Schedule

- 4/5
- 4/12
- 4/19 Information Visualization
- 4/26 Programming by Example
- 5/10 Pen computing
- 5/17 3D User Interfaces
- 5/24 Real world Computing
- 5/31

End-user Programming, Prediction

(Programming by Example / Demonstration)

- MetaMouse, Eager, Chimera, repeat&predict, Pobox
- BitPict, Agentsheets, Viscuit

Multimodal User Interfaces

- Put-that-there,   , VoiceAsSound

Pen-based User Interfaces

- Devices
- Projects
  - Text input methods
  - Electric board
  - Support for creative activities
  - Drawing applications
- Discussion

Introduction

Desktop computers
⇩
More diverse devices

PDA   Whiteboard   Desk   TV   Car

Small, large, invisible…

Introduction

Desktop computers   GUI
⇩
More diverse devices   Voice/audio
Small, large, invisible…   Gesture
                            Haptic
                            Pen

Outline

- Devices
- Research projects
- Discussion

Pen-based Devices

- PDAs
- Portable Pen computers
- Display integrated Tablet
- Electric whiteboards

PDAs

Sharp

Palm Pilot

Casiopea
(Windows CE)

Personal Information Management (PIM)

Portable Pen Computers
(Tablet PCs)

Warehouse, sales, etc.

⟹ Office & Home (?)
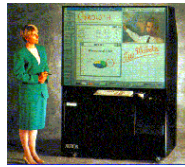
Display Integrated Tablets

Wacom
Tablet

Wacom
LCD tablet

Mutoh
LCD tablet

CAD, CG   Medical applications

Electric white boards

Xerox Liveboard   SMART Board   Idea Board

Meeting support

New devices are getting available!

But UI remains unchanged…

- Standard GUI (Buttons, sliders, etc.)
- Character Recognition
- Handwriting notes (Paint brush)

We need interaction techniques
that make the most of pen computers

Research projects

The Strength of Pen-based Interface

- Handwriting texts
- Gestures
- No keyboard situation (PDA)
- Support for creative activity
- Drawing a picture

Pen-related Research projects

- (Character recognition)
- Text input methods without recognition
- Electric boards
- Support for creative activities
- Drawing applications

Text Input methods

Alphabet
- Unistroke
- Graffiti
- Quikwriting

Unistroke

Single stroke per character

Graffiti

Used in Palm Pilot

Similar to original shape than Unistroke

EdgeWrite
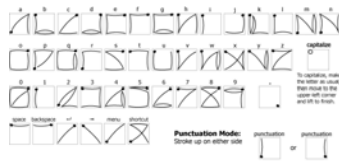
Quikwriting

"the"

Single stroke per *word*
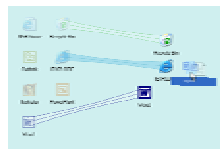
Electric Whiteboards

- Tivoli
- Idea board
- Flatland

Drag and Pop

Drag and Drop for large displays

..dp

Pick and Drop

[Rekimoto 1997]

- Data transportation among multiple devices
- Pen version of Drag and Drop
- PDA to PDA, Whiteboard to PDA, etc.

.. pickanddrop

Flatland (Xerox PARC)

- Applications based on handwriting input/output
- Layout control to prevent overlapping
- Automatic storage and context based search

Desktop PC	Flatland
Static, goal-oriented	Dynamic, exploratory
Keyboard, click, drag…	Inking
Typed text	Handwriting text
Persistent window	Dynamic segmenting
Dominant application	Pluggable behavior

Support for Creative Activities

- SILK, Denim
- Cocktail Napkin
- Music Notepad
- ASSIST
- Formula Editor
- MathJournal
- MathPad^2

SILK (UC Berkley)
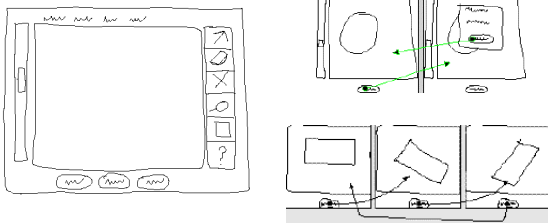
- GUI prototyping
- Widget

silk

Denim

[Berkley, Lin 2003]

- Web site design
-

..denim_talk.rm

Suede

-
- Wizard-of-Oz

.suede

Music Notepad (Brown Univ.)

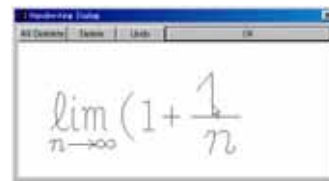- Music score editing based on gestures

Video

demo

ASSIST
(MIT Media Lab.)
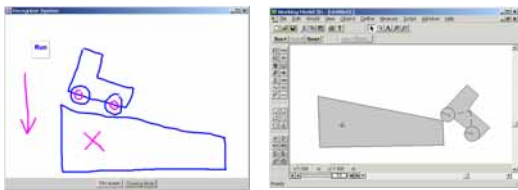
.. assist.wmv

Formula Editor (   )

$$\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)$$

Tex
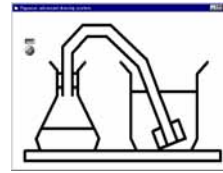
..demo.exe

MathJournal

Mathematica

..xcalc.wmv
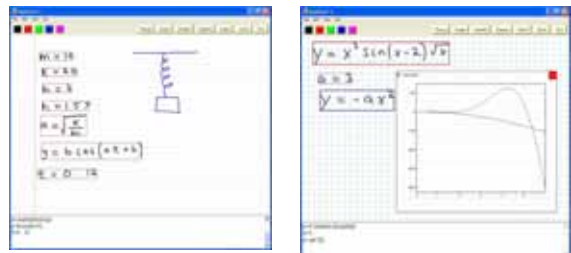
MathPad^2

.. mathpad.mp4

Drawing Applications

- Spline editing
- Pegasus
- SKETCH
- Teddy

Pegasus [Igarashi 97]
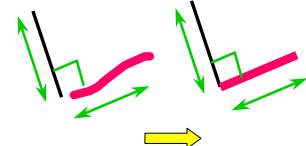
Example   Beautification

- Beautification based on geometric constraints
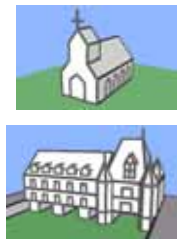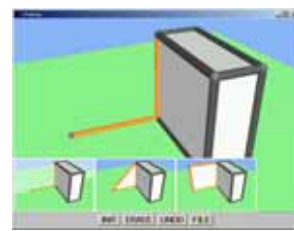- Prediction

SKETCH [Zeleznik 96]
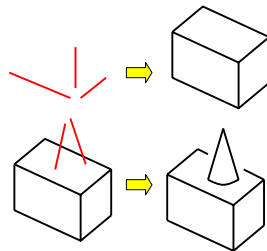
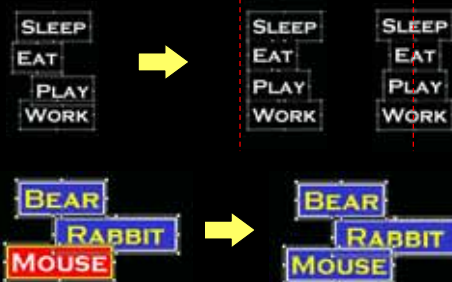- 3D scene construction using gestures.
- Stack of primitives
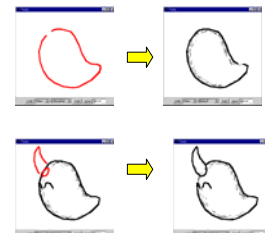
. sketch.avi

Chateau [Igarashi 99]

User interface using hints and suggestions
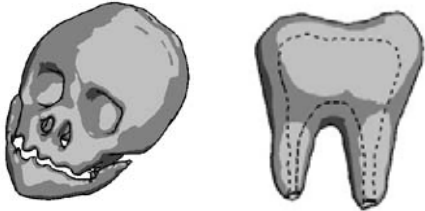
Other applications (e.g. PowerPoint)

Teddy [Igarashi 99]

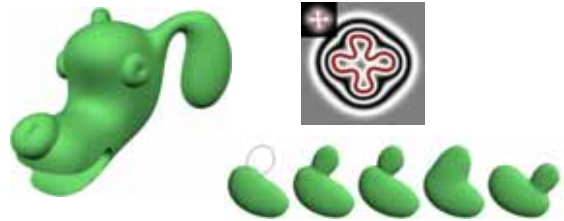- 3D modeling by silhouette sketching

Volume Teddy [Owada 03]
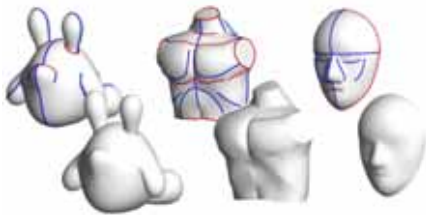

- Using volume representation

.vteddy.avi

Shape Shop [Schmidt 05]

- Using implicit representation

..Schmidt05.mpg

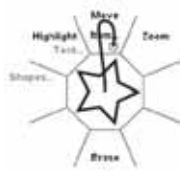## FiberMesh [Nealen 07]

- Using Optimization

Others

- Menus
- Crossing UI

PieMenu   MarkingMenu   FlowMenu

Crossing Interfaces

[Accot 2003]

(a) Pointing a target   (b) Crossing a goal

- Pen

CrossY

[Guimbretiere 2004]

- Crossing
-

.. crossY.mov

Scriboli

[Hinckley 2005]

-

.Scriboli.wmv

Fold n' Drop

[Dragicevic 2004]

-

foldndrop

Discussion

Paper and Pen

- Annote-Pen
- Papier-Craft
- Pen-top Feedback
- FlyingForm

The strength of pen-based Interface

- Handwriting texts (fast & flexible)
- Gestures (fast & keep focus)
- No keyboard situation (PDA)
- Support for creative activity
- Can express a shape directly