COGS 1 – FA07: Week 10


How lives are changing with interactions with screens (cell phones, and application)
Projects:
- Infinite resolution sheet of paper – zoomable technology
- Producing record of everything occurring in vehicle, monitors, hands, feet, eyes, speed, etc.
- Pens becoming computing data

Computers – produce a new kind of stuff out of which to fashion dynamic interactive representations and systems to assist through:
- Communication
- Thought
- Collaboration
- Action

Expanded uses of computers: **Mimic existing media, create new media, create models, virtual worlds, combine real and virtual**

Morphable model for the Synthesis of 3D faces:
- Combines 3D shape and texture information of 200 faces; creates average face that can be transformed along many parameters

Image Resizing
- Content-aware resizing

Touch interaction
- Acrylic surface using infrared light to interact using hands directly

New generation of projectors

Changes in computing
- Camera is used in conjunction with projector
- Unbundling of the monolithic computer
- Power and ubiquity of computing
- Boundaries between physical, digital, and social world are becoming permeable

Move computation into kids’ hands throughout the world: One Laptop per child
- Camera
- Mesh wireless network

Da Vinci surgery robot
- Produces 3D image through much smaller opening in the body
- Wrists support real wrist movements
- Possibilities of doing surgery remotely…

Rekimoto (computer research lab in Tokyo): Augmented surfaces
- Projectors project onto table, camera above table
- Drag physical things from table to desktop

**Very little technology is being designed thoughtfully**

**Key to understand how people are in their social context**

Bridging the gap between digital world and pen and paper
- Important to know history of ideas
- Xerox XLibris
  - Mark-up digital doc => tablet computer
• With computers, no need for paper: however, Myth of Paperless Office - paper not going away
  o Digital does not afford same properties
• Web
  o Paper still didn’t go away
• Possible solutions to digi-paper divide
  o Make one technology more like the other
  o Make them be able to interact with each other
    • Pen technology
      • Camera on pen
      • Special kind of paper with dot-pattern
        o Pen know where on paper it is – path that pen takes at what time: records writing
      • Upload proof reader marks
      • Checked and linked to digital reference automatically
      • **Use commands to have markings produce specific actions (copy-paste, stitch together too pieces)
        o google text off of page
        o gesture note in email from document

“Every 18 months computing power doubles”

Goal – build intellectual and social places of the world
Beautiful places that we would want to be

Recommended Reading:
Weaving the Web by Tim Burners Lee

David Kirsh – Designing Future Environment

Interaction design in environments
  • capacity for elements to respond in a more complex manner
  • Technology outpacing design
  • How to study how we interact with each other

Dr. Kirsh’s projected technologies
  • Data walls
    o Could be embedded with sensors
    o We could all interact with white boards
    o We would have to arbitrate who can access what and when
    o Micromotors fifteen years ago 300000 RPM, everything will be on internet
  • Internet everywhere and wireless everything
    o RFID’s on everything
      ▪ Passive – works like “tuning fork”, same as tags on clothing
      ▪ Active – has its own energy source
      ▪ Supermarket could access information, inventory control, interaction with supermarkets
      ▪ Creating ecologies of artifacts: whole environments of artifacts that interact with each other
  • Near-field haptics
    o Objects that know their orientation
    o Interesting interactions with regular devices
  • Easy telepresence
    o High bandwidth lines make more realistic
  • Effective digitalization of paper
Paper in contact with computer/internet

- Sensors make it easy to cross from physical to digital
- Rooms can become context aware

In order to effectively design interactive environments, we must look at how people interact with their environments, what constrains design, how perceptual systems work.

New Cognitive Theory

- People are embedded in their environments
- Premise to studying design: we are closely coupled to environment
  - How do we design that coupling
    - Analogy: Design of building constrained by materials used
      - Material science guides architects
      - Physics guides engineers
    - Create vs. Project Structure
      - Paradigm of cognitive psychology limits observation of “natural” cognition by not allow subject manipulation - stimuli unchanging in experiments
    - We actually use Dynamic coupling
      - Re-arranging search space
    - Complimentary/Epistemic actions
      - Example: in counting, fingers are used to compensate for perceptual limitations

- Study how perceptual systems works
  - Ex. Tetris
    - In studying how perceptual processes work in playing tetris – there are not fewer superfluous actions for experts => Rotation task accomplishes something, compensates for limitations
    - Physical rotation faster than mental rotation

How to compare two environments:

- One better if we can push speed-accuracy curve toward origin
- Errors on interruption
- Cognitive measures
  - How much cognitive activity required
  - Example, if abundant space
    - No need to schedule, optimize, or swap

Externalization

- Ex. Cubic structure
  - When in mind’s eye, sustaining under intention yet only external representation can transpose from one representation to another

  Representation shifting
  - Hard problem can be made trivial with right representation
    - Example: Prove \((A + B)^2\)
      - Easy to show if using area of a square to solve

- Recognition vs. Recall: Harder to remember than recognize something
  - Faster to show radio buttons than have drop-down menu
  - Hiding vs. clutter
• How do you hide what you don’t need to see and show what you need to see without creating clutter
• Bad interface: No distinction between parent and family
• Better: Family is in boxes
• Now: Choices shown in choices

- **Coordinating Mechanisms**
  - Diagrams for dancing
  - Clocks
  - Lists, agenda
  - Cup – the most sophisticated mechanism in Starbucks
    - takes errors out of remembering orders and sequence
    - preserves ordering/sequence => fewer error => coffee faster