EE212/CE653
Extraordinary HCI

HCI for the Extraordinary

Disabled Peoples Access to Technology

Lecturer: Dave Lyons

One text

- Edwards, A, "Extraordinary Human-Computer Interaction: Interfaces for Users with Disabilities", Cambridge Series on Human-Computer Interaction, 1995
- Sounds a bit old, but the principles are still valid.
- The hardware has got better, and therefore some of the software too (see voice recognition).

Let us start with "WHO"

- There are two groups of people involved here
  - Those who require extraordinary HCI
  - Those who develop systems, devices and applications which have an HCI.

Which of those groups do you think are the experts?

Commercial motivation

- Disabled people make up over 10% (14.7% in Essex two years ago) of the population.
- Think of that in terms of purchasing power – a market.

Who needs EHCI?

- You will see that, as a general rule, that HCI that is good for disabled people is good for people.
- What is a disability?
  - One definition: something in society or environment which gets in the way of an impairment.
  - OED says an impairment is some function that is weakened or damaged.

Impairments

- Sensory
  - Full or partial loss of: sight, hearing, touch, smell, taste
- Mobility and co-ordination
  - Weakened or nonexistant: limbs, back, neck, breathing, dexterity
- Cognitive
  - Memory (short or long term), dyslexia/dyspraxia, behavioural
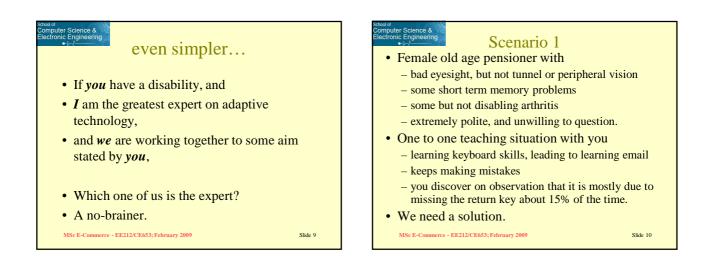- And they can interact.

Three theories of disability

- The OU has a good reference at http://www.open.ac.uk/inclusiveteaching/pages/understanding-and-awareness/models-of-disability.php
- Medical model looks at disease or impairment from a curative point of view.
- Charitable model looks at what organizations can decide to do for disabled people.

Social Model of Disability

- We said it before: "the placement of a disability in the path of a person's impairment"
- There are many Ph.D. theses on this, but here is a good popular reference, http://www.leeds.ac.uk/disability-studies/archiveuk/Oliver/in%20soc%20dis.pdf from the guy who invented the idea of the social model.

even simpler…

- If *you* have a disability, and
- *I* am the greatest expert on adaptive technology,
- and *we* are working together to some aim stated by *you*,

- Which one of us is the expert?
- A no-brainer.

Scenario 1

- Female old age pensioner with
  - bad eyesight, but not tunnel or peripheral vision
  - some short term memory problems
  - some but not disabling arthritis
  - extremely polite, and unwilling to question.
- One to one teaching situation with you
  - learning keyboard skills, leading to learning email
  - keeps making mistakes
  - you discover on observation that it is mostly due to missing the return key about 15% of the time.
- We need a solution.

Solutions

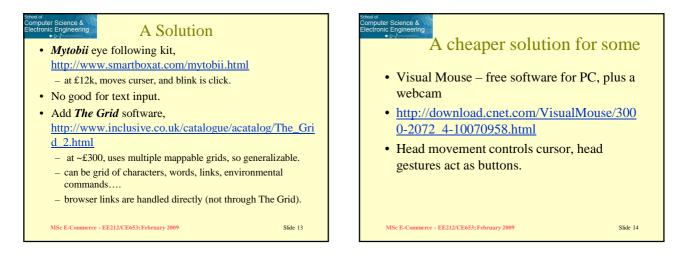1. Build a specialist keyboard for her.
2. Consider voice input.
3. … grid input, switch input, helper

4. Remap keyboard – (almost) all operating systems have a key to character table.
   - the cost is zero plus some time.
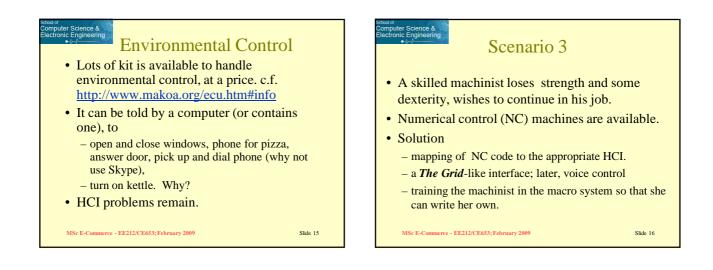   - it is intrinsically generalizable.
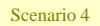
Scenario 2

- Young man whose only stable movement is with his eyes. No speech
  - may be some cognitive damage
- Requirement – browsing and environmental control.
- You have tried head movement, switches on various body parts, joystick, all failed.
  - What do we mean by failed?

A Solution

- *Mytobii* eye following kit, http://www.smartboxat.com/mytobii.html
  - at £12k, moves curser, and blink is click.
- No good for text input.
- Add *The Grid* software, http://www.inclusive.co.uk/catalogue/acatalog/The_Grid_2.html
  - at ~£300, uses multiple mappable grids, so generalizable.
  - can be grid of characters, words, links, environmental commands….
  - browser links are handled directly (not through The Grid).

A cheaper solution for some

- Visual Mouse – free software for PC, plus a webcam
- http://download.cnet.com/VisualMouse/3000-2072_4-10070958.html
- Head movement controls cursor, head gestures act as buttons.

Environmental Control

- Lots of kit is available to handle environmental control, at a price. c.f. http://www.makoa.org/ecu.htm#info
- It can be told by a computer (or contains one), to
  - open and close windows, phone for pizza, answer door, pick up and dial phone (why not use Skype),
  - turn on kettle. Why?
- HCI problems remain.

Scenario 3

- A skilled machinist loses strength and some dexterity, wishes to continue in his job.
- Numerical control (NC) machines are available.
- Solution
  - mapping of NC code to the appropriate HCI.
  - a *The Grid*-like interface; later, voice control
  - training the machinist in the macro system so that she can write her own.

Scenario 4

- A personal assistant acquires a heavily wasting disease. After trying many interface mechanisms, a tracker ball under the chin is chosen.
- Two clamps, some wood and velcro solve the problem, along with a *The Grid*-like on-screen keyboard. Cost: £8.50
- She retains her job.

Scenario 4 failures

- Voice input: voice too weak and variable.
- multiple buttons: hand or foot fatigue.
- *Quadjoy* http://www.quadjoy.com/ mouth operated joystick, suck is left click, blow is right click:
  - intrinsic hygiene problems
  - very important: personal perception of own disability
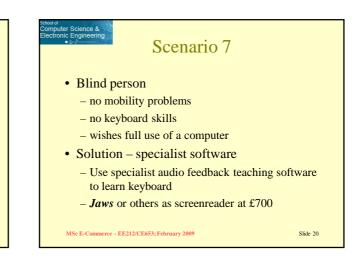 - tools that appear technically to liberate may badly effect ones perception of oneself.
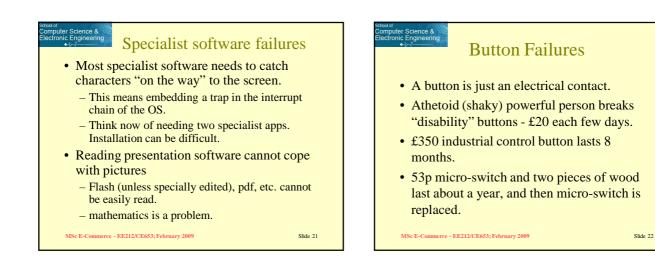
Scenario 5 and 6

- Student with only peripheral vision
  - puts nose on the screen, and scans with eyes
  - can work for 10 minutes, then exhausted
  - **Solution. put screen on arm, move screen to nose. Cost, £40**.
- Wheelchair user in laboratory
  - had very expensive ramp built to get chair safely to lab bench height.
  - **Solution. put lab kit on ordinary desk**.
- These are examples of the KISS rule.

Scenario 7

- Blind person
  - no mobility problems
  - no keyboard skills
  - wishes full use of a computer
- Solution – specialist software
  - Use specialist audio feedback teaching software to learn keyboard
  - *Jaws* or others as screenreader at £700

Specialist software failures

- Most specialist software needs to catch characters "on the way" to the screen.
  - This means embedding a trap in the interrupt chain of the OS.
  - Think now of needing two specialist apps. Installation can be difficult.
- Reading presentation software cannot cope with pictures
  - Flash (unless specially edited), pdf, etc. cannot be easily read.
  - mathematics is a problem.

Button Failures

- A button is just an electrical contact.
- Athetoid (shaky) powerful person breaks "disability" buttons - £20 each few days.
- £350 industrial control button lasts 8 months.
- 53p micro-switch and two pieces of wood last about a year, and then micro-switch is replaced.

Button Successes

- Take an ordinary keyboard, and provide external contacts from keypad 8, 4, 6, 2
- Connect switches to computer via game port or other interface
- Use for any digital purpose.

Voice Failures

- Modern voice recognition software requires training in a voice.
- Voices can change over the course of a day's work through fatigue, for example.
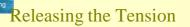- Multiple scenaria solves this.
- If you get angry with it, or have timing problems, it can fail.

The major tension: Individualization v.s. Generalization

- It is clear (from the social model, if not from common sense), that every solution depends upon the individual.
- It is commercially clear that no single device or software product suits all.
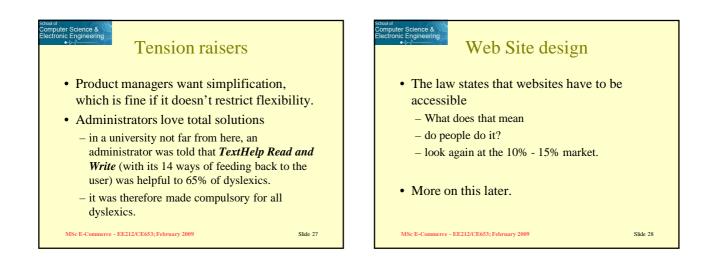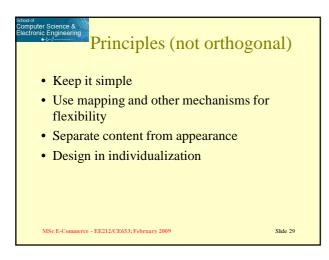- How do you square that circle?

Releasing the Tension

- Firstly, provide any physical product with lots of variability, and accept it will not suit everybody.
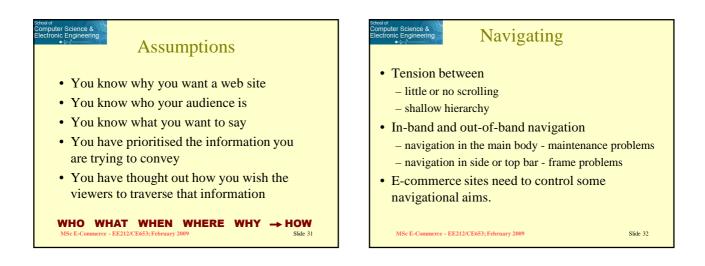- Provide any software product with similar quantities of variability, and accept it will not suit everybody.
  - in particular, note the power of the map that we have seen with Scenario 1. Use a lot of maps.

Tension raisers

- Product managers want simplification, which is fine if it doesn't restrict flexibility.
- Administrators love total solutions
  - in a university not far from here, an administrator was told that *TextHelp Read and Write* (with its 14 ways of feeding back to the user) was helpful to 65% of dyslexics.
  - it was therefore made compulsory for all dyslexics.

Web Site design

- The law states that websites have to be accessible
  - What does that mean
  - do people do it?
  - look again at the 10% - 15% market.

- More on this later.

Principles (not orthogonal)

- Keep it simple
- Use mapping and other mechanisms for flexibility
- Separate content from appearance
- Design in individualization

Making Web Pages Accessible

Cute, but not much good for blind people

Assumptions

- You know why you want a web site
- You know who your audience is
- You know what you want to say
- You have prioritised the information you are trying to convey
- You have thought out how you wish the viewers to traverse that information

WHO WHAT WHEN WHERE WHY ➝ HOW

Navigating

- Tension between
  - little or no scrolling
  - shallow hierarchy
- In-band and out-of-band navigation
  - navigation in the main body - maintenance problems
  - navigation in side or top bar - frame problems
- E-commerce sites need to control some navigational aims.

Who needs access?

- People with visual disabilities

- People with aural disabilities

- People with cognitive disabilities such as dyslexia

- People

Vision problems

- Need the fonts and colours adjustable

- Keep it simple
  - no frames, or simple use of frames
  - tables only for tabular information
  - simple (and often) navigation
  - ensure that there is an ALT text or alternative textual description for purely visual elements.
  - use simple backgrounds, *fonts* and sizes.

Aural Problems

- What can I say?

- Don't rely on sound.

Cognitive problems

- Use language correctly and simply
  - It is not a bad idea not to use double negatives

- Get your navigation right.

- Problem
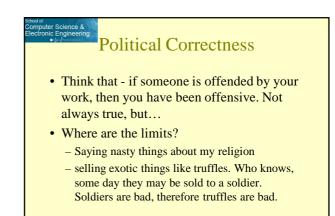 - for most people, fonts with serifs are best, for long texts.
  - For dyslexics, sans serif fonts are best.

The Big Tension

HTTP was designed to allow the user (the browser) control over the appearance, as opposed to the content, of a web page. Can be good for disability access.

Corporate users want total control over what and how the user sees and hears the material. Can be bad for disability access.

Note that this slide is bad for colour blind people.

Political Correctness

- Think that - if someone is offended by your work, then you have been offensive. Not always true, but…
- Where are the limits?
  – Saying nasty things about my religion
  – selling exotic things like truffles. Who knows, some day they may be sold to a soldier. Soldiers are bad, therefore truffles are bad.

To learn more..

There is a very good tool that will lead to further information. It is "Cynthia says at http://www.contentquality.com/

It will not only actually check your site for you for accessibility, cross-browser compatibility, and speed of access,

"The source" is
http://www.w3.org/WAI/GL/

A Simple Test

- Unplug the mouse.

- If the site works well from the keyboard you are successful in making an accessible sight.

..and more..

- One of the best studies of pathological HCI is Edwards, D.N., ed., Extra-*Ordinary Human Computer Interaction*, CUP 1995
- A commercial designer (of many) with the right idea
  – http://dreamink.com/design/
- For an entry into the psychology, try
  – http://kpope.com/
  – http://www.internettg.org/newsletter/dec98/banner_blindness.html - old but useful.

Exercise

Exercise: Separating content from display information is always a good idea. Find reasons and techniques on the WAI web site (or others) to say

- Why this is true for accessibility
- What techniques are available to do the separation
- Why they set the priority of this guidline as they do.
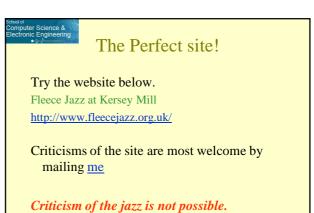
Exercise answer

- Today, the answers are easy, if only people would do them.
- Separate content and display with `xhtml` and `css`.
- Always provide `alt` or `longdef` for pictures.
- Don't use pictures (including Flash) for important information.
- Think KISS rule.

The Perfect site!

Try the website below.

Fleece Jazz at Kersey Mill

http://www.fleecejazz.org.uk/

Criticisms of the site are most welcome by mailing me

Criticism of the jazz is not possible.