Questions?

• Project #3
• Homework #4 is due today
• Homework #5 is out today
• Midterm in a week and a half
KLM heuristic rules (Raskin’s)

0: Insert M
   • \textit{In front of all Ks}
   • \textit{In front of all P’s selecting a command}

1: Remove M between \textit{fully anticipated} operators
   • \( PMK \rightarrow PK \)

2: if a string of MKs belong to \textit{cognitive unit} delete all M but first
   • \( 4564.23: \text{MKMKMKMKMKMKMK} \rightarrow \text{MKKKKKKK} \)

3: if K is a \textit{redundant terminator} then delete M in front of it
   • \( \leftarrow \downarrow: \text{MKMK} \rightarrow \text{MKK} \)

4a: if K terminate a constant string (command name) delete the M in front of it
   • \( cd \leftarrow \downarrow: \text{MKKMK} \rightarrow \text{MKKK} \)

4b: if K terminate a variable string (parameter) keep the M in front of it
   • \( cd\ class \leftarrow \downarrow: \text{MKKKMKKKKKKMK} \rightarrow \text{MKKKMKKKKKKMK} \)
How to select a movie? (I)

• Picking from a list
  – Standard list (Windows for example)
  – Fisheye Menus [Bederson 2000]
  – Speed dependant automatic zooming [Igarachi 2000]
  – Dynamic query system (like the SpotFire)

• Using text entry
Picking a movie from a list

SpotFireFisheye menu [Bederson 2000]

Speed dependant automatic zooming [Igarachi 2000]
How to select a movie? (II)

• Picking from a list
• Text entry
  – Keyboards
    • Standard,
    • Miniatures
      – Phones, Blackberry
    • Virtual on screen
      – Touch based, game like (selecting each letter with a joystick)
  – Gesture based
    • UniStroke [Goldberg 93] and Graffiti
    • QuikWrite [Perlin 98] and T-Cube [Venolia 94]
    • Dasher [Ward 2000]
    • Handwriting recognition
  – Smart completion and advanced search engines
    • Google...
Keyboards

Office keyboard

Cell phone  Blackberry

Metropolis keyboard (Zhai, IBM, 2000)
Gestures based

Unistroke alphabet [Goldberg 93]

Graffiti (Palm OS)

QuikWriting system [Perlin 98]

Dasher [Ward 2000]
How to pick a movie? (III)

- Inside a Blockbuster?
- For my on demand video system?
Computer today
Input devices I

Logitech mouse
IBM Trackpoint

Voice

PlayStation 2

Wacom

Wacom tablet

Microsoft keyboard
Input devices II

SpaceBall (6DOF)

Phantom

Anoto pen

Ken Hinckley

George Fitzmaurice
Input devices characteristics

• Degrees of Freedom
  – Rotary knob: (1 DOF), Mouse (2 DOF)…
  – SpaceBall (6 DOF), 2 Handed Polhemus (12 DOF)

• Isometric or Isotonic
  – TrackPoint versus mouse

• Relative or absolute
  – Mouse versus a pen on the screen

• Direct or indirect
  – Working on your desk versus working on the screen

• Linear or rotary
  – Knob versus a slider
Design space of input devices [Card et al.]
Some Insights

• Isometric or Isotonic
  – Isotonic best for position
  – Isometric best for rate control
    •*Good driver difficult to implement*

• Relative or absolute
  – Relative saves space
  – Absolute faster

• Direct or indirect
  – Direct is faster
  – Indirect maybe more ergonomic
Output devices characteristics

• Modality
  – Sight, hearing, touch, taste and smell

• Dynamic or static
  – Computer display versus printer

• Resolution and size
  – From cell phone display to mural size

• How faithful to our everyday experience
  – From grey scale printed image to full color stereoscopic display
Output devices I

Wacom

Printer

Stanford interactive Mural

IBM (9 Mpixel)
Output devices II

Phantom

VirTouch

Olympus Eye-Trek

Speech
The computer for the 21st Century
(Mark Weiser)

- **Unnoticeable**
  - Like writing, street signs...

- **Disappear into the background**
  - Like electric motors
  - Not attention demanding

- **3 scales**
  - Taps (100s, inches scale)
  - Pads (10s, feet scale)
  - **Scrap computers**
  - Boards (few, yards scale)

*The invisible computer (Norman)*