CMSC 838G
People, Paper and Computers

François Guimbretière
CSI 2120 Tue-Thu 3:30-4:45
Background
Key questions

• Can we design a digital interface as good as paper?
  – For a digital table?
  – For a tablet computer?

• Can we blur the boundary between computer and paper?
  – Can we seamlessly use paper while editing digital documents?

• How do these techniques compare?
  – Digitally enhanced paper
  – Tablet computer
  – Table top
Affordances of paper
(See also Sellen and Harper)

• Quick, flexible navigation
  – Two-handed interactions
  – Tactile feedback

• Reading across more than one document at once
  – Use of spatial layout
    • No interface needed
  – Writing on a pad while reading a document

• Easy to mark-up
  – Very flexible
    • Large format
    • no power needed...
  – Paper is static so we focus on the editing

• Collaboration medium
  – Socially accepted conventions
Paperless offices

• Use paper as a transient medium
  – Keep digital records
  – Create a hard copy
    • Easy navigation
    • Easy annotations
    • Easy collaborations
  – Modify the digital records
  – Shred paper documents
Tablet PC

• More paper like?
  – Interaction with the Digital table
  – Simultaneous editing of several documents
    • Tablet PC cluster
      – 2 or more TabletPCs linked together
      – One TabletPC linked to many thin clients
        – Connected through UWSS links
    • Each member is a physical window
      – Fluid interfaces

From Sellen and Harper
Digital Table

- High resolution (64+ dpi)
  - Projected/LCD

- Tracking
  - Tools
    - Pens...
  - Non-instrumented tracking of the non-dominant hand
    - FingerWorks
    - SmartSkin [Rekimoto ’02]

- Two-handed fluid interactions
  - Tools and commands with dominant hand
  - Context with non-dominant hand
Anoto paper: typical use

- Collect and send information to a computer
  - One way channel
- Key applications
  - Calendar
  - Form filling, Note taking…
Family calendar project

- Different family members prefer different input modalities
  - Teenagers might use a PDA or a cell phone
  - Parents might use Outlook
  - Grandparents might prefer a paper based calendar
  - All might use a calendar posted on the fridge
Real world note taking
Paper augmented digital documents

Edit
Share
Distribute

Merge with digital documents

Print with Anoto pattern

Proofread
Annotate
Discuss

(AnotoID, pageID)
Proofreading

• Most people use paper
  – More convenient
  – Better collaboration
    • IMF example

From Sellen and Harper
Proofreading using Anoto paper

Print on Anoto paper

(AnotoID, pageID)

Proofread
Annotate
Discuss

Paper World

Computer World

Merge annotations
(They flow with text!)

Share
Distribute

Edit
Architecture and design

Initial design

Capturing as built design in the field
The RECALL™ system

- Developed at Stanford by Dr Renate Fruchter’s group
- Capture and synchronize strokes, audio and voice
- Use strokes as an indexing mechanism during replay
Combining Recall and Anoto

- Update
- Share
- Distribute

Merge within Recall document

Print on Anoto paper

(AnotoID, pageID)

Computer World

Paper World

Voice/Video

Annotate
Paper only display system?

- “Print, proofread, print” cycle
- A paper based Palm Pilot?
- A designer note book?

Update
Share
Distribute

Proofread
Sketch
Annotate
Discuss
Paper-Computer synergy

- **ATC flight strips**
  - Use to keep track flights
  - Reliable, failure proof
  - Move toward digital-only difficult.

Compute
Detect
Fail

ATC system

Anoto paper world

Print Anoto flight strip

Annotate
Organize
Share
Rely upon
CMSC 838G Administrivia

• Instructor
  – François Guimbretière

• Human computer interaction
  – Large interactive surfaces
  – Information Visualization

• Office hours (Room 3267 AVW):
  – Mon 1:30pm – 3:30pm
  – or by email any time: francois@cs.umd.edu
  – or by appointment
Student info

- Name, e-mail
- Are you taking the class for credit?
  - Comps?
- Why are you taking the class?
  - Goals
  - Topics you would like to be covered in the class
- Additional comments
Work load

• Reading
  – Textbooks and papers
  – ~1-2 papers per class

• In class presentation and discussion
  – Paper reviews
  – Project presentations

• Project
  – 1 project, 4 checkpoints
  – Project proposal due Feb 13
What you will learn

• People, Paper and Computers
  – Affordances of paper
  – Paper as a social medium
  – Paper based user interfaces
  – User interfaces for digital paper

• Experimental design
  – User study fundamentals
  – Basic experimental designs
  – Non-traditional experimental designs
  – Interpretation of experimental results
How you will be evaluated

• Participation: 10%
• Presentation (reviews, project): 20%
• Project: 50%
• Final 20%
Texts

• Required text

• Course web sites:
Reading for This Thursday

- MPO: Chapter 1 & 2
Previous work (Annotation)

• Wang FreeStyle system [Wang 89]
• MATE [Hardock 93]
• XLibris [Schilit 98], [Golovchinsky 02]
Previous work
(Paper/Computer interaction)

• Projecting on to paper
  – DigitalDesk [Wellner 93]
  – Ariel [Mackay 95]

• Linking with the digital world
  – PaperLink [Toshifumi 97]
  – Intelligent Paper [Dymetman 98?]
  – Anoto
  – A-Book [Mackay 02]

• Independent paper interaction
  – Xax [Johnson 93]
  – Paper PDA [Heiner 99], [Avrahami 01]