Re-engineering the CDE/Motif Graphical User Interface for Pens Computing with X

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How Does a Pen Change the GUI?

- Physical Difficulties
- Reduced Accuracy
- Increased Importance of Feedback
- Reduced Screen Real Estate
- No Keyboard

Modifying the Software Platform for Pens

Add Handwriting Recognition

- Add limited enhancements to desktop GUI (e.g. digital ink).
- Add API enhancements for access to new pen features (e.g. digital ink and handwriting recognition).
- Example: Microsoft Windows for Pen Computing

Modifying the Software Platform for Pens (cont.)

Maximalist

- Provide a new GUI tailored for pen computing.
- Provide a new API, including, in most cases, a new OS.
- Example: Apple Newton

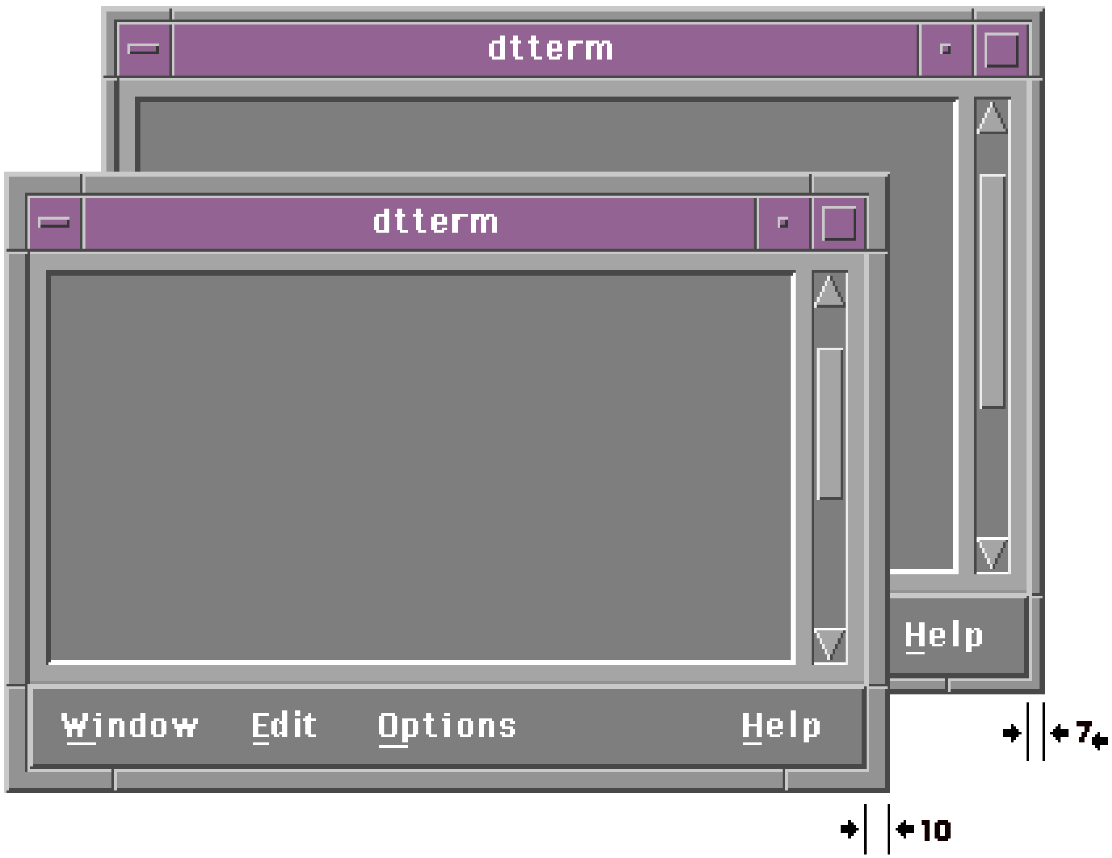
Modifying the Software Platform for Pens (cont.)

Pragmatic

- Redesign GUI based on how a pen changes interacting with the GUI.
- Add API support for new pen features.
- Example: CDE/Motif

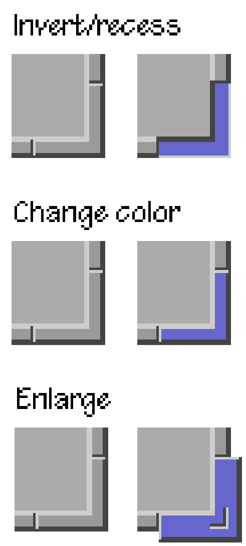
Modifying Window Border Width

- Increase window border width to 10 pixels.



Resize Corners

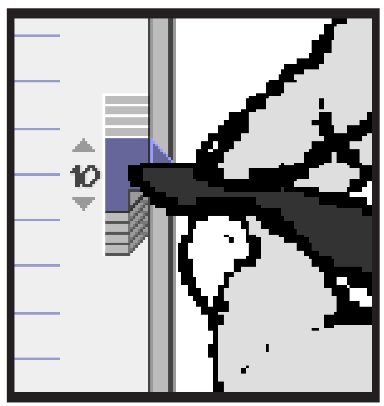
- Highlight resize corners.



Scrolling

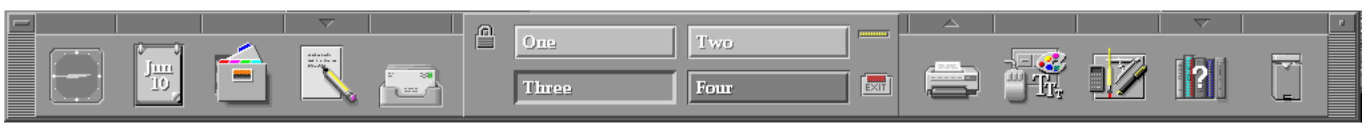
- Feedback under the pen to show the user that the intended target has been touched.

- Location of scrollbar changed.



New Front Panel

CDE Front Panel
modified for pen
1017 x 81 pixels



Menu Changes

General

- Menus pop up depending on the user's handedness.
- Menu bar at bottom of window.

Menu Changes (cont.)

Popup Menus

- Menus should stay up until selection to avoid dragging.
- Require a menu bar for CDE applications.
- Desktop menu brought up with double tap.
- Background menu elsewhere brought up with a check.

Drag and Drop

- Increasing movement threshold for drag cursor to appear.
- Drag cursor appears above pen tip.
- Cursor animation changed to happen in direction of pointer.

Other Changes

- Buttons should become unhighlighted if the pen escapes the button area before pen up.
- Pointer absent when pen in use if tablet and display are integrated
- Gestures for selecting and extending text regions
- Gestures for opening icons

Preference Settings In Style Manager

- Window border widths
- Right/left handed
- Pressure calibration (if available)
- Double tap distances
- Time delay thresholds

Important Resources

- Window frame: `Dtwm*clientDecoration`, `Dtwm*resizeBorderWidth`, `Dtwm*moveThreshold`
- Menu behavior and menu bar: `*XmRowColumn.menuPullDirection`, `*XmRowColumn.marginHeight`, `*XmMainWindow.menuBarLocation`
- Scrolling: `*XmScrolledWindow.scrollBarPlacement`
- Drag and Drop: `*XmDragContext.dropGrace`
- Replacing a 2 or 3 button mouse: `DtButtonBindings` table changed in `.dtwmrc`.

Keyboardless Text Entry

Existing Approaches

- Handwriting recognition performed in text widget
- Handwriting recognition in separate application
- A “virtual keyboard” window for on–screen typing

Keyboardless Text Entry (cont.)

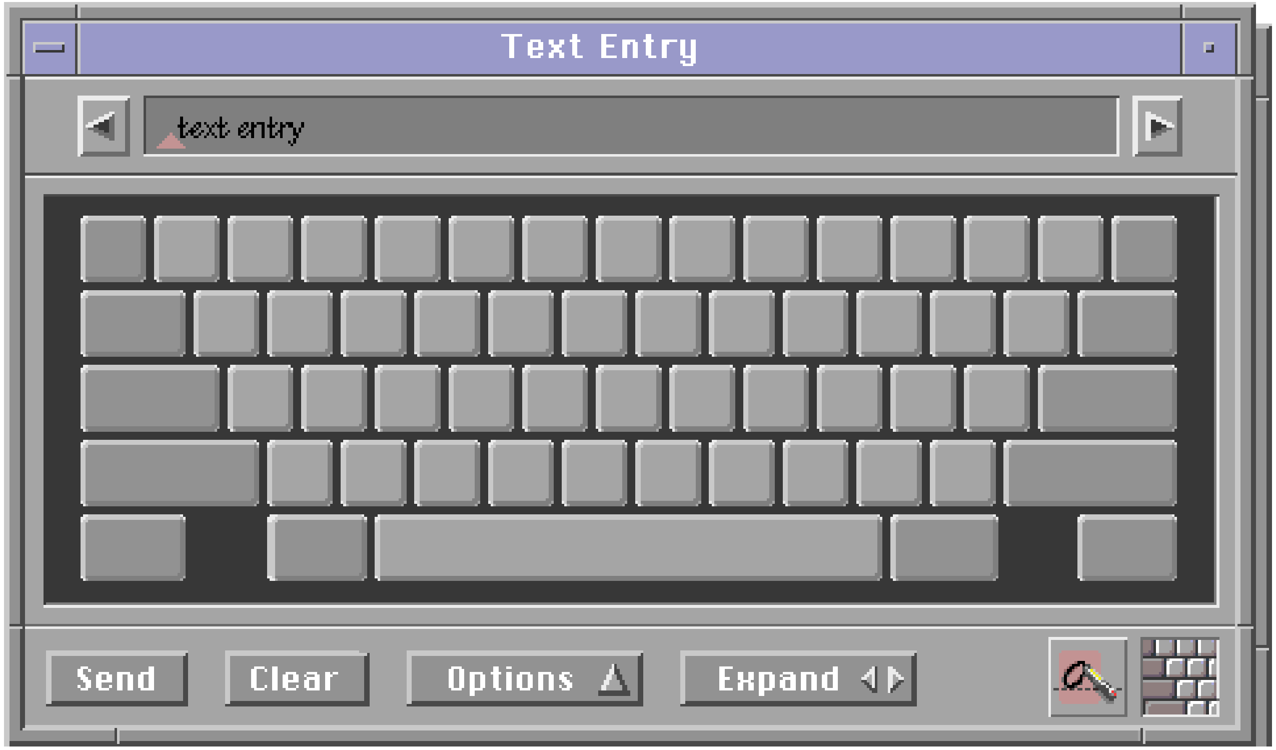
Problems with Handwriting Recognition

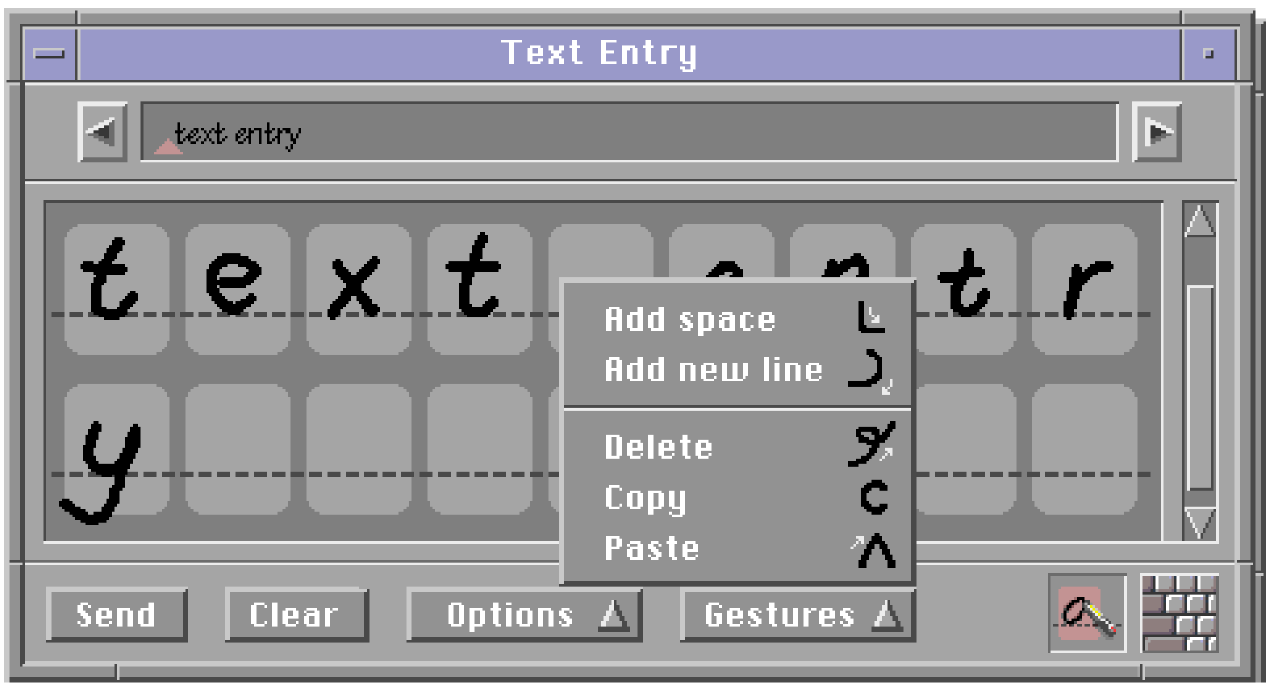
- Current handwriting recognition algorithms only get 97% accuracy.
- Correction of errors requires cognitive processing vs. muscle memory for keyboard.

Keyboardless Text Entry (cont.)

Solution

- Combined virtual keyboard/handwriting recognition application for text entry in separate application.
- Motif text widget only accepts keyboard input or input from the text entry application.
- Insertion via Drag and Drop or SVR4 Streams multi-plexor


Text Entry
text entry
Send
Clear
Options
Expand


Text Entry
text entry
Add space
Add new line
Delete
Copy
Paste
Send
Clear
Options
Gestures

Summary

- Deep changes in CDE/Motif GUI design to accommodate interaction characteristics of the pen.
- Changes partially implemented with resources and by changing the CDE front panel.
- Keyboardless text entry implemented with a desktop virtual keyboard/handwriting recognition text entry application.
- Motif text entry widget accepts keyboard or desktop text entry application input rather than handwriting.

Further Information

- HRE API: *http://playground.sun.com/pub/multimedia/hand-writing/hre.html*
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