Using IBM Workpads / PalmPilots Synchronously in Meetings:

The Pebbles Project

Brad A. Myers

Human-Computer Interaction Institute

School of Computer Science

Carnegie Mellon University

bam@cs.cmu.edu

http://www.cs.cmu.edu/~pebbles

Background

- Many have IBM Workpads / 3Com PalmPilots
  - PDAs with “Graffiti” gestures and touch-sensitive surface
  - Are being used in meetings
- How can they be used more effectively?
  - Connect to a PC
  - Connect to each other through the PC
- Also, investigate other uses for PalmPilots connected to PCs

Pebbles is:

PalmPilots for

Entry of

Both

Bytes and

Locations from up to

Eight

Sources.

http://www.cs.cmu.edu/~pebbles

Meetings

- People don’t bring laptops to meetings
- Previous Computer-Supported Cooperative Work (CSCW) meeting approaches required significant hardware
  - Xerox PARC COLAB room
  - “Electronic Meeting Room” at Univ. Arizona
  - Even the Xerox “LiveBoard” is very expensive
    - Multiple cursors
  - Instead, we will get leverage from people already having PalmPilots

Local Meetings

- Targeting local meetings
  - Everyone is in same room
  - Often have a PC projected onto a wall
  - Examples: presentations, design reviews, brainstorming
  - Remote participants would use other CSCW software
- Also, informal meetings
  - E.g. Two people in an office sharing a PC

Goals

- Investigate connecting people's PalmPilots to the PC and to each other
  - Others studying use of PalmPilots when *not* connected
- *"Single Display Groupware"*
  - One display, multiple people
- Create a variety of applications
- Distribute the applications for general use to get more experience

Considerations

- Must be natural, non-intrusive
- PalmPilot's limitations
  - Small screen, not color, slow processor
- Focus is usually on the PC's screen
  - PalmPilot's screen is secondary or not used
- Many PalmPilots at the same time

First Application: Remote Commander

- Allow PalmPilot to control a PC
  - Don’t have to jump up and grab mouse
- Started in October’97
  - One undergrad: Herb Stiel, and me
- Stylus pretends to be the mouse
- Graffiti pretends to be the keyboard
- Initially, no “floor control”
- Using it now to control this talk
  - Space, backspace; with finger

Connecting PalmPilot to the PC

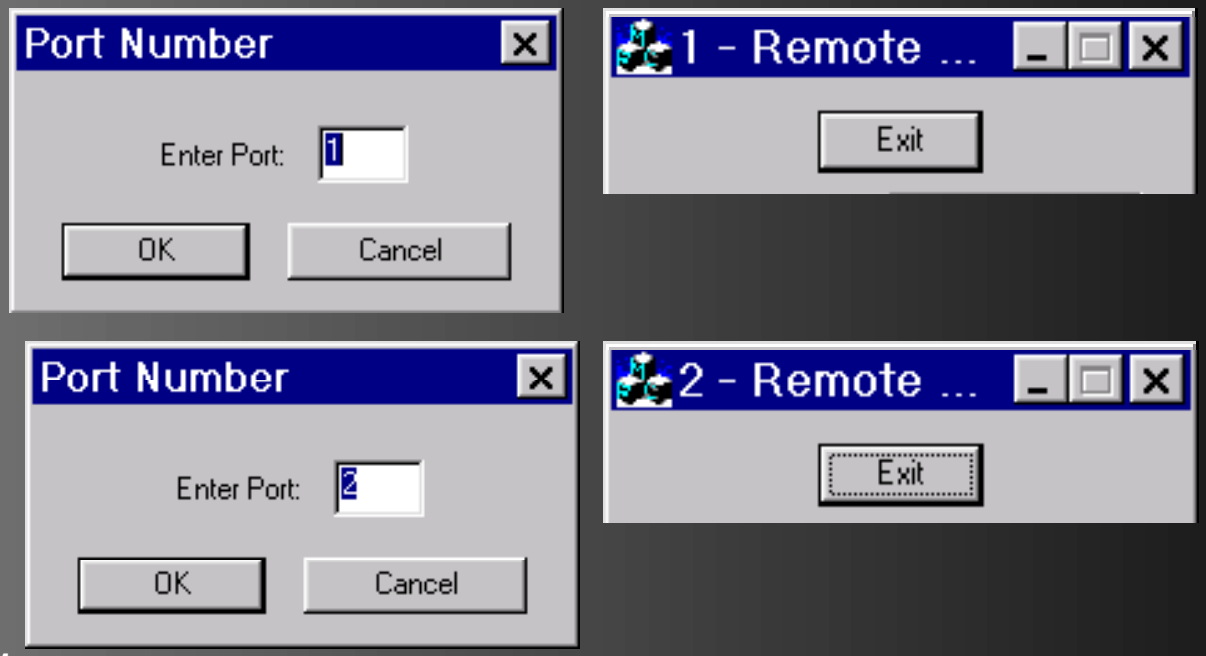
- Would like wireless
  - Interference using InfraRed (IR)
  - Lots of special technology needed by PARCTabs
- Using wires for now
  - Supplied cradle or optional cable
    - Stays attached nicely
  - Connects directly to the PC's serial port

Connecting More than One

- Desktop PCs:
  - Can use various serial cards
  - About $400 for 8 ports
- Laptops:
  - QUATECH QSP-100 PCMCIA
    - Can connect up to 8 PalmPilots to a laptop using both slots
    - About $500 each (4 ports)

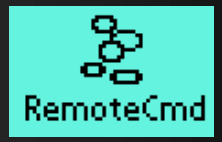
PC Side

- Run Remote Command PC application
  - Give it a COM port to use
  - Run more than once to support multiple Pilots
    - Future: Single instance controls multiple Pilots



PalmPilot Side

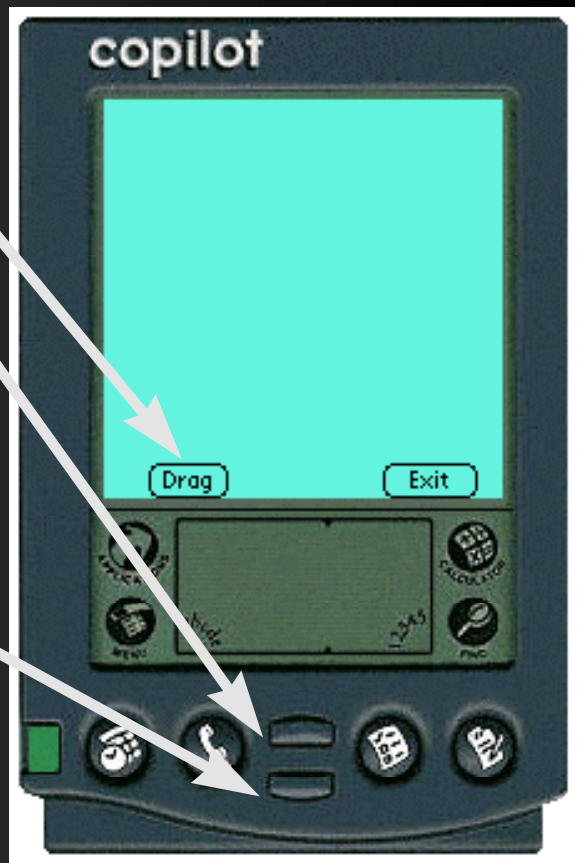
- Run RemoteCommanderPilot



- Move stylus to move mouse
- Works like a touchpad
  - Relative
  - Only 160 pixels across
- Filtering needed
  - Even jittered when sketching
- Speed controlled by regular mouse acceleration on PC

Clicking Mouse Buttons

- Tap to click
- “Drag” button is a toggle
  - Left-down, left-up
- Or use top button for press and release
- Lower button for right mouse button



Keyboard

- Graffiti sent as characters
- Our keyboard includes special keys
  - Tap in “abc” corner
  - Tap again or “Done” to remove
  - Can still use top area for mouse
  - Fit all keys in small area

Shift Keys

- Needed a lot
- Use menu to change to “Special App Keys”
- Buttons at bottom are then SHIFT, CONTROL and ALT
  - Labeled
- Can change back

Example Uses for Remote Commander

- Can be used with any existing application
  - Uses the standard (single) cursor
  - PowerPoint, Paint, Word, Excel, etc.
    - ☞ *Demo with Paint*
  - Shared control
  - Shared annotations and data entry
    - E.g., taking turns entering data in a spreadsheet

More Uses

- For single users:
  - Whenever need a tablet
  - Gestures, freehand drawings easier with stylus than with the mouse
  - Can trace through paper onto PalmPilot
  - Designers, architects, ...

Special Versions

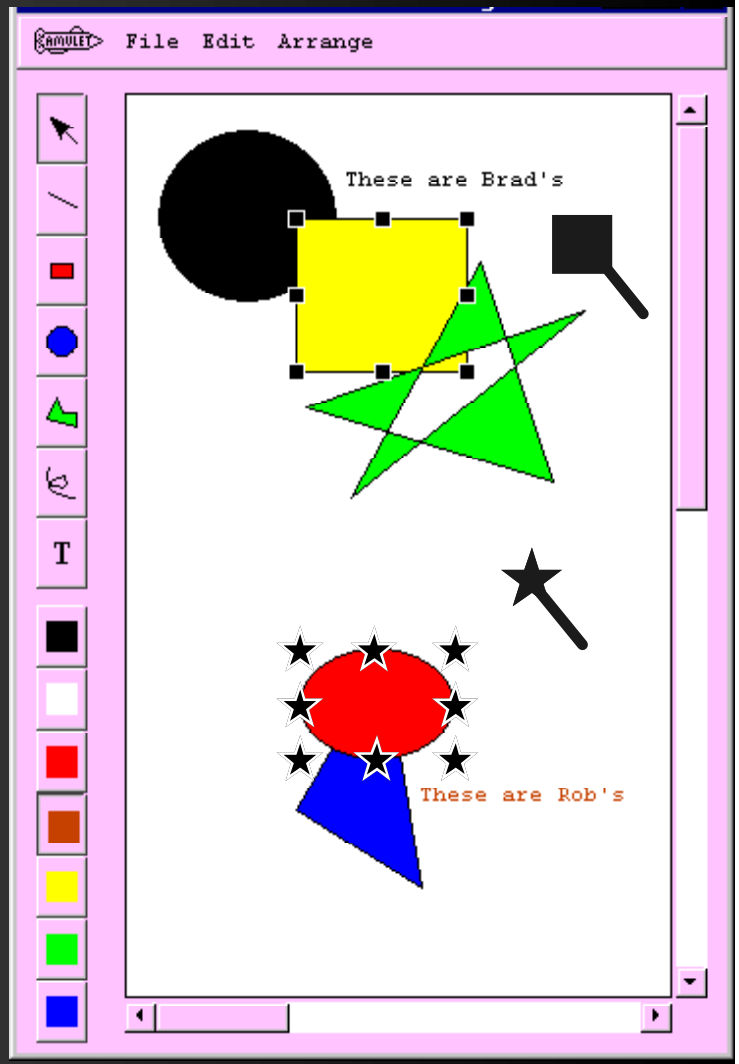
- For PowerPoint
  - Different users draw in different colors
  - Uses PowerPoint's *own* drawing mechanisms
  - Could save annotations with PrintScreen
- Future: better customized versions of PC end for various applications
  - Using OLE integration?

Other Planned Applications

- Shared Drawing Tool
  - "Whiteboard" application
  - Interesting issues: shared widgets; showing each user's state
    - Harder than with Multi-Display Groupware
      - Since they have *separate* widgets
    - Previous SDG systems have had little state
    - Robert Gargiulo (a graphic designer) is collaborating with us

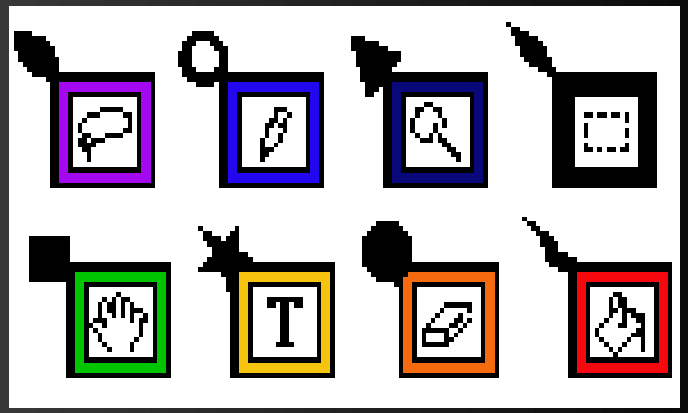
Shared Whiteboard

- Using colors to identify users confused with current drawing color?
- Idea: use different cursors with unique shapes?
  - Selection handles can use the same shape?
- Menubar inappropriate?

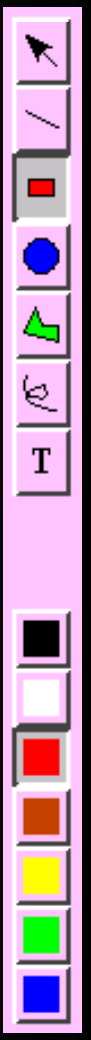


Showing Multiple Users' Status

- Regular palettes only show one state
- Show in each user's cursor?
  - Less confusing
  - Less eye movement
  - These shapes are distinct at all sizes
  - Still visible even if overlap



- Maybe move palettes to PalmPilot?



More Applications...

- Taking attendance
- Synchronizing
- Investigate floor control; taking turns
- Voting
  - Formal or informal
- Joint note taking
- Multiple TCP-IP connections through the PC
  - For email, Telnet, WWW, etc.
  - or Chat to outside

Sharing Information

- Transferring information from PC to Pilot
  - Readable on the Pilot, or use Pilot as a floppy
- Sending information from Pilot to Pilot
  - Share files

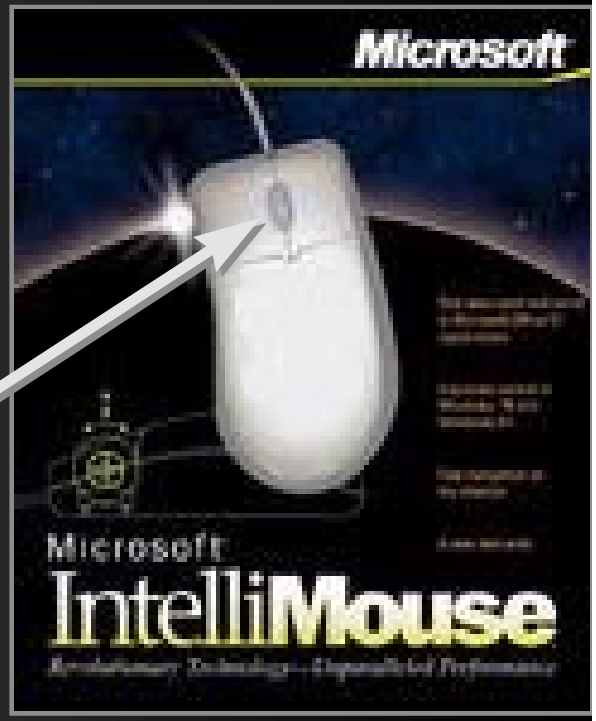
TealPoint DirectSync $50 with wire

More Applications

- Coordinating Schedules and To-Do lists
  - Could automatically distribute the right information
- Automatic annotations of video or audio recordings
  - Connect notes to parts of recording
    - Or to slides or pages of the PC's presentation
  - Even if notes are kept private, the system might record *when* the notes are taken

Yet More Applications

- For scrolling using the “other” hand
  - Our research showed parallel and efficient uses of both hands together
  - Generate input as if from the wheel on the top of the Microsoft “IntelliMouse®”



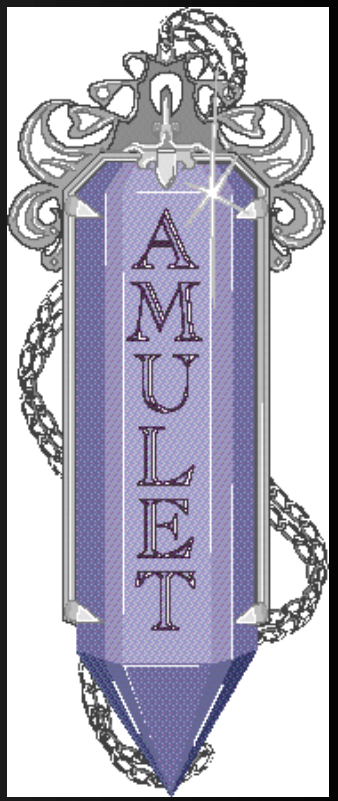
- As an “Identicard”
  - For security
  - To retrieve my personal configuration

Other CSCW applications

- "Structured Idea Generation Process" from Univ. of Arizona
- Brainstorming applications
  - Everyone writes in parallel
- Parallel sorting or annotations

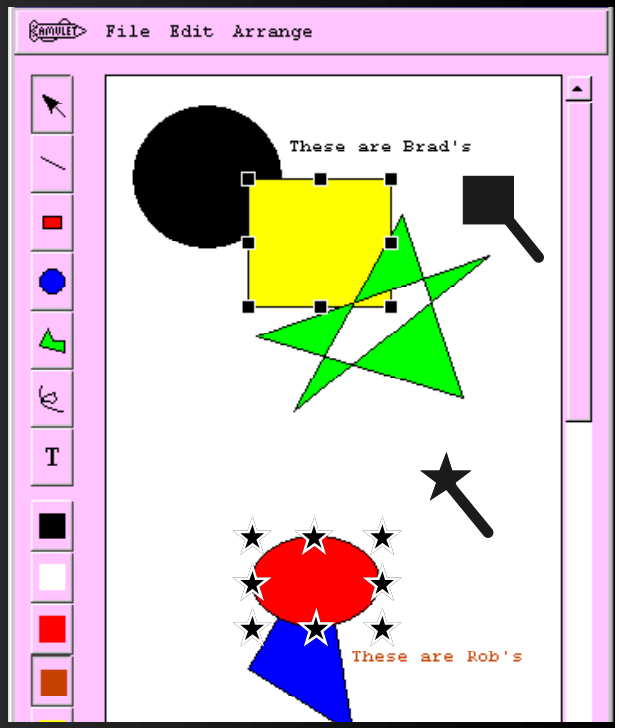
Implementation Architecture

- *Toolkit* for Single Display Groupware
- Modifying **Amulet** to support multiple users
  - Amulet is our user interface development environment in C++
  - Is a comprehensive application framework
  - Has a full set of widgets (controls)



Amulet for Single Display Groupware

- Widgets have User-ID
  - Specific user, Any-User, One-At-A-Time
- Each user has own selection objects
  - Commands mapped to user's selection



- Undo *the* last, or undo *my* last operation
- Applications will be able to support multiple users with little or no changes

Other Research Issues

- Wireless connections
- Battery management
- Different applications for the PalmPilot end
  - For example, putting menus and palettes there
  - Programmable, distributed applications
  - Reconfigurable, “semantic” input device
- Connections with other PalmPilot research
  - For example, for coordinated note taking, using in classes, etc.

Conclusions

- PalmPilots / IBM Workpads and similar technologies are becoming ubiquitous
- Techniques for connecting them together will get better
- Important to study how they can be used in meetings *effectively*
- The Pebbles research project is off to a good start
- Exciting potential

Using PalmPilots / IBM Workpads Synchronously in Meetings:

The Pebbles Project

Brad A. Myers

Human-Computer Interaction Institute

School of Computer Science

Carnegie Mellon University

bam@cs.cmu.edu

http://www.cs.cmu.edu/~pebbles