Important considerations:
  - HTML must note change in language, e.g., English to Spanish, using the “lang” attribute
  - HTML tables must *not* be used to control layout: doing so makes the narration difficult to understand
  - HTML tables used to display tabular material need additional markup to make the meaning clear

One form of Braille, with contractions

"It was a dark and stormy night."

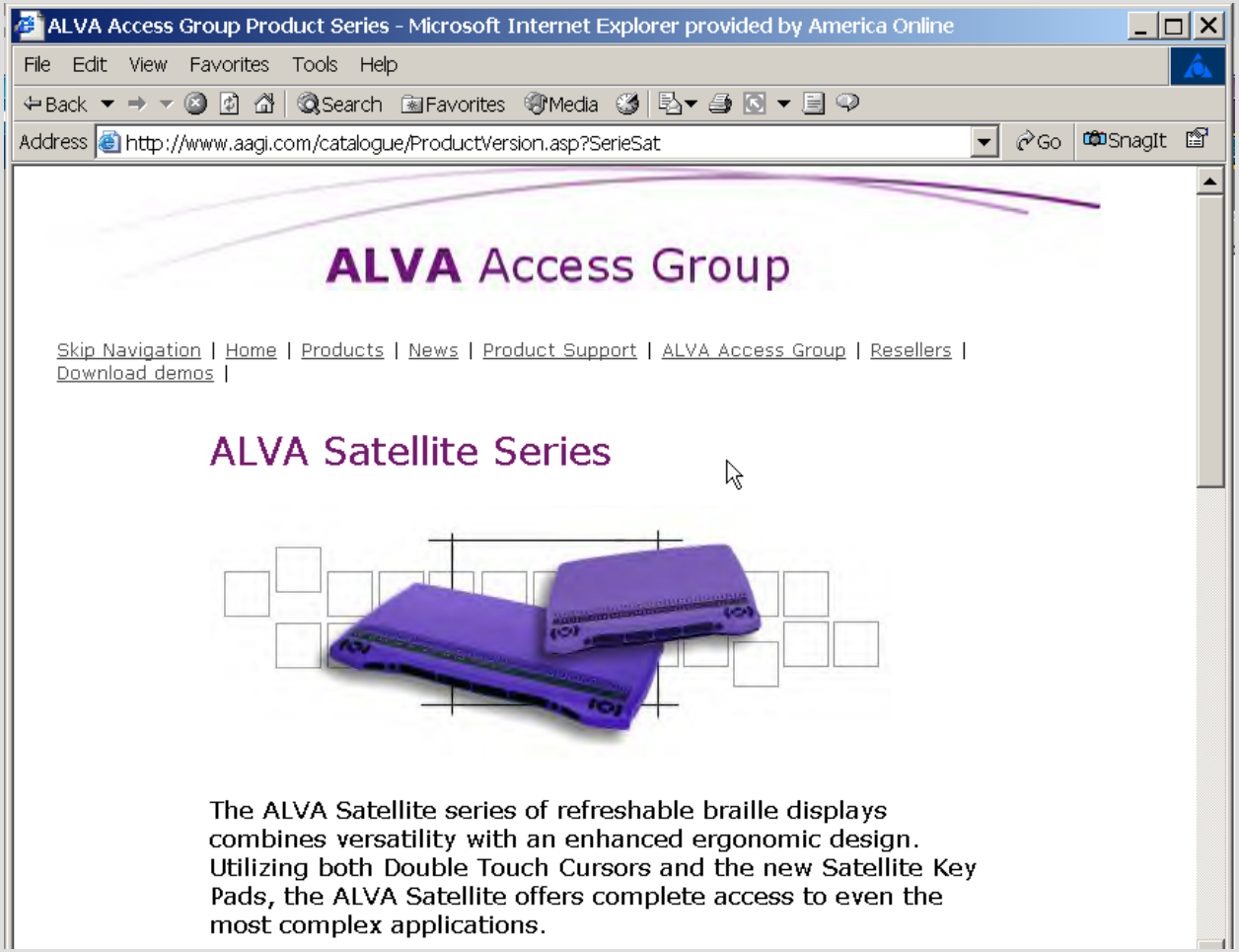


Refreshable Braille display

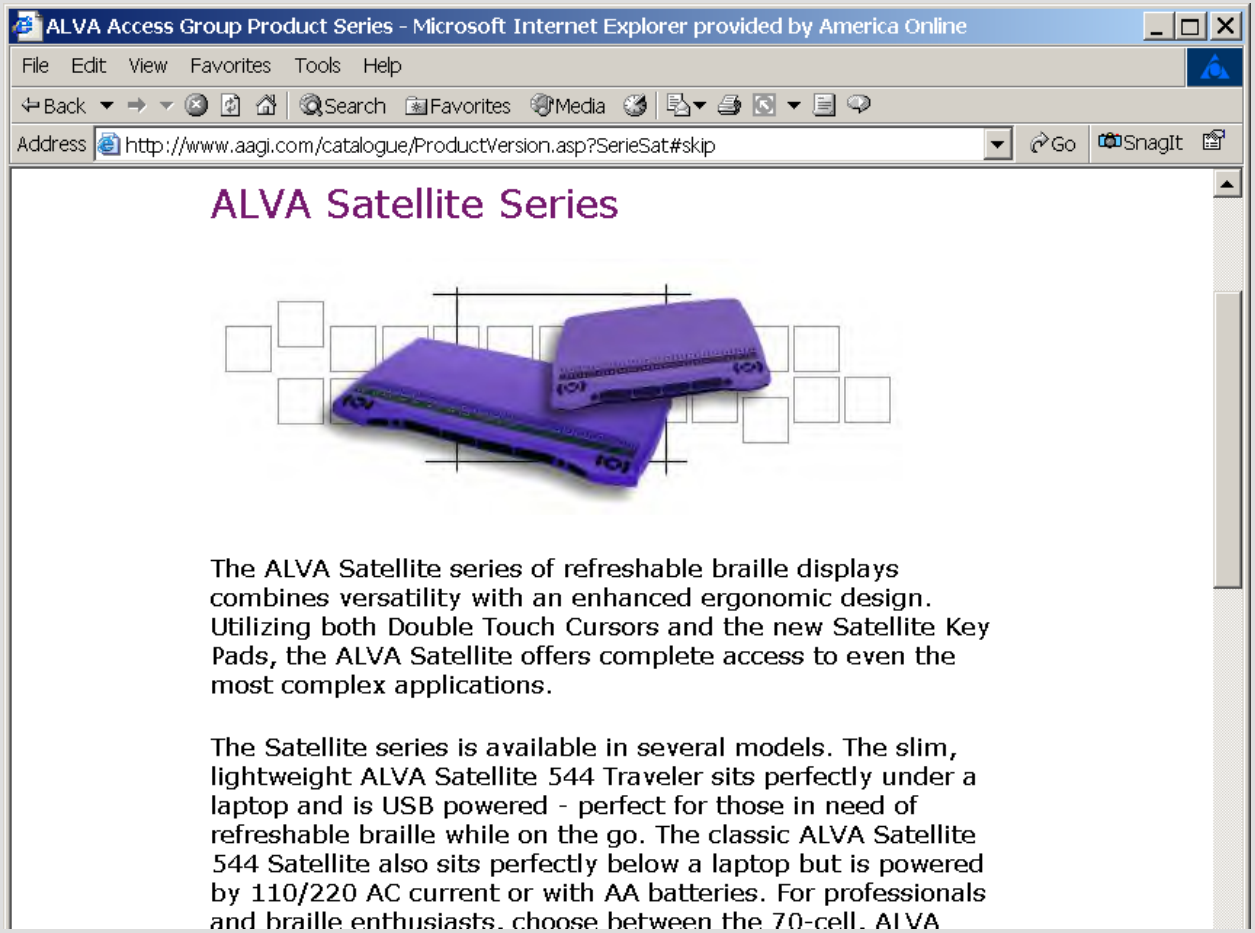
Descriptive audio can make dialog more meaningful to a blind person

- Straight dialog:
  - Susy: “Run.”
  - John: “What?”
  - Susy: “Go!”
  - John: “Argh!”
- Dialog with descriptive audio inserted:
  - *Descriptive Audio:* A large bear enters the campground. Susy sees the bear.
  - Susy: “Run.”
  - John: “What?”
  - Susy: “Go!”
  - *Descriptive Audio:* John turns and sees the bear.
  - John: “Argh!”

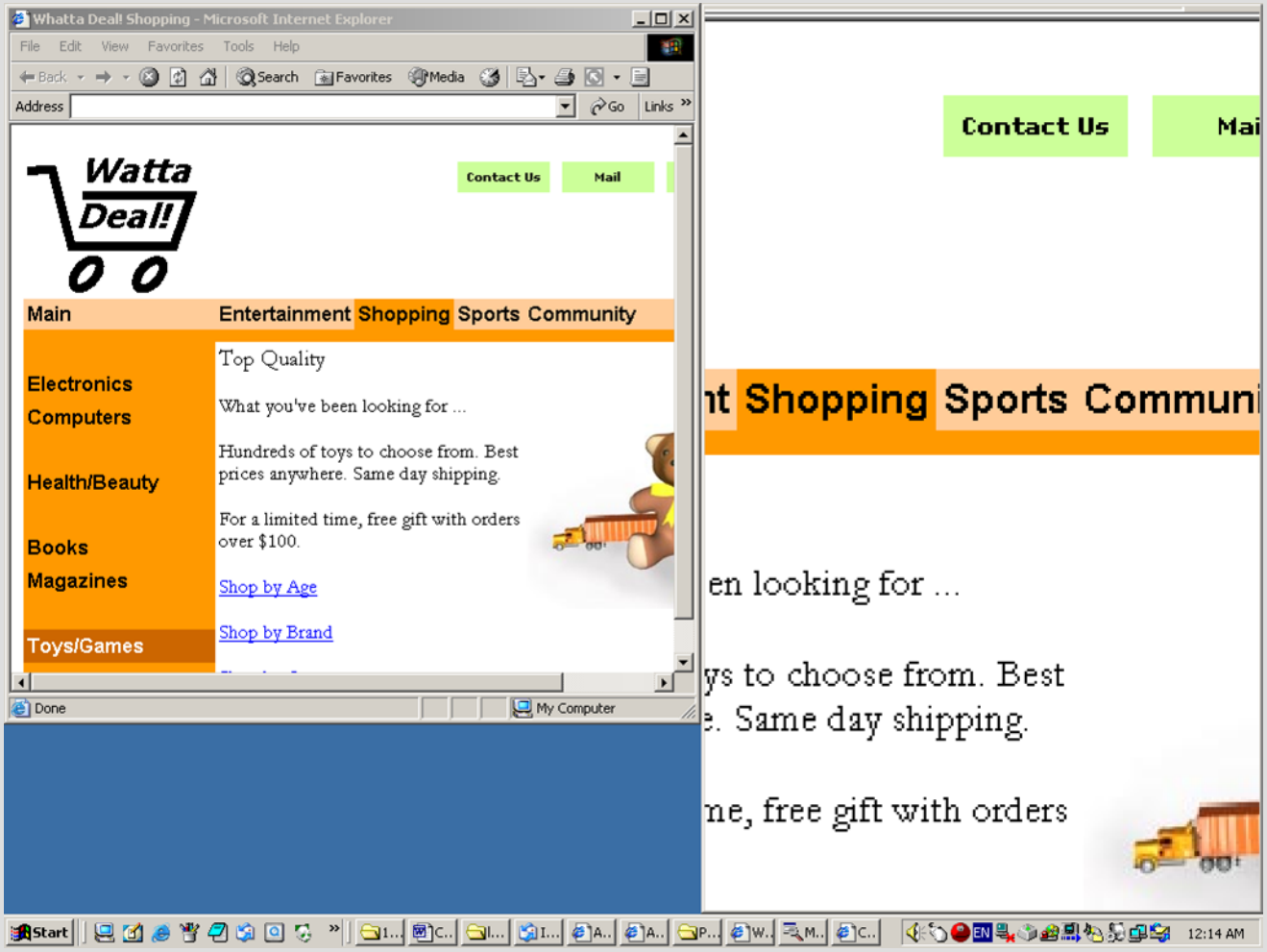
Note “Skip Navigation” at top left

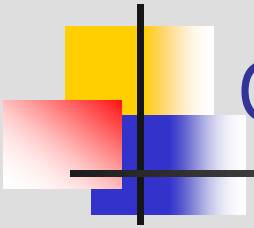


The result of clicking on “Skip Navigation”



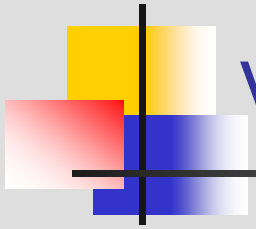
A screen magnifier: the right portion here





Color blindness

- 8% of the male population
- There are three kinds, one of which is extremely rare
- The most common type is *deuteranopia*, commonly called red/green confusion
- The following slides show how some colored materials would look to a color blind person, simulated by software from Vischeck, Inc.

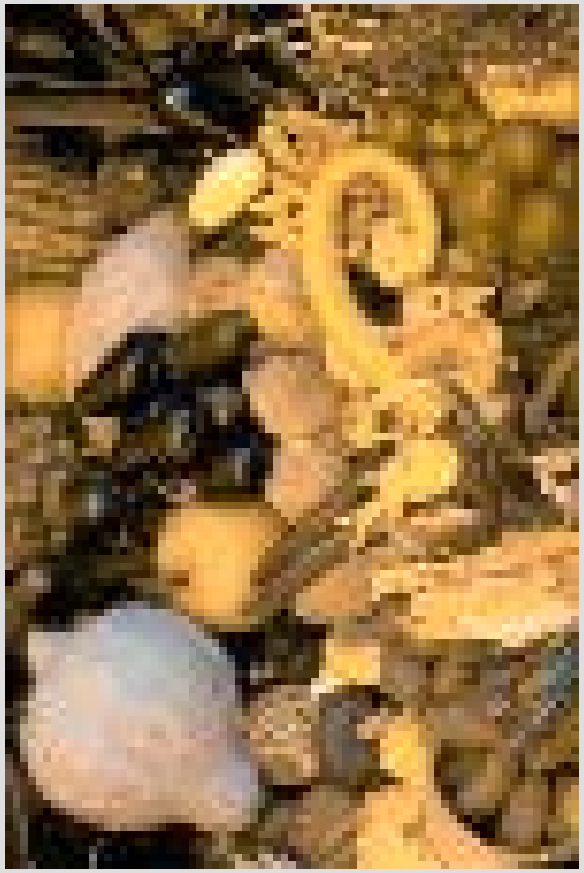


Vischeck

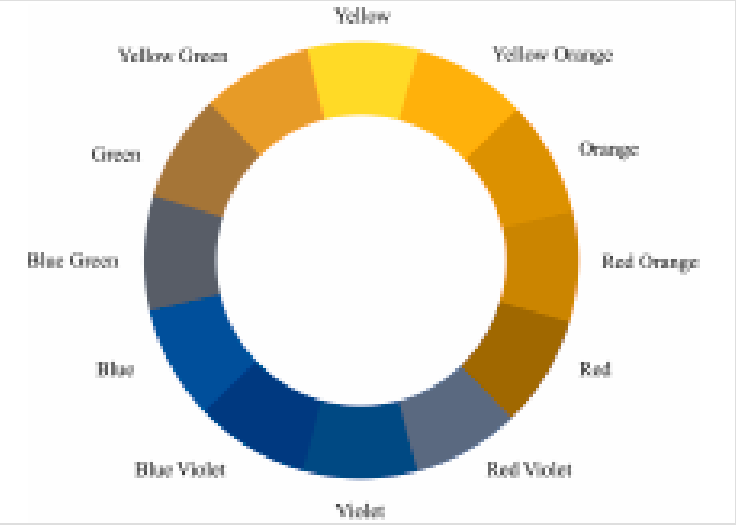
- Thanks to Vischeck, Inc., for permission to use the examples in the next six slides
- They show what the color images look like to a person with deuteranopia, the most common form of color blindness
- See vischeck.com for lots of information and for free download of software

Do you prefer red peppers or green peppers? *How would you pick?*

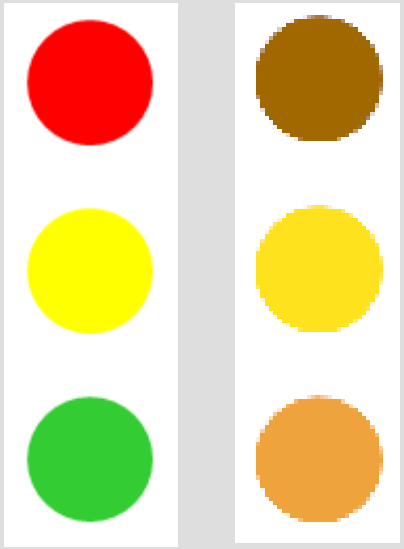
What is a green salad?



A color wheel, to the color blind



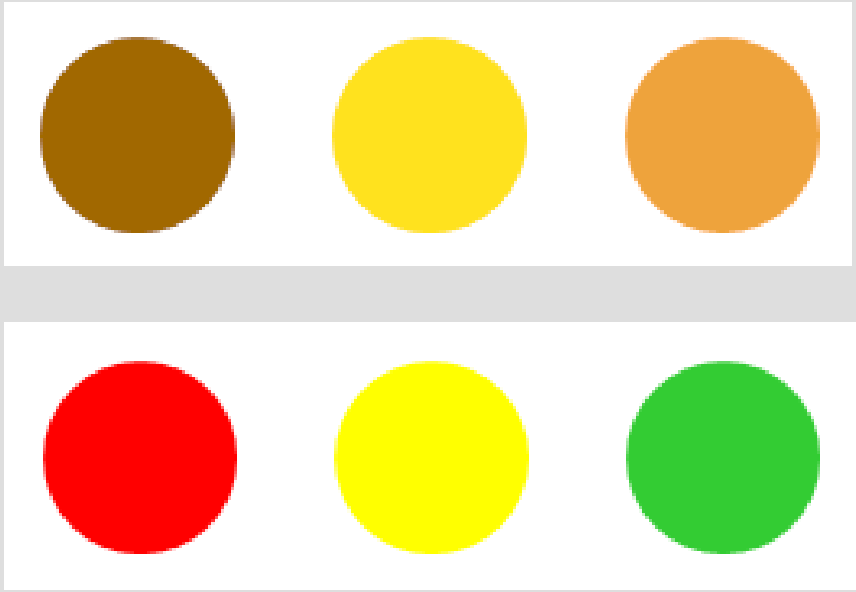
How do traffic lights look to a color blind driver?



So: learn that red is always on top

Always? Are you sure?

Is red on the right or left?



Did you get it right? Are you sure *we* got it right, or is the red sometimes on the other side?

The worst

Red text on a green background is a *really* bad idea. It is almost painful for people with unimpaired color vision, and, depending on brightness and saturation, meaningless to the colorblind.

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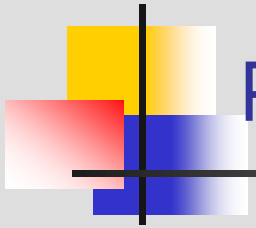


Photosensitive epilepsy

- Also called photo convulsions
- Not everyone is affected, but a serious issue for those who are susceptible
- Can be triggered by flashing lights in the range of 4-59 times per second
- Worst at about 20 times a second
- *Never* use flashing text
  - At least annoying to everybody
  - Many people completely tune out the content
  - A serious health hazard to some

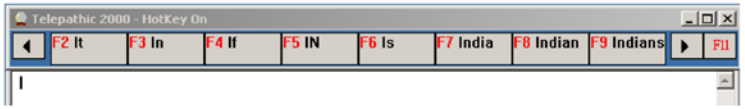
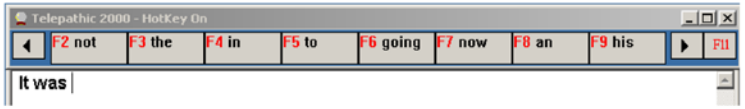
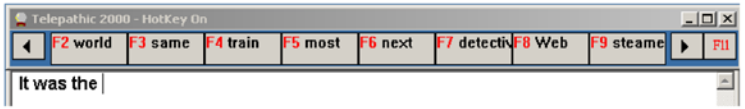
12.4 Issues Involving Mobility Impairment

- As applies here: any conditions that affects a person's ability to use keyboard and mouse
- Can be caused by:
  - Diseases: arthritis, muscular dystrophy, multiple sclerosis
  - Stroke
  - Injury
  - Loss of limb
  - Repetitive strain injury
  - Natural aging processes

Assistive technologies available in Windows

- StickyKeys permits one-finger typing
  - Press Shift, Ctrl, or Alt followed by another key, rather than pressing two keys at same time
- FilterKeys helpful for people with hand tremors or problems with fine-motor control
  - Ignores brief or repeated keystrokes
- MouseKeys permits moving pointer with the numeric keypad
- SerialKey permits access, via serial port or USB port, to alternatives for mouse and keyboard functions
  - Foot mouse
  - Sip-and-puff mouse

Predictive typing

User types	Results on screen
I	
F2	
F2	
F3	
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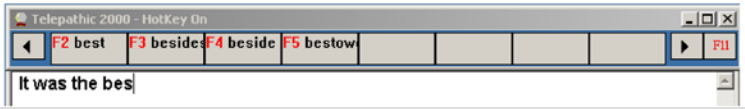
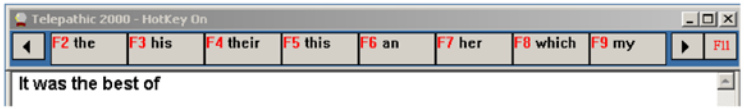
s	

“It was the best of times, it was the worst of times.” –Dickens

F2

F3



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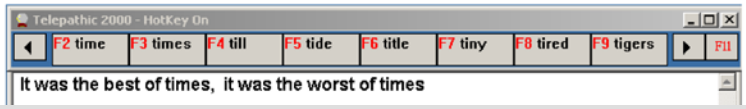
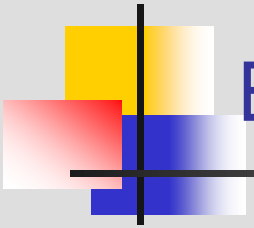
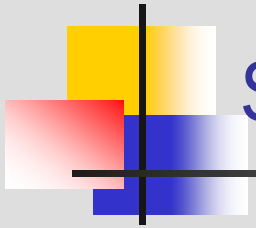


The Eyegaze™ system



Eyegaze®

- A video camera tracks eye movement as the user looks at an on-screen keyboard
- Customizable as to how long a key must be looked at to be recorded
- When system has identified the key looked at, the symbol appears and the user looks at next key



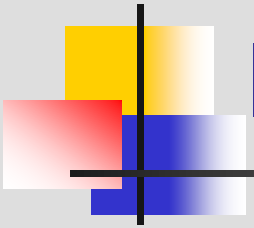
Sample text and timing

- “There is a tide in the affairs of men, which, taken at the flood, leads on to fortune.”

  -- Shakespeare, Julius Caesar

- 18 words, “typed” by looking the screen, in a little over three minutes, after very little practice
- That’s five words per minute
- Experienced users do ten words per minute
- Young children can go faster . . . but if I were a quadriplegic kept alive by a breathing tube, ten words a minutes would be a blessing from heaven.

12.5 Issues Involving Hearing Impairment



- Deafness
- Hard of hearing; can be helped by hearing aids
- Can be caused by prolonged exposure to noisy environments
- Hearing often degrades with age

Closed captioning

The American Sign Language (ASL) Project at DePaul University

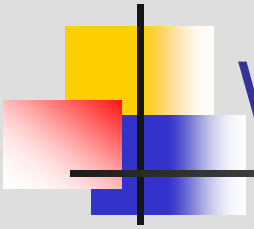
- “Our goal is to translate English to American Sign Language, the language of the Deaf in North America.”
- ASL is the fourth most-used language in the United States
- Certain signs represent complete words or phrases
- A manual alphabet is used to “finger-spell” words before signs for them have been created

An avatar signs from English text

See asl.cs.depaul.edu for more information and a demo. The project is led by Dr. Rosalee Wolfe.

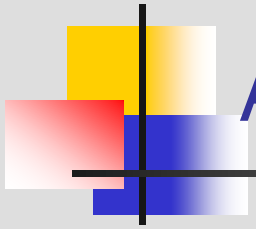
12.5 The Web Accessibility Initiative

- The World Wide Web Consortium (W3C) is committed to promoting usability for people with disabilities
- The goal: Universal access. Everyone.
- Must take into account *user agents* other than browsers: mobile phones, PDAs, screen readers and magnifiers, etc.
- Not easy; not free
- It's simply the right thing to do



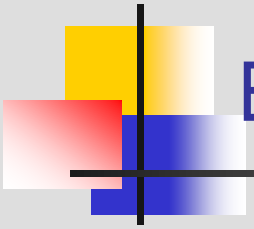
W3C Web Content Accessibility Guidelines

- Provide equivalent alternatives to auditory and visual content
- Don't rely on color alone
- Use markup and style sheets and do so properly
- Clarify natural language usage
- Create tables that transform gracefully
- Ensure that pages featuring new technologies transform gracefully
- Ensure user control of time-sensitive content changes



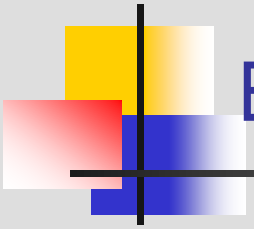
Accessibility Guidelines, Continued

- Ensure direct accessibility of embedded user interfaces
- Design for device-independence
- Use interim solutions
- Use W3C technologies and guidelines
- Provide context and orientation information
- Provide clear navigation mechanisms
- Ensure that documents are clear and simple



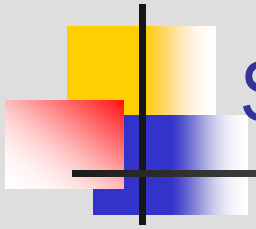
Evaluating for accessibility

- Manual checking: how does site work with:
  - Images and Java turned off
  - Sound turned off
  - Larger than normal font sizes
  - Small screen size
  - Black and white display
  - Without a mouse
- Look at pages with a text browser such as Lynx or a voice browser such as IBM's Home Page Reader



Evaluating for accessibility, continued

- Check with a semi-automatic accessibility checker:
  - Wave
  - Bobby
  - A-prompt
  - (See text for URLs)
- “Semi”-automatic because some things are matters of judgment
- Syntax check HTML through W3C validators
- Do user testing

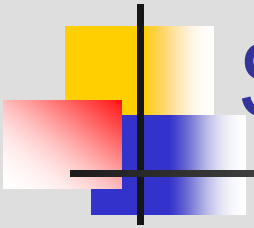


Some closing thoughts

- If you live with any of the issues discussed in this chapter, consider . . .
  - Sharing with your classmates what the experience is like, from your standpoint
  - Explain anything that other people do, unthinkingly, that you find irritating
  - Explain the differences, as you experience them, between the words impaired, handicapped, disabled, challenged, differently-abled, and any others that you encounter
  - Are any of them offensive to you? If so, explain why, and what you prefer

A few experiments, to try to understand what others experience

- With StickyKeys:
  - Put tape on the fingers of one hand, so that you can use only one finger. Sit on your other hand. Type a term paper.
  - Put a coffee-stirrer stick, or the like, between your teeth. Sit on both hands. Type a paper.
- With a screen magnifier:
  - Get some cheap dark glasses, smear something greasy on them so that you can't read small type. Browse the Web, looking for a book.
- With a screen narrator:
  - Turn off the monitor. Now you are in a blind person's seat. Buy a book at Amazon.com.



Summary

In this chapter you learned:

- That the Web should be accessible to all
- The scope of the need
- The challenges and the technology for:
  - Vision issues
  - Mobility issues
  - Hearing issues
- Two assistive technologies impossible without computers
  - The DePaul American Sign Language Project
  - The Eyegaze system
- Checking for accessibility