UNIVERSITY
OF ONTARIO
INSTITUTE OF TECHNOLOGY

Universal Design and Accessibility

Human Computer Interaction
CSCI 4620U| SOFE 4850U | CSCI 5540G
Dr. Christopher Collins

Acknowledgement: Parts of this lecture are based on material prepared by Jeremy Bradbury

REVIEW

User Participation

- In general evaluation techniques that involve users can occur in the laboratory or in the field
- Both laboratory and field studies can be costly
  - Field studies involve interruption to work day and onsite evaluation
  - Laboratory studies also interrupt participants work day and require them to travel to the lab
- There are benefits and drawbacks to both which we will now discuss

Validity

- External validity
  - confidence that results applies to real situations
  - usually good in natural settings

- Internal validity
  - confidence in our explanation of experimental results
  - usually good in experimental settings

- Trade-off: Natural vs Experimental
  - precision and direct control over experimental design versus
  - desire for maximum generalizability in real life situations

ANNOUNCEMENTS

Announcements

- Group project 4a – Project presentations will take place in class on Dec 2; details posted online.

- Group project 4b – Evaluation has been posted as well, due Dec 3 at 11:59pm.

Learning Objectives

- By the end of the lesson, you will be able to:
  - Define 'universal usability'
  - Address the needs of diverse populations through interface design

Special Topics in HCI

UNIVERSAL DESIGN

Usability, Usefulness ...

Usability, Usefulness and Accessibility

"It is estimated that at least 10% of the population of every country has a disability that will affect interaction with computers."

-Dix, Finlay, Abowd, Beale

Accessibility

- Newell (1995) points out that the sort of issues that face an ordinary person in an extraordinary environment (such as under stress, time pressures, etc.) are often similar to the issues that face a person with disabilities in an ordinary environment.

Accessibility

- Access to physical spaces for people with disabilities has long been an important legal and ethical requirement and this is now becoming increasingly so for information spaces.

- Legislation such as the UK's Disability Discrimination Act and Section 508 in the US now requires software to be accessible.

- The United Nations and the World Wide Web Consortium (W3C) have declarations and guidelines on ensuring that everyone can get access to information that is delivered through software technologies

Economic and Cultural Exclusions

- Economic:
  - people are excluded if they cannot afford some essential technology.

- Cultural:
  - designers make inappropriate assumptions about how people work and organize their lives. For example, using a metaphor based on American football would exclude those who do not understand the game.

Social Exclusion

- Social exclusion can occur if equipment is unavailable at an appropriate time and place or if people are not members of a particular social group and cannot understand particular social mores or messages.

Physical Exclusion

- Inappropriate positioning of equipment
- Input and output devices making excessive demands on user abilities.
- Examples: an ATM may be positioned too high for a person in a wheelchair to reach, a mouse may be too big for a child's hand or a mobile phone may be too fiddly for someone with arthritis to use.

Conceptual Exclusions

- People may be excluded because they cannot understand complicated instructions or obscure commands or they cannot form a clear mental model of the system.

Curb Cuts: Universal Design

- Curb cuts help people with mobility devices (such as wheelchairs).

- Tactile additions help people with low vision.

- … these also help everyone: people with suitcases, baby strollers, texting and not watching where they are going, wearing roller blades, etc.

http://www.armor-tile.com/articles_docs3/ADA-Compliant-Curb-cuts-Safety.html

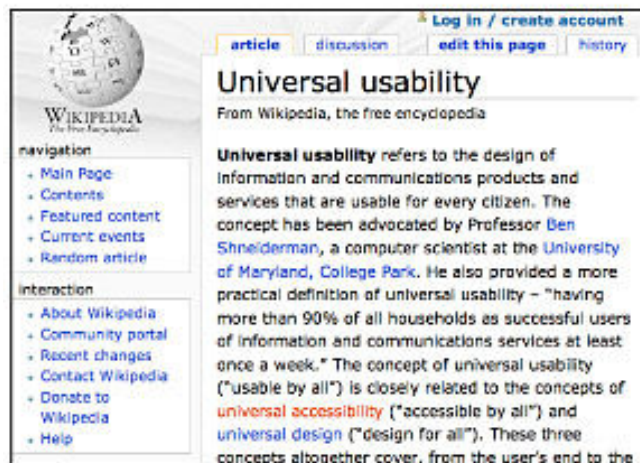Wikipedia

Universal Design in Interfaces

Flexibility and user control allow users to adapt designs to meet their needs and preferences
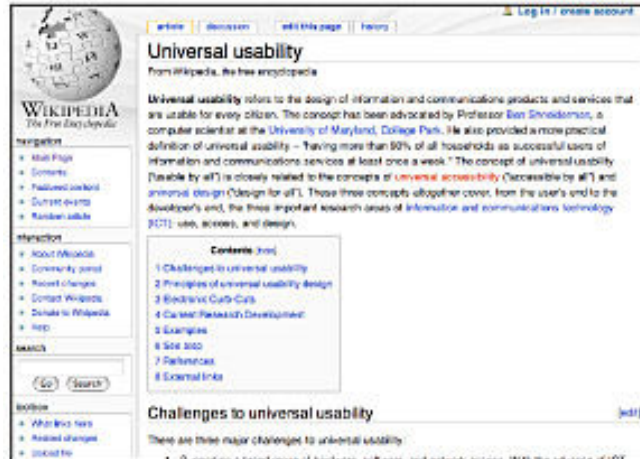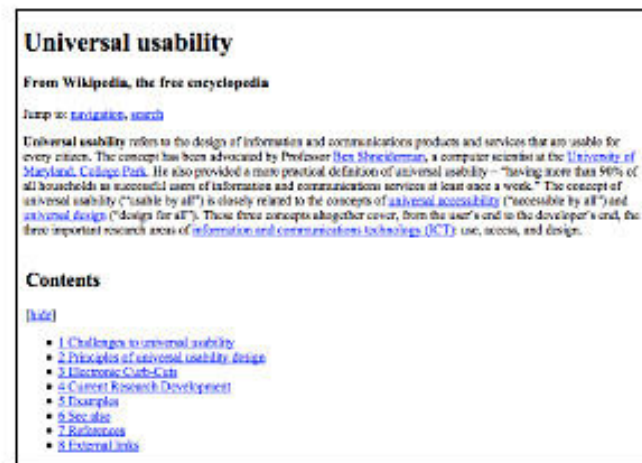

Standard
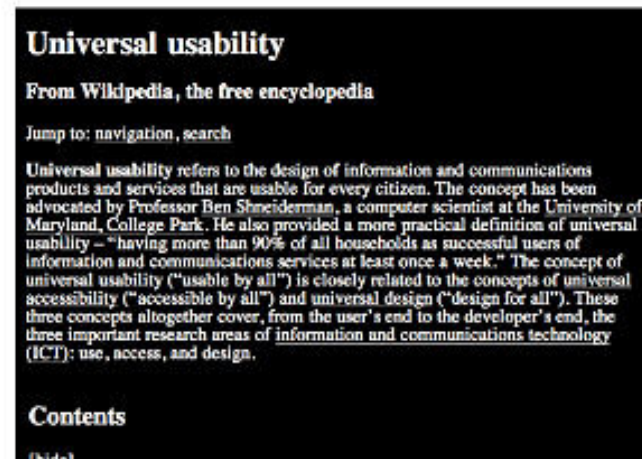
High-contrast text

Enlarged text

Without styling

Principles of Universal Design

- Equitable Use: The design does not disadvantage or stigmatize any group of users.

- Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.

- Simple, Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

- Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Memorize!

http://www.ncsu.edu/ncsu/design/cud/pubs_p/docs/poster.pdf

Principles of Universal Design

- Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.

- Low Physical Effort: The design can be used efficiently and comfortably, and with a minimum of fatigue.

- Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.

Memorize!

http://www.ncsu.edu/ncsu/design/cud/pubs_p/docs/poster.pdf

Accessibility in User-Centered Design

- A great online book and resource:
http://www.uiaccess.com/

SUPPORTING EVERYONE: EXAMPLES

Visual Impairment

- A visual impairment can limit ones ability to view text and graphical output

- With text output, a common solution is to use a screen reader

- What about with graphical output?

Visual Impairment

- With graphical output a user interface designer may be able to do any of the following:
  - Provide alternative text for graphics so that a screen reader can be used (**Example:** webpages)
  - Use sound to provide auditory cues regarding the graphical elements in the interface (**Example:** mouse-over sounds for buttons)
  - Use tactile output to provide more information about graphics (**Example:** braille)

Alternative Text

"This image is a line art drawing of a grey magnifying glass with blue glass. If you click on it, it will take you to the Search page for this Acme Company website."

Alternative Text

"Search"

- Avoid overly descriptive text!

VoiceOver

- A built in screen reader with Mac OS X
- Supports speech synthesis as well as braille display output
- Website: http://www.apple.com/accessibility/voiceover/devicesupport.html

Narrator

- A built in screen reader with Windows 7

- Supports speech synthesis

- Website:
  http://windows.microsoft.com/en-US/Windows7/Hear-text-read-aloud-with-Narrator

Hear text read aloud with Narrator

Windows comes with a basic screen reader called Narrator, which reads text on the screen aloud and describes some events (such as an error message appearing) that happen while you're using the computer.

Narrator is not available in all languages, so if the steps below don't work, Narrator is not available for your language.

1. To open Narrator click the **Start** button 🌐, and then, in the search box, type **Narrator**. In the list of results, click **Narrator**.

2. Use the keyboard shortcuts in the following table to specify which text you want Narrator to read:

Use this keyboard shortcut	To do this
Ctrl+Shift+Enter	Get information about the current item
Ctrl+Shift+Spacebar	Read the entire selected window
Ctrl+Alt+Spacebar	Read the items that are selected in the current window

<Demo>

Hearing & Speech Impairment

Output

- Multimedia is one area where a hearing impairment can be difficult
  - (As with television content) it is important the multimedia content on the web have captions
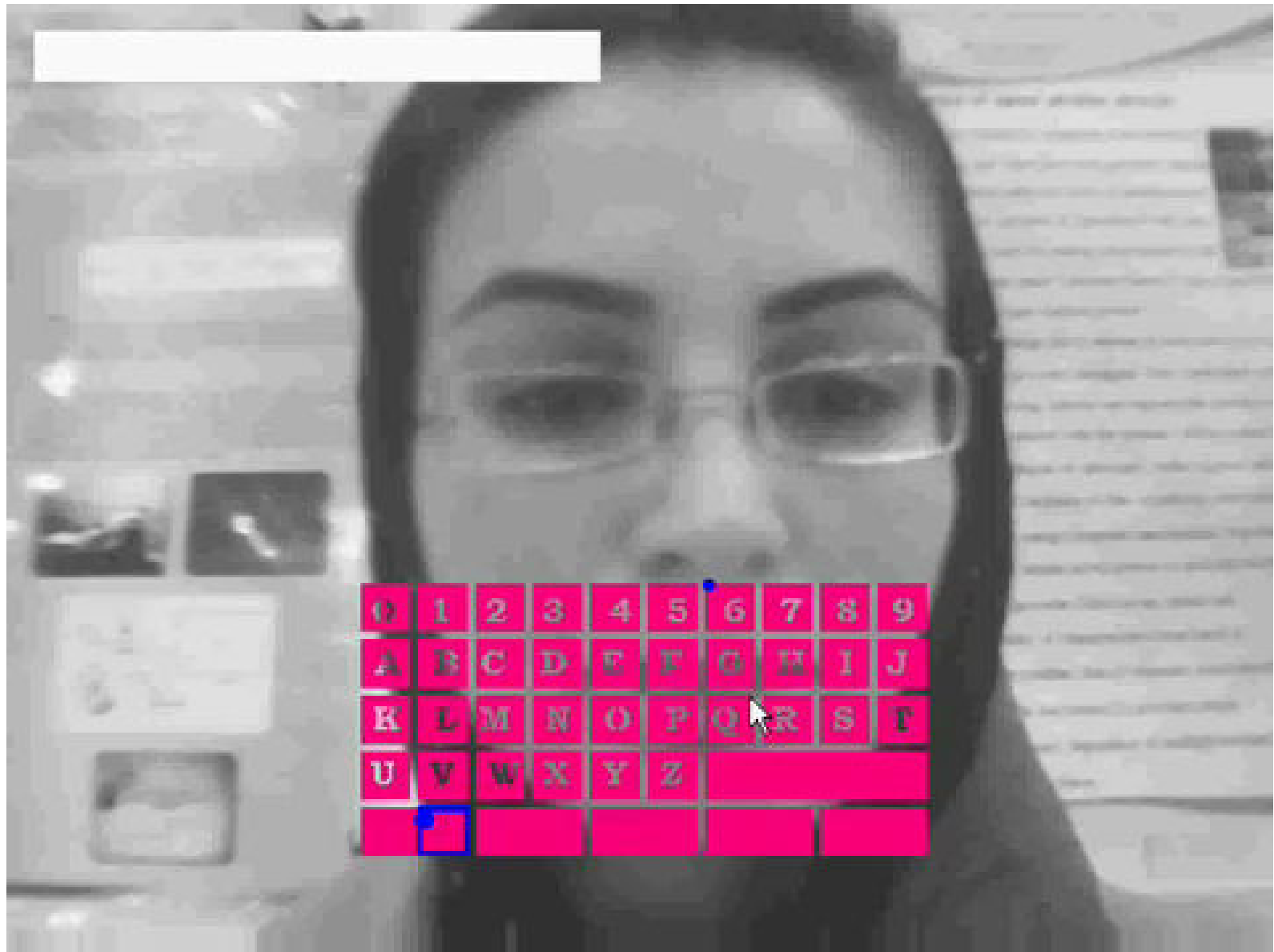
Input

- In addition to traditional text-based input the use of gesture-based input could enable users to use sign language with a computer
  - This may be faster depending on the gesture recognition software

Physical Impairment

Input

- With a physical impairment, providing input using a keyboard and mouse may be limited or not possible
- Alternative forms of input maybe used including:
  - Speech
  - Eyegaze
  - Keyboard with predictive text

Dyslexia

- *"…a learning disability that manifests primarily as a difficulty with written language, particularly with reading and spelling."*   - Wikipedia
- Speech input and output can be used in place of text
- Special spell checkers can be used
  - Example: http://www.ghotit.com
- When conducting design navigation recall the design principle – "Be Consistent!"
  - Use color-coding and visual queues to help users navigate the interface

Captchas

[Megaupload]

[Reddit]

[eBay]

[CNN]

[Baidu]

[Recaptcha]

[Captcha.net]

[Authorize]

[Skyrock]

[NIH]

[Digg]

[Google]

[Wikipedia]

[Slashdot]

[Blizzard]

http://www.extremetech.com/wp-content/uploads/2011/11/captcha-selection1.jpg

W3C Accessible Captchas Guidelines

- Solutions:
  - Logic puzzles, audio outputs
  - Single sign on across sites
  - Better spam filtering and heuristic detection of robot users
- http://www.w3.org/WAI/intro/captcha.php

Example reCAPTCHA with audio alternative

Example logic captcha

http://files.samhart.net/img/misc/logic-captcha.png

Autism

- *"...affects a person's ability to communicate and interact with people around them and to make sense of their environment."*

  -Dix, Finlay, Abowd, Beale

- Computers can be used to help people with autism communicate
  - The use of graphics and speech synthesis can help
- Computers using virtual reality can help educate people with autism practice appropriate forms of interaction

ACCESSIBILITY STANDARDS

W3C Web Accessibility Initiative

- Guidelines and technical specifications for universal web design, for example:
  - Supporting screen reading
  - Use of styles which can be customized by accessibility plugins
  - Evaluation tools
- http://www.w3.org/WAI/
- Web Content Accessibility Guidelines adopted as ISO 40500:2012 standard

▶▶ FUTURE SHOP.
exciting stuff

WEEKLY FLYER STORE LOCATOR CLEARANCE OUTLET EXPERT ADVICE TECH YEAH COMMUNITY ▼

» MY ACCOUNT   » MY ORDERS   » WISH LIST   » PRICE WATCH

Keyword or WebID   SEARCH ▶   Welcome! **Create an Account** | Sign In

Shop by department ▼   **Specialty Stores** ▼   **VIEW CART**   SUBTOTAL

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Making online shopping better for everyone.

Future Shop proudly supports eSSENTIAL Accessibility, an innovative technology helping those with physical disabilities access the Internet.

If you have trouble typing, moving a mouse, or reading a webpage, the eSSENTIAL Accessibility software can help with your shopping experience at futureshop.ca

» Click here to visit the eSSENTIAL Accessibility website for more details.
http://www.essentialaccessibility.com/

» Click here to download the eSSENTIAL Accessibility software.
http://www.essentialaccessibility.com/download

Help Centre	**Company Services**	**About Us**	**Shipping Policies**
Order Status / My Orders	Future Shop Credit Card	About Future Shop	Shipping and Delivery
Customer Support	Check Gift Card Balance	Contact Us	Safe Shopping Guarantee
Easy Returns	Product Service Plans	Careers - NOW HIRING	Verified by Visa®
Navigation Help	Product Recall Centre	Press Room	Privacy Policy
Search Help	Product Replacement Plan	Community Relations	Website Use Agreement
Email Fraud	PartStore	Green and Recycling	Our Online Policies
Site Index	ReClaim Insurance Replacement	Future Shop Newsletter	Retail Stores Policies
		Contest Winners	In-Store Pickup
		Rebate-free Shopping	Purchase Terms and Conditions

cybertrust secured website

Verified by VISA

PicturePlanner

COGNITIVE SUPPORT EXAMPLE

PicturePlanner

- An icon-based tool for individuals with cognitive disabilities

- The purpose of the tool is to allow users to schedule activities for the day, week, etc.

- Website: http://cognitopia.com

PicturePlanner

Source: http://cognitopia.com

PicturePlanner

- The design of picture planner has the following goals:
  - "…enable maximally independent use of individuals with limited reading ability…"
  - "…enable use by those for whom standard commercial software interfaces are overly complex and non-intuitive."
  - "…have the application incorporate a metacognitive approach to interface design that seeks to anticipate the information management challenges experience by individuals with cognitive disabilities." [Kea06]

PicturePlanner

- Goal 1: *"…enable maximally independent use of individuals with limited reading ability…"*

- How?
  - Elements in the interface are tri-modal icons
    - Text
    - Picture
    - Text to speech synthesis

PicturePlanner

- Goal 2: *"…enable use by those for whom standard commercial software interfaces are overly complex and non-intuitive."*

- How?
  - Use single click instead of double click
  - Simplify screen layout
  - For user tasks, avoid multi-screen action sequences
    - Use "out and back" action sequences which ensure the user returns the original screen

PicturePlanner

- Goal 3: *"…have the application incorporate a metacognitive approach to interface design that seeks to anticipate the information management challenges experience by individuals with cognitive disabilities."*

- How?
  - Explicit representation of metacognitive data
  - **Example:** going to a movie
    - Need to store metacognitive data such as transportation route, travel time, location, cost, other people attending, etc.

TAG Lab

- "Technology for Aging Gracefully" Lab
- http://taglab.utoronto.ca/
- Cognitive, physical support for seniors
- Bereavement technologies

MyVoice - Context Aware Communication Aid

Phones are getting smarter. Many now have sensors that can detect things like location (in other words, these phones know where they are). In a first project, Friend Forecaster, we leveraged this sensing technology to create a context-aware cell phone that could make plausible conjectures of individuals one might encounter in a given situation, thereby aiding the many senior citizens who experience difficulties in recalling people's names. Currently, we are working on MyVoice, a context-aware application that suggests vocabulary — words, phrases, and sentences — based on the locations the user visits. MyVoice seems particularly useful for individuals with anomic aphasia, which often results from strokes, certain types of dementia, and other types of brain injury.

People
Alex Levy
Mike Massimi
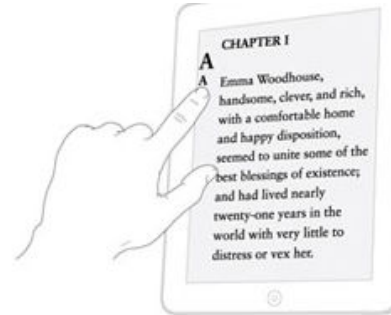Golnoosh Pourshahid
Aakash Sahney
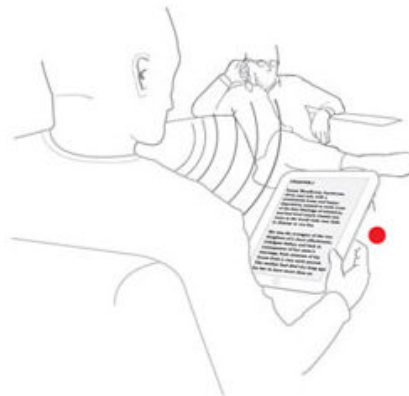Kevin Tonon

Sponsors
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Large Print Listening and Talking eBooks

The ALLT e-book is *Accessible* to people with different sensory and motor abilities.

It provides a *Large-print* capability by magnifying the type.

It *Listens*, i.e., it records the voice of a family member reading to the user to allow that voice to be later heard in (re)reading.
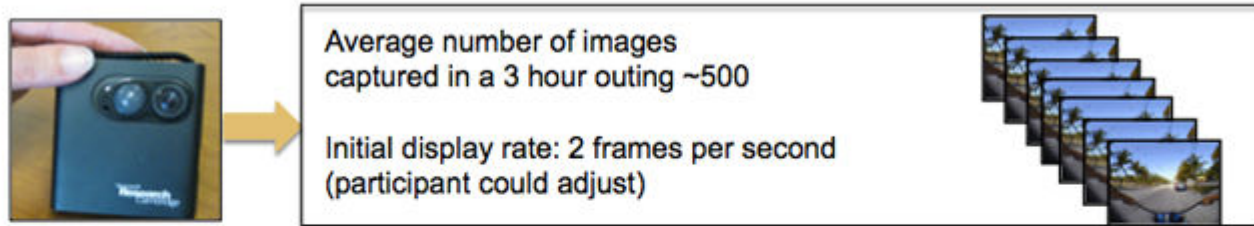
It also *Talks*, i.e, it speaks the text aloud as in books on tape, using either a computerized voice or the voice of a family member.
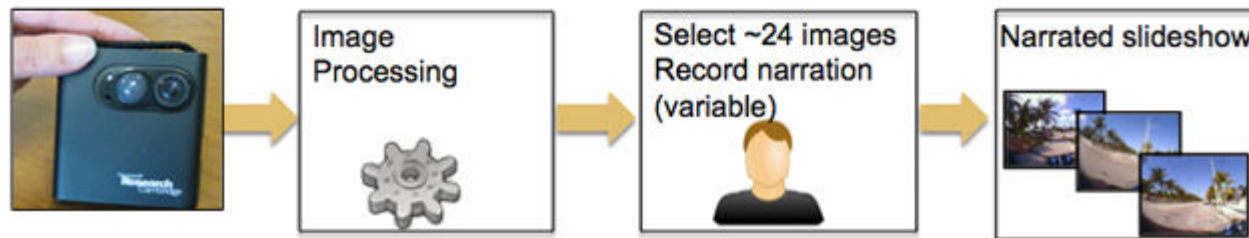
Digital Life Histories / SenseCam

SenseCam Re-experience
Unfiltered SenseCam image stream

Average number of images captured in a 3 hour outing ~500

Initial display rate: 2 frames per second (participant could adjust)

SenseCam Remix
Caregiver selected images with narration

Image Processing

Select ~24 images
Record narration (variable)

Narrated slideshow

Screening Techniques

- Screening techniques are simple activities to help identify potential accessibility barriers in product designs.

  – a software designer turns off her monitor and uses a screen reader to interact with her application;

  – a usability specialist uses a mouthstick or unplugs his mouse to get an idea of how usable a product is by people who cannot use their arms or hands

- Screening techniques are **not disability simulations**.

Screening Techniques

http://www.uiaccess.com/accessucd/screening.html

Activity

- Choose one of these and research it online:
  - Interface design for the eldery
  - Interface design for physical disabilities
  - Interface design for cognitive disabilities

- Post links and comments to the "Accessibility" discussion in today's lecture folder

Summary

- Today we introduced:
  - University design and accessibility

Your Action Items

- Work on assignments!

Ongoing Course Evaluation

- Please provide your feedback on today's Blackboard survey.