The Design of Interactive Computational Media

University of Toronto CSC 318F
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www.dgp.utoronto.ca/people/RMB/318/csc318.html
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Course Introduction

Hour 1: Introduction to Interactive Computational Media and to the Course

Hour 2: Designing for Senior Citizens

Introduction to Interactive Computational Media and The Course

- Interactive computational media
- Designing interactive computational media
- Human-computer interfaces
- Human-computer interaction
- Objectives of course
- Topics, non-topics
- Texts and staff
- Term Project
- Evaluation

What are interactive computational media?

- Interactive — Conversational with, responsive to user
- Computational — With processing power and memory
- Medium (Webster's 3rd New International Dictionary)
  - "Something through or by which something is accomplished, conveyed, or carried on ..."
  - "a channel, method, or system of communication, information, or entertainment ..."
  - "the material or technical means for artistic expression ..."
  - Thus implies uses for creativity, thinking, problem solving

A generic hardware example

- *Personal Digital Assistant* , e.g., PalmPilot
  - Inexpensive, small, light, hand-held device
  - Pen input with "handwriting" recognizer
  - Capabilities for address book, to-do list, and calendar
  - Communication to desktop computers and other PDAs
  - Synchronization with desktop computers
- Issues and methods of differentiation
  - Price, weight, size, form factor
  - Target users
  - Memory, peripherals
  - Software environment and capabilities
  - Interface, look & feel, metaphor — how user thinks about it

Another hardware example

- These are general-purpose devices
- There can also be similar special-purpose devices
- For example, imagine a hand-held language translation machine for travelers
  - Target customer — Tourist, businessperson, student
  - Functionality — Words, phrases, sentences, single language, multiple languages

Software-based interactive comp. media

- The web
- Email
- Instant messaging systems
- Spreadsheets (e.g., Excel)
- Personal finance managers (e.g., Intuit)
- Virtual reality (3D) environments
  - Games
  - Simulators (e.g., for flight or surgery training)
- Video authoring and publishing systems
- Collaborative writing systems

VIDEO example: ePresence — Interactive Webcasting with Structured Archives

- Highly interactive
- Computes (retrieves) real-time video and archived video, allows navigating and browsing
- Medium that communicates and informs

QuickTime™ and a Sorenson Video decompressor are needed to see this picture.

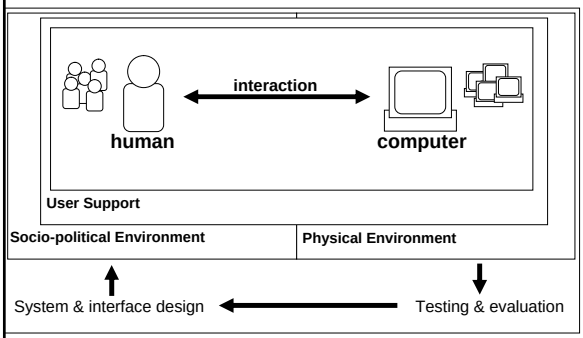
Desiging interactive computational media

- Begins with brainstorming, conception, envisionment
- This comprises both:
  - Functionality (function)
  - Human-computer interface (form)
- Concept then developed through a design process...
  - User-centred
  - Iterative
  - Multidisciplinary
- Design process
  - To be introduced next week
  - See also Rosson & Carroll

The human-computer interface

- The place where humans and computers meet
- The human's image (view) of the computer
  - Allows interaction with the computer
  - Should be invisible, allowing user to focus on task

The human-computer interface in context



The importance of the interface

- Business and marketing
  - The success of the Macintosh
  - "User friendly" systems marketing
- Industry benchmarks
  - UI consumes nearly 50% of development effort
  - "Usability" — 20-40% of software review criteria
- Productivity and safety
  - Productivity improvements, or lack thereof
  - Life or death, e.g., AECL Therac radiation machine
- Caution: Usability without true usefulness fails!

Class Exercise

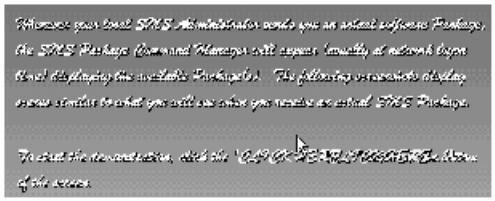
- *Recall an interface that you found problematic and that may even have given you trouble.*
- *In a few words, describe the salient features of the problem.*

Example #1 from the Interface Hall of Shame

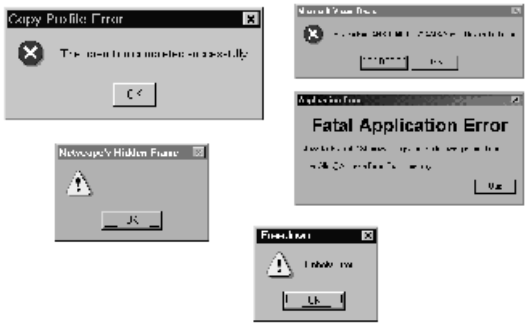
- Do you really want Outlook Express to delete some (mail) items for you?

Example #2 from the Interface Hall of Shame

- Totally unreadable type!!!



More examples from Interface Hall of Shame



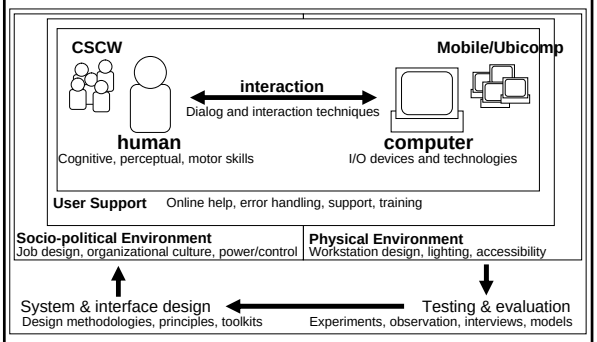
How to do user interface design

- Requires a design process, executed with craftsmanship, thoughtfulness, and care
  - Next week, also see Rosson & Carroll
- Must be rooted in the culture and needs of the users
  - But also be driven by inspiration and leaps of imagination
- Must include iterative refinement incorporating observation, evaluation, and usability testing
- Therefore is best done with a multidisciplinary team

Human-computer interaction (HCI)

- HCI is a scientific discipline
  - Seeking to understand how people use computers
  - Seeking to help in designing computer systems that support people so that they can carry out their activities productively, and in comfort and safety
- Dual concerns
  - Usefulness — The extent to which a system's functionality meets the needs of users and supports their tasks
  - Usability — The degree to which an interface is easy to learn, is easy to use, protects against catastrophic errors, and provides user support
- A multi-faceted, multi-disciplinary endeavor

Human-computer interaction



User interface design and HCI

- UI design (CSC318) — a craft, synthesis, creation
- HCI (CSC428) — science, analysis, understanding

- Goals
  - Design rooted in an emerging science
  - Science grounded in and relevant to design

Objectives of course

- To learn key concepts of interactive computational media and user interface design
- To practice critical thinking about interfaces
- To learn key design approaches, methods, tools
- To participate in a project design team
- To learn about understanding users and their work practices
- To experience prototyping and evaluating systems with real users

Topics (1)

- What are interactive computational media?
- What is design, and how do we do design?
- What design principles can we apply for success?
- What tools can help us design?
- How do we understand work practices as starting point for effective design?
- What sensory modalities are useful for human-machine communication?
- What media are appropriate for communication using these modalities?

Topics (2)

- What interaction techniques can effectively be used for such communication?
- How can we decide if a computer system actually does what we intend it to do?
- What happens when people learn a new system, and how does this differ from skilled usage?
- So that the systems we build are maximally useable, what else must we do other than write the code?
- What are the research frontiers of interactive computational media design?

Non-topics

- CSC300F: Computers and Society
  - What are good uses for computers?
  - What are pitfalls in computerizing organizations?
  - What should we automate and what should people do?
- CSC428F: Human-Computer Interaction
  - How do we build formal models of computer use?
  - What are the frontiers in I/O technologies and devices?
  - How can we evaluate different input devices?
  - How do we design an HCI experiment?
  - What are key issues in the design of interface building tools?

Course Overview (Handed Out)

- Page 1: Important facts + course description
- Page 2: Course objectives + texts
- Page 3: Course calendar
- Pages 4-5: Assigned readings
- Page 6: Project and assignments
- Page 7: Evaluation, photographs
- Page 8: Facilities, web site, staff

Texts

- Mary Beth Rossen and Jack Carroll (2002*). Usability Engineering: Scenario-Based Development of Human-Computer Interaction*, Morgan Kaufmann, available at U of T Bookstore
- Course readings package available at Canadian Scholar's Press Inc. (CSPI)
  - 180 Bloor St. West, Suite 1202, 416-929-2774 … on Bloor St. just West of Avenue Road and across from the ROM
  - Hours (Sept 9 - 20): Mon-Th 9-7, Fri 9-5, Sat 12-4

Staff

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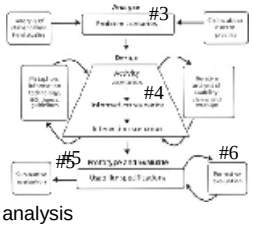
Project: Design for senior citizens

- Teams of four or five



- Assignment 1: Brainstorming
- Assignment 2: Proposal
- Assignment 3: Requirements analysis
- Assignment 4: Activity design and information design
- Assignment 5: Interaction design; prototyping
- Assignment 6: Usefulness and usability evaluation
- Assignment 7: Oral presentation

Course Evaluation

- Photo: 1%
- Assignment 1: 1%
- Assignment 2: 2%
- Assignments 3-6: 12% each
- Assignment 7: 5%
- Class participation: 8%
  - You must read, write, speak, and interact in this course!!
- Final exam: 35%
  - Minimum grade of 35% to pass course

Questions and Discussion

5-minute Break

Designing for Senior Citizens (Second Hour)

- Choosing a problem domain for the design project
- Senior citizens as a client group
- What are the issues (Your turn)
- Maslow's hierarchy of needs
- The opportunity
- Seniors and technology (Your turn)
- Modalities, spaces, objects, tools
- Cautions
- Summing up

Choosing a Problem Domain

- Goal: The class forms a design community
- Therefore need to work on "similar" design problems
- Options
  - Common user community
  - Common application for a common task
  - Common implementation platform
- Some past examples next week

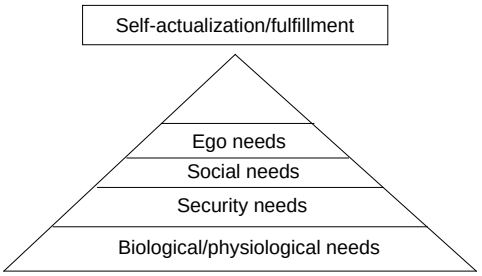
Senior Citizens Design Problem

- This term's choice: Common user community
- Target user community: *senior citizens*
- Thus the design problem is:
  To conceive, design, prototype, and evaluate interactive computational media useful or beneficial for seniors (or at least some subset of them)
- For example, it may assist them with tasks that they normally carry out or help satisfy needs they have

Class Discussion

- *With what tasks/activities are seniors typically engaged?*
- *What are the major needs and problems facing seniors?*

Maslow's Hierarchy of Needs



Maslow's Hierarchy in More Detail

- Biological/physiological needs
  - Oxygen, food, water, body temperature --> Health
- Security needs
  - Need to feel safe, free from danger or perceived danger
- Social needs
  - Love, affection, sense of belonging
- Ego needs
  - Need to feel satisfied, self confident, valuable, esteemed
- Self-actualization
  - Need for a cause, a calling, a sense of vocation, fulfillment

Biological Needs

- Problems
  - Declining health, especially due to cancer, strokes, heart disease, diabetes, dementia including Alzheimer's disease, Parkinson's disease, frailty, stress, fear, memory loss
    - "Old age is not for sissies :-)"
- Opportunities
  - Increased time for exercise to achieve physical fitness
  - Increased control over one's diet
- Tasks and activities
  - Dressing, grooming, eating, carrying out bodily functions
  - Exercising, walking, being proactive about health/fitness
  - Taking medications, seeing doctors, being in hospitals

Security Needs

- Problems
  - Frailty, feeling of vulnerability
- Opportunities
  - Checking up on others
  - Checking in with relatives or caregivers
  - Using alarms
- Tasks and activities
  - Locking doors and windows, ensuring that things are locked
  - Setting alarms, turning off alarms

Social Needs

- Problems
  - Separation from family, friends dying off, no social contacts through a job
  - Loneliness
- Opportunities
  - Lots of time to stay in contact
  - Ability to move near family
  - Ability to communicate via phone, email, instant message, ...
- Tasks and activities
  - Socializing, conversation, communication, enjoying family and friends
  - Writing, phoning, emailing, instant messaging

Ego Needs

- Problems
  - No job, reduced meaningful work
  - Reduced capabilities, declining health and memory
- Opportunities
  - Lots of time
  - Ability to work without concern for compensation
  - Ability to volunteer and pick one's hours
  - Time for personal development, learning, recreation
- Tasks and activities
  - Reading and learning
  - Volunteer work
  - Recreational activities

Self-actualization

- Problems
  - Tendency to dwell on one's own problems, declining health and capabilities, etc.
- Opportunities
  - Time to pursue opportunities for meaningful activities and involvement
- Tasks and activities
  - Writing
  - Documenting family history … (Example: Dallas Read)
  - Mentoring
  - Volunteering

Class Discussion

- *Do seniors use technology?*
- *Under what circumstances, yes?*
- *Under what circumstances, no?*

- *Will they use more technology in the future?*

Heuristics for Computational Media Design

- Sensory modalities
- Spaces
- Everyday objects
- Tools and instruments

HCI and Sensory Modalities

- Sight
- Sound
- Touch
- Speech
- Mobility

Spaces for Seniors

- Homes and apartments
- Senior citizens' centers
- Medical offices
- Specially equipped vehicles
- Designated locations in parking lots, vehicles

- Virtual environments

Everyday Objects

- Doors
- Furniture
- Lights, light switches
- Refrigerators, ovens, dishwashers
- Washers/dryers
- Bath tubs, showers, toilets
- Automobiles, buses
- Radios, televisions
- Books, newspapers, magazines

Tools and Instruments

- Glasses
- Hearing aids
- Canes, walkers, wheel chairs
- Cardiac monitors
- Pill containers
- Telephones
- Computers

Cautions

- Reluctance to try new things
- Lack of ease or facility with technology
- Reduced sensory or motor skills
- Anxiety and fear

Summing Up

- A rich design space
- An expanding target market (U.N. Data on Aging, 2001)
  - 600 million older persons in world today
  - Will grow to nearly 2 billion by 2050 (80M in U.S.)
  - Then will outnumber population of children (0-14 years) for first time in history
  - One of every 10 persons now over 60
    - By 2050 ==> one out of every 5
    - By 2150 ==> one out of every 3
- Access to informants
  - Parents, grandparents, aunts, uncles
  - Neighbors

Questions and Discussion