

Pen and Document Applications

CSEP 510
Lecture 7, February 19, 2004
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Announcements



Outline

- Office applications
 - Whiteboards
 - Note taking
 - Annotation
 - Reading

System level contributions to HCI

- Must have a clear understanding of the application domain
 - Goals for system
- Implementation
- Evaluation or deployment experience

Technology focus

- Enabling technology
 - Wall sized displays
- Technological innovations
 - Flow menus
 - ZoomScapes
- Work process
 - Designer brainstorming

Whiteboards

- Electronic Whiteboards
 - Tivoli
 - Flatland
- Wall sized displays
 - Stanford Interactive Mural
 - Tape Drawing

Enabling Technology

- Electronic whiteboards
 - Office size whiteboards – 5' x 3'
 - Moderate resolution
 - Projection capability
- Direct manipulation important
 - Gestures and body language
- Physical motion must be taken into account

Tivoli Scenario

- Group meeting scenario
 - A small number of people collaborating around a whiteboard
 - Multiple writers
 - Meeting record a secondary scenario

Tivoli Design Features

- Surface model
 - Meeting generated sequence of slides
- Pen based UI
 - Large display issues
 - Multiple pens
 - Pen state vs. system state
 - Selection
 - Generalized *wiping*
 - Gestures
 - Mode control
 - Postfix: Select, Command Gesture, Command
 - Double tap used in version 1.0. Problem case - To:

Flatland Scenario

- Office whiteboard
 - Informal use – support for thinking tasks
 - Pre-production work
 - Everyday content – context dependent
 - Material often clustered
 - Personal and semi-public roles

Flatland goals

- Low threshold for initial use
- Support informal pre-production tasks such as to do lists and sketching
- Support clustering of content
- Support context aware interaction and infrastructure
- Support dynamic use of space
- Support semi public and private use

Flatland

- UI – gestures and pie menus
- Managing space
 - Segmentation of space
 - Non-overlapping
 - Automatic
 - Dynamic resizing
 - Active segments (zero or one)
 - Moving segments and resizing
 - Inactive segments bumped out of the way

Behaviors

- Add computer support for typical whiteboard tasks
 - Todo lists
 - Sketching
 - Maps
 - Calculator
- In Flatland, behaviors are explicitly set, but other systems implicitly recognize and classify actions.

Stanford Interactive Mural

- Interactive Wall
 - Greater area and precision than electronic whiteboard
- Wall interactions
 - Design studios
 - Post-its, sketches put up on a wall
 - Goal – benefits of both physical wall, and digital capture

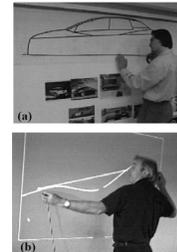


Stanford Interactive Mural Technology

- Custom made large screen displays with massive computing power
 - Twelve 1028x768 digital projectors
 - 32 Linux PCs + 1GB/sec local network
- Integration of scanning
- Software ideas
 - Flow menus
 - Zoom scapes
 - Handwriting recognition + drag and drop for parameter input

Tape drawing

- Novel curve input technique
- Used for large scale, wall drawings
- Digital implementation

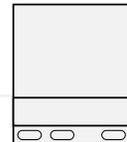


Shared Notes

- Notepals
 - Portable note taking
- Livenotes
 - Collaborative note taking
- Audio notebook
 - Augmented Paper based notetaking

Notepals

- Enabling Technology (1997)
 - PDAs / Web
 - 160 x 160 pixel display
 - Focus area / Overview area
 - Docking causes notes to be uploaded
 - Browsing interface



Notepals

- Results
 - UI issues – slower writing and reading
- Shared note taking study
 - Group took meeting notes on small paper pads
 - Avoid the UI problems of NotePals
 - Assemble the notes into meeting record
 - Difficulty reading each others handwriting
 - Especially when notes of different note takers were interleaved.
 - Combined notes by note taker
 - Added off-line hand writing recognition

Meeting record

- Minutes created from jumble of personal notes
- Lack of coherence
- Key insight – use a single unifying document for structure
 - Lecture slides as mediating artifact

Livenotes

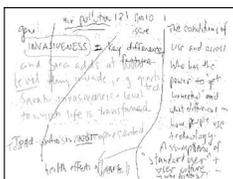
- Collaborative note taking
- Wireless Tablets for note taking
 - Clio – Tablet PC
- Shared writing space



Livenotes

- Distributed dialog
- Pedagogical view
 - Students learn through distributed dialog
- Emphasis on interaction, not on recording
- Minimalist interface

Livenotes Behavior



Livenotes

- Results
 - Successful at supporting in-class discussion
 - 3-7 participants
 - Substantial amount of writing related to lecture (87%)
- Behavior changed over time
 - Phases of lecture
 - Veteran / Novice user

Note coding

- Content
 - Summary
 - Expansion of themes
 - Unrelated
 - Humor
 - About Livenotes
- Management
 - Linking disjoint spaces
 - Marking territory
 - Highlighting someone else
 - Self-highlighting
 - Page hello / navigation

	Daniel	Alastair	Greg	Kim
1				
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Pen and Audio and Paper

- Audio Notebook
- Playback of audio with text notes
- Paper notebook implementation
 - Audio capture
 - Playback with audio cursor and audio scrollbar

Audio notebook



Fig. 1: Audio Notebook version 1. A user can randomly access parts of the audio recording by pointing to a location in his/her notes.



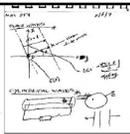
Fig. 2: The Audio Notebook version 2.

Study methodology

- Observe small number of long term users
- Real situations requiring review
 - Student note taking
 - Reporter story writing

Student 1

- Rapid skimming for post lecture review
- Listening time 1/3 of initial time
- Audio scrollbar used for skimming control
- Meaning of notes often not clear to student
 - Explicit review of cryptic notes
 - Review of notes marked with ?



Student 2

- Took sparse / outline notes and relied on audio for detailed review
- Review time over 100% of original
- Rewrote notes during review

Reporter 1 & 2

- Review interview and playback quotes to get verbatim transcript
- Reporter 1 relied primarily on audio scrollbar
 - Sometimes accessing material not linked in notes
 - Audio scrollbar vs cursor: 124 to 38
- Reporter 2 used cursor to efficiently locate quotes
 - Initially very skeptical of value
 - Audio scrollbar vs cursor: 22 to 41

Document Annotation

- XLibris
- Annotation positioning
- Reflowing annotations

XLibris Project

- Active readings with free form digital ink annotations
- Essentially, building a tablet pc

Annotation behavior

- What do people annotate in documents
- Style and use of annotation
- What defines an annotation

Annotations

- Frozen document
- Changing documents
 - Content changes
 - Layout changes
- Orphan problem
 - Annotations that cannot be anchored in modified document

Positioning annotations in changed document

- Annotation anchoring
 - Anchor range
 - Surrounding text
- Annotation positioning algorithm
 - Approximate string match for annotation and surrounding text

If lawyers are disbarred and clergymen defrocked, doesn't it follow that electricians can be delighted, musicians denoted, cowboys deranged, models deposed, tree surgeons debarked, and dry cleaners depressed? Last night I played a blank tape at full blast. The mime next door went nuts. If a cow laughed, would milk come out of her nose?

Annotation study

- Brush et al. CHI '01
- Paper pilot study
 - Participants given annotated document
 - Asked to transfer annotations from original to modified document
 - Compare their placement of annotations with algorithmic placement
- Pilot results
 - Difficulty in transferring annotations
 - Difficulty in working with other peoples annotations

Annotation study

- Analyze users reactions to algorithmic movement of annotations
 - Annotate document
 - Automatically transfer annotations to a modified document
 - Evaluate quality of anchors

Annotation study results

- Anchor text unchanged rated highly
- Anchor text moved rated highly
- Anchor text modified
 - Annotation orphaned
 - Medium score
 - Partial match found
 - Medium score. Higher score for longer match

Annotation study conclusions

- Surrounding context is less important
- Focus on keywords in annotation anchor
 - Based on user comments "should have got this one"
- Orphan annotations with a tenuous match

Hand written annotations

- Issue – how do annotations change when document layout changes?

The quick brown fox jumped over the lazy dog and the dish ran away with the spoon while little Miss Muffett sat on her tuffet and ate four and twenty blackbirds baked in a pie.

The quick brown fox jumped over the lazy dog and the dish ran away with the spoon while little Miss Muffett sat on her tuffet and ate four and twenty blackbirds baked in a pie.

Handwritten annotations

- Anchoring annotations
- Re-rendering annotations
- Cleaning up annotations

Results

- General support for reflowing annotations
- Rich variety of annotations
- Anchor identification often ambiguous
 - UI for specifying anchors
- Cleaning annotations changes expectations

Table 1: Frequency of annotation types created by participants.

Annotation Type	Total	%
underline	118	31%
highlight	102	27%
marginia	90	24%
circle	44	12%
margin bar	25	6%
Total	379	100%

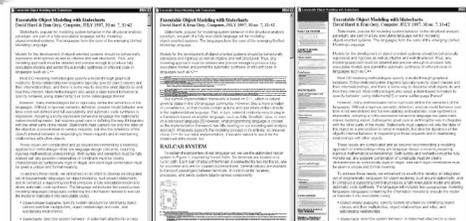
Reading electronic documents

- Presenting electronic documents for reading
 - Presentation format
 - Evaluation

Document reading

- Scenario
 - Read to learn
 - Read to do
- Layout approaches
 - Linear
 - Fisheye
 - Overview + detail

Layouts



Linear

Fisheye

Overview + Detail

Experiment

- Evaluate subjects ability to perform tasks based upon reading
- Write essay, answer questions afterwards
 - Essay quality
 - Incidental learning questions
- Direct question answer from papers

Results

- O+D had significantly better essay scores than L and F
- L and O+D had significantly better incidental learning scores than F
- No significant differences in question answering
- Subjects has a significant preference for O+D
- Efficiency
 - Essay significantly faster using F than O+D or L
 - Question answering significantly faster using L then O+D

Lecture summary

- n Systems
- n Scenarios
- n Evaluation