

The Design of Interactive Computational Media

University of Toronto CSC 318W
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www.dgp.utoronto.ca/people/RMB/318/csc318.html

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Class 1: 7 January 2003

Course Introduction

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

Hour 2: Wearable Computers

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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

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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

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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

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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

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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

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VIDEO example: ePresence — Interactive Webcasting with Structured Archives

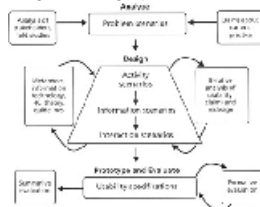
- Highly interactive
- Computes (retrieves) real-time video and archived video, allows navigating and browsing
- Medium that communicates and informs

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

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Designing 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



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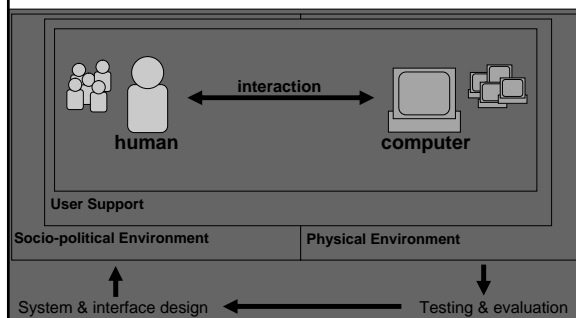
The human-computer interface

- 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



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The human-computer interface in context



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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!

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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.

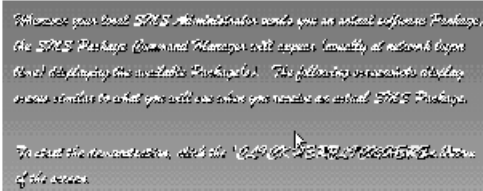
Example #1 from the Interface Hall of Shame

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

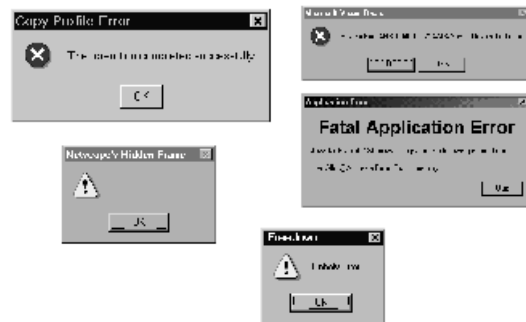


Example #2 from the Interface Hall of Shame

- Totally unreadable type!!!



More examples from Interface Hall of Shame

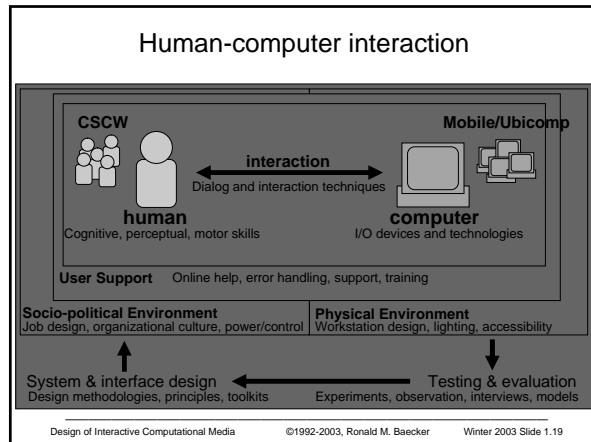


How to do user interface design

- 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



- ### 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
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- ### 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
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- ### 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?
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- ### 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?
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- ### 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?
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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

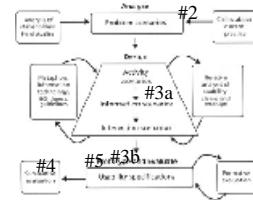
- Mary Beth Rossen and Jack Carroll (2002). *Usability Engineering: Scenario-Based Development of Human-Computer Interaction*, Morgan Kaufmann, available at U of T Bookstore
- Course readings package available at Canadian Scholar's Press Inc. (CSPI)
 - 180 Bloor St. West, Suite 801, 416-929-2774 ... on Bloor St. just West of Avenue Road and across from the ROM
 - Hours: Mon-Fri 9-7, Sat 12-4 (first 2 weeks of the term)

Staff

- Prof. Ron Baecker, rmb@kmdi.toronto.edu
- Admin. Issues —> Kelly Rankin, kelly@kmdi.utoronto.ca
- Teaching Assistants
 - Faye Baron faye@cs.toronto.edu
 - Daniel Wigdor dwigdor@dgp.toronto.edu
 - Michael Wu mchi@dgp.toronto.edu
 - Shengdong Zhao sszhao@dgp.toronto.edu

Project: Design with wearable computers

- Teams of four or five
- Assignment 1: Proposal
- Assignment 2: Requirements analysis
- Assignment 3: Design and prototyping
- Assignment 4: Usefulness and usability evaluation
- Assignment 5: Oral presentation



Assignment 1: Project Proposal

- Assignment 1a: Individual Brainstorming Ideas
 - Come up with 2 ideas
 - Write them up in a paragraph each
 - Submit to the course listserv with a meaningful title
 - Due by Monday, January 13th, 4 p.m.
- Assignment 1b: Group Project Proposal
 - Form a group
 - Brainstorm your various ideas
 - Pick one (or two) and write it up in 3-6 paragraphs
 - Submit to the course listserv with a meaningful title
 - Due by Monday, January 20th, 4 p.m.

Course Evaluation

- !!!Photo: 1%
- Assignment 1a-1b: 4%
- Assignments 2a-4b: 15% each
- Assignment 5: 5%
- Class participation: 10%
 - 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

Design For Wearable Computers (Second Hour)

- Choosing a problem domain for the design project
- Wearables as a design space
- Maslow's hierarchy of needs
- Jobs, tasks, activities, spaces, vehicles, instruments
- Parts of the body, items of clothing, modalities for sensing and affecting
- Individual or group or organization
- Computers and technology
- Cautions
- Summing up

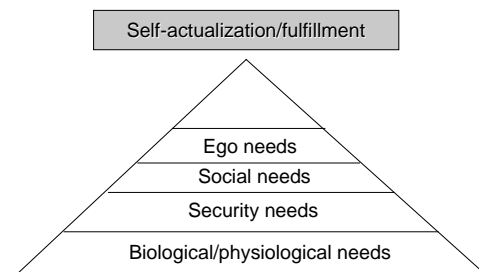
Choosing a Problem Domain

- 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
 - Common technology space
- Some past examples next week

Wearable Computers Design Problem

- This term's choice: Common technology space
- Target technology space: *wearable computers*
- Thus the design problem is:
To conceive, design, prototype, and evaluate interactive computational media based on wearable computers
- But you want to design in terms of specific kinds of users, needs, tasks, etc.

Maslow's Hierarchy of Needs



Maslow's Hierarchy in More Detail

- Biological/physiological needs
 - Oxygen, food, water, warmth, fitness, health
- Security needs
 - Feeling of safety, freedom from danger or perceived danger
- Social needs
 - Love, affection, sense of belonging, family, friends
- Ego needs
 - Need to feel satisfied, self confident, valuable, esteemed; meaningful work and activities; personal development
- Self-actualization
 - Need for a cause, a calling, a sense of vocation, fulfillment

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Heuristics for Computational Media Design

- Jobs
- Tasks and activities
- Spaces
- Vehicles, furniture, appliances
- Devices, tools, instruments
- Parts of the body
- Items of clothing, accessories
- Modalities for sensing and affecting the world
- Individuals, groups, organizations
- Computers and technology

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Jobs

- Doctor
- Policeman
- Fireman
- Pilot
- Plumber
- Teacher
- Parent
- etc.

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Tasks

- Writing
- Walking
- Talking
- Reading
- Planning
- Searching
- Remembering
- Taking care of themselves
- Inspecting things
- Fixing things
- Caring for people
- etc.

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Activities

- Work
- Learning
- Recreation, including sports
- Keeping fit
- Reflection
- Travel
- Shopping
- Social interaction
- Grooming
- Sleep
- etc.

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Spaces

- Offices
- Homes
- Kitchens
- Workrooms
- Vehicles
- The outdoors
- Mountains
- Water
- etc.

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Vehicles, furniture, appliances, etc.

- Automobiles
- Buses
- Airplanes
- Beds
- Chairs
- Tables
- Refrigerators
- Ovens
- Bath tubs
- Sinks
- Radios
- Television
- etc.

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Devices, tools, and Instruments

- Glasses
- Watches
- Wallets and purses
- Keychains and keyrings
- Pens and pencils
- Light switches
- Power tools
- Telephones
- etc.

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Parts of the body

- The head
- The neck
- The chest
- The waist
- The arm
- The wrist
- The leg
- The foot
- The eyes
- The ears
- The mouth
- etc.

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Items of clothing

- Hats
- Vests
- Jackets
- Pants
- Suspenders
- Belts
- Shoes
- Jewelry
- etc.

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Modalities for sensing the world

- Seeing
- Hearing
- Feeling
- Smelling
- Sensing orientation
- Sensing pressure
- Sensing temperature
- etc.

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Modalities for affecting the world

- Moving oneself
- Speaking
- Singing
- Touching
- Grasping objects
- Moving objects
- etc.

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Individuals, groups, organizations

- Individuals by themselves
- Pairs of individuals interacting
- Small groups of interacting individuals
- Organizations
- Communities

Technology

- Processors
- Memories
- Input devices
 - Technologies for sensing the world
- Output devices
 - Technologies for affecting the world

Sample Wearables Research Visions

- Steve Mann @ U of T ECE
- Sandy Pentland @ MIT Media Lab
- Wearable Research @ CMU HCI Institute



Sample Wearables Commercial Product

Products

SenseWear™ Armband

The SenseWear™ Armband is a sleek, compact, easy-to-wear, non-invasive sensor, allowing you to track your calories. Worn on the back of the forearm, it uses a single combination of sensors that measure activity, posture, breathing, heart movement, heart rate, skin temperature, ambient temperature, and skeletal tilt to estimate calories.

For extended functionality, the SenseWear Armband connects to a PC via a USB cable or a compatible wireless device.

- Supports customizer sensor methods and user-set goals
- Acts as a "gateway" to collect data from other third party devices
- Allows data capture & removal from the SenseWear Armband from the body.

Overview | **Features** | **Specifications**



Package includes:

- SenseWear™ Armband
- IEEE 802.11b™ Heart Rate Monitor
- Cable (with power supply and serial port connection)

Sample Wearables Commercial Product



go to TOP

IBM Japan and Citizen Watch co-develop a wristwatch computer

Oct 25, 2000

IBM Japan and Citizen Watch announced that they have jointly developed a prototype of "WatchPad," a 1.5-inch wireless PDA convergence with the capabilities of PDA's handheld.

WatchPad is based on 32-bit MPU and incorporates 8-Mbyte DRAM and 17-Mbyte Flash. EEPROM. It includes QVGA (320 by 240) color LCD device, a voice-compatible photo and infrared data communication accessories equipped. WatchPad is the first device that was developed by applying the mechanisms of industrial watch data are captured as devices for primary functions. In addition, WatchPad comes with the program areas for time, identification and accelerated sensor for recording the various angles of the bodies when used and monitoring the movement of time.



Sample Wearables Commercial Products

Affordable Clip-On Display!

The new Mirra Optical SV Clip-On Display is designed to be used with any computer, laptop, or PDA. It features a 1.5-inch color LCD display, a 1.5-inch touch screen, and a 1.5-inch camera. It is available for purchase at \$199.99.



Matias Corp.



Charmed Technology

Your SmartBadge is the CharmedBadge

The CharmedBadge is a sleek, compact, easy-to-wear, non-invasive sensor, allowing you to track your calories. Worn on the back of the forearm, it uses a single combination of sensors that measure activity, posture, breathing, heart movement, heart rate, skin temperature, ambient temperature, and skeletal tilt to estimate calories.



Summing Up

- A very rich design space
- An important new research frontier
- An expanding commercial opportunity

Questions and Discussion