HCI Application: The Future of HCI

Humans Technology Task Design Organizational & Social Issues

Jobs, internship, etc

Jobs:
- http://listserv.acm.org/scripts/wa.exe?A0=CHI-JOBS

Internship:

Graduate advisor?

Top 10 Most Frequently Cited CHI Authors
- Stu Card (484 citations)
- Bill Buxton (351)
- Thomas Moran (344)
- Ben Shneiderman (322)
- Hiroshi Ishii (298)
- Brad Myers (287)
- Jakob Nielsen (286)
- Allen Newell (222)
- Jock Mackinlay (217)
- George Robertson (215)

SIGCHI Award Recipients:
(http://www.sigchi.org/documents/awards/)

Authors in multiple significant HCI journals:
http://eprints.rclis.org/archive/00012942/01/Meho-Rogers.pdf

Authors in Handbooks of HCI:
http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=11330

Check HCI programs:
http://www.hcibib.org/education/

Psych contribution: Theory-driven Design

Why theory, especially now?
- Advances to GUI desktops arguably stalled
- Lots of evolution on designs but less new theories
- Many new tools used both singly and by multiple people
- A way to guarantee progress
- Invite new disciplines to work in HCI
- Cognitive neuroscientists, biologists, ethicists?

The importance/role of theory
- Descriptive: clarify terms, key concepts
- Explanatory: reveal relationships and processes
- Predictive: about performance and situations
- Prescriptive: convey guidance for decision making in design by recording best practice
- Generative: enable practitioners to create, invent or discover something new

Cocktail Party Phenomenon

Cocktail party problem
- How is it that out of a sea of voices we can focus on a single conversation?

Cocktail party effect (Moray, 1959)
- While you are usually unaware of identity of words in a non-attended conversation…
- A notable exception is your name

Attenuation Theory of Attention (Treisman, 1960)
- Blocking out the irrelevant content easy until….
- It's semantically meaningful or important to you

Guidelines for speech communication applications, cockpits, etc.
- Provide a mechanism to “pull” one voice into focus
- Do not present too much information simultaneously
- Provide enough time for the user to fully fuse streams if necessary
VeriChip
► FDA approved implantable chips
► RFID tags transmit data via radio (already in your passports)
► Rooted in the skin for accessing medical records
► Privacy issues are becoming pervasive in our research
► What are other issues?
► What theories can inform design of such system (both at hardware and software levels)?

Using Norman’s model predictively...
► Miyata & Norman (1986)
  ▪ Predicted interruptions between task execution and evaluation as less harmful when multitasking
► Attention-based principles of notification, Czerwinski et al, Microsoft, 2000, tested this model using IM and multiple tasks
  ▪ Examined planning, execution and evaluation phases of tasks
  ▪ Early in a task was the worst time to interrupt if you want user to remember
  ▪ Make notifications situation-aware
  ▪ Look for cognitive breakpoints in users’ interactions.
  ▪ When possible, use smart monitoring
  ▪ Monitor the user (what stage in task?)
  ▪ Content of interruption—similar is better

Explanatory Theory Example
► Norman’s seven stage model of interaction from POET (Psychology of Everyday Thing, 1988)
► An approximate model with a continuous feedback loop

Predictive Theory Examples
► Large display research (Tan, Czerwinski & Robertson, 2001-2003)
  ▪ Most early research carried out around cockpit design
  ▪ New hardware often necessitates the need for new software/interaction
  ▪ Serendipitous gender and spatial cognition findings based on theories of perception and cognition

Prescriptive Theory Examples
► Gestalt Theory of Perception
► Feature Integration Theory (Treisman et al., 80s) → feature search (performed fast and pre-attentively for targets defined by primitive features) & conjunction search (serial search for targets defined by a conjunction of primitive features);
► Utilized well in design guidelines today for guided visual search and pop out effects

Generative Theory Examples
► Buxton’s 3-State Model of Graphical Input (1990)
► Pointing devices follow an STD of 3 states: out-of-range, tracking and dragging
► Hinckley et al. (1998) extended the ideas to add notation for continuous properties during state transitions of devices
Crossing – more than dotting the i’s

Why crossing?
- increasing interaction vocabulary
- Pen based computing

How does crossing compare with pointing?
- What is the theoretical foundation of crossing?

Computing off the desktop

Desktop computing “workstation” interface foundation
- Large and personal display
- Input device (mouse)
- Typewriter keyboard

HCI Frontier – beyond the desktop
- Interfaces without display–mouse-keyboard tripod
- Numerous difficult challenges

Alphabetically Tuned and Optimized Mobile Interface Keyboard (ATOMIK)

English Letter Corpus (News, chat etc)

METROPOLIS “random walk” optimization

Zeigarnik Effect (1927)

The Marriage of HCI and Games

There are many things HCI community can learn from the games community
- Effortless community: forming groups and participating
- Learning by watching: Learn from more experienced users
- Deep customizability: customizing for each individual user
- Fluid Human-Computer Interaction: transparent interaction with minimal disruption to the main activity
Effortless Community

► Motivation
  - Communities serve as valuable resources
  - Comment on content
  - Resolve problems
  - Provide collaboration

► Challenges for general HCI applications
  - Participation occurs outside of the application
  - Interaction is often asynchronous (i.e. newsgroup)
  - Ability to find or form the right subgroups is limited as users are often disconnected and unaware of others

► Why are games successful in community building?
  - Nature of games (multi-player, guilds, friends)
  - Host servers enable gamers to host communities on their own game servers
  - Others?

Learning by watching

► Motivation
  - Proven benefits of observational learning (remember developmental psychology?)

► Challenges for general HCI applications
  - Users are distributed, not face-to-face
  - Requires embodiment and workspace awareness
  - Requires understanding of detailed actions

► Why are games successful in learning by watching?
  - Clearly conveys embodiment, real-time awareness, and task based info
  - Allows easy interpretation of fine-grained actions, e.g. 3D Avatar in GhostRecon - crouch, crawl, jump, run, open doors, and pick up items
  - Others?

Deep customizability

► Motivation
  - “There is no single configuration best for all tasks.”
  - Increase efficiency & usability

► Challenges
  - Usually takes effort to customize

► Why are games successful?
  - Anything-goes UI malleability (UI element locations, new command container, remap controls)
  - Natural extensibility - Macros: Everquest: 2 mouse clicks vs. MS Word: 7 actions before starting, 5 more to place onto a toolbar to use
  - Portable customizations - “Mod kits” for simplifying creation, editing, and installation of extensions, layouts and skins - even novice users can use
  - Others?

Fluid HCI

► Motivation
  - Minimize disruptions to work flow
  - Less user attention
  - Less user effort

► Why are games successful?
  - Calm messaging – spatialized environmental sound, gradually fading text, scrolling message area
  - Attention-aware interface elements: transparency levels reflect user attention
  - Context-aware view behaviors: Neverwinter Nights: 3 camera behaviors; easy to toggle using key shortcuts

The Marriage of HCI and Robotics

► In the past: animated but sessile

► In the present: social mobile robot

► Invasive: shared physical space
  - extended interaction context: the human social-physical frame
  - social communication as a co-habitant
  - incidental & opportunistic interaction

► Asynchronous; episodic
  - demands intentional transparency
  - active communication acts (social competency, expressiveness, perceptual action)