

# The Two-handed Desktop Interface

Are we there yet?

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## Plan

- Bimmanual Control
- The Desktop Interface
- Scrolling
- Microsoft's Response

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## What is Bimanual Control?

- Aka, two-handed interaction
- Theoretic groundwork: Buxton and Myers (1986), Guiard (1987)
- Considerable recent work in HCI (Zhai, Kabbash, Hinckley, Balakrishnan, etc.)
- The idea:
  - Two-hands work in cooperative, asymmetric manner

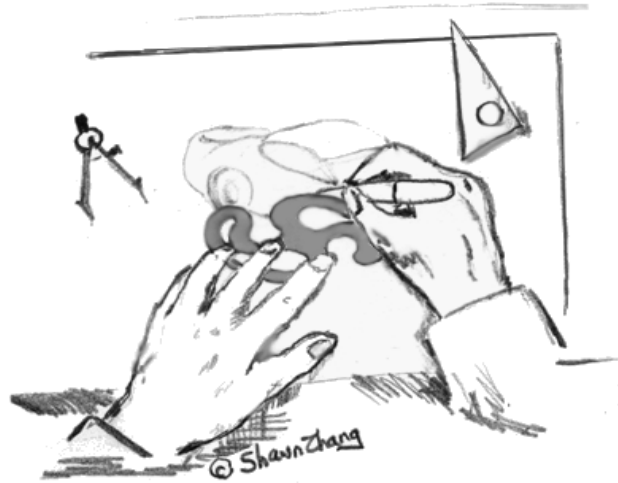
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## Role of Each Hand

- Non-dominant hand
  - leads (goes first)
  - sets frame of reference
  - works on larger, more coarse tasks
- Dominant hand
  - follows (goes second)
  - works within frame of reference set by non-dominant hand
  - works on smaller but finer scale

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## Two Hands Working Together



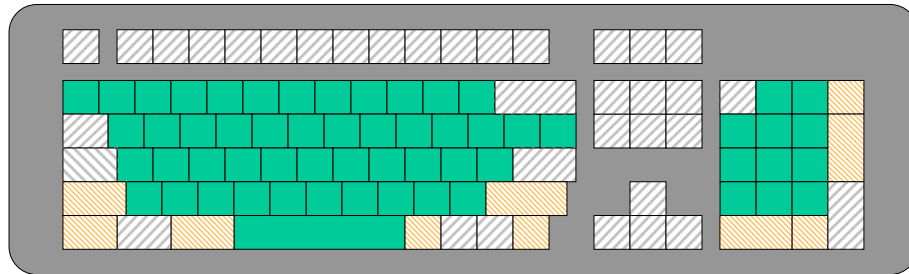
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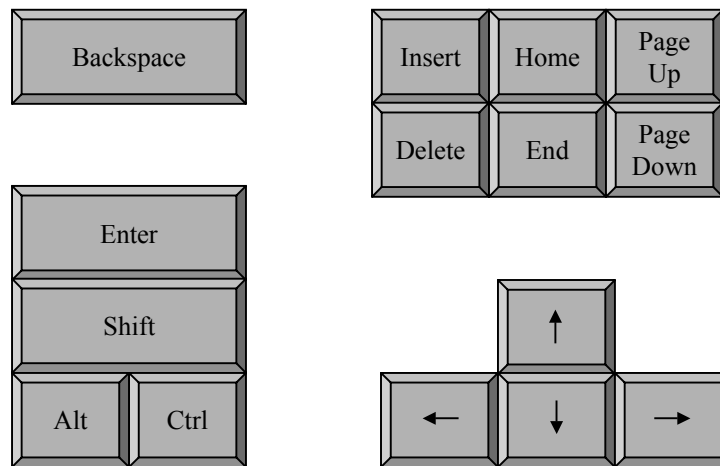
# 101-Style Keyboard



- Symbol keys
- ▨ Executive keys
- Modifier keys

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# Frequently Used Keys



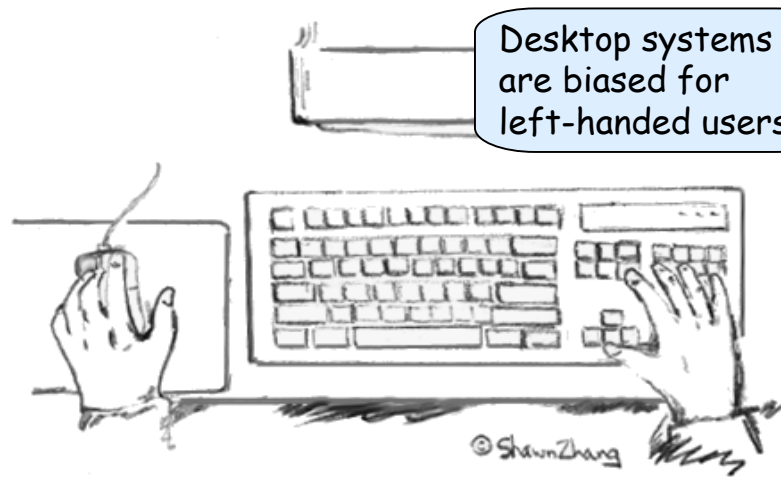
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## Where are they?



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## The Left-Handed Desktop



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Some examples...

Note: Left-handed users holding the mouse in their left hand.

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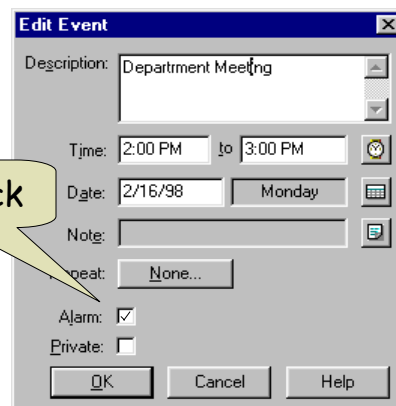
## Select Option in Window

LH:

Point-click

RH:

Enter



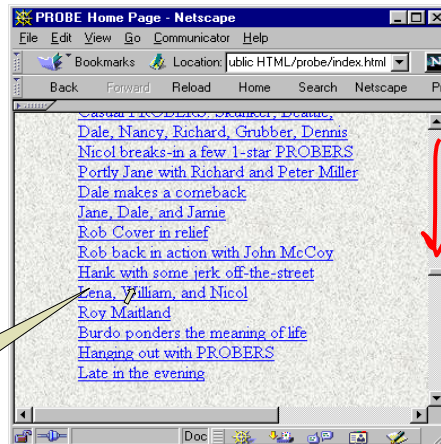
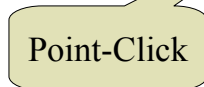
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## Find and Select a Link

RH:



LH:

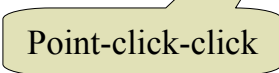


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## Delete a Word

This is some really **utterly** simple text.  
If I want to delete the word "utterly", I  
double click on it and hit Backspace.

LH:



RH:



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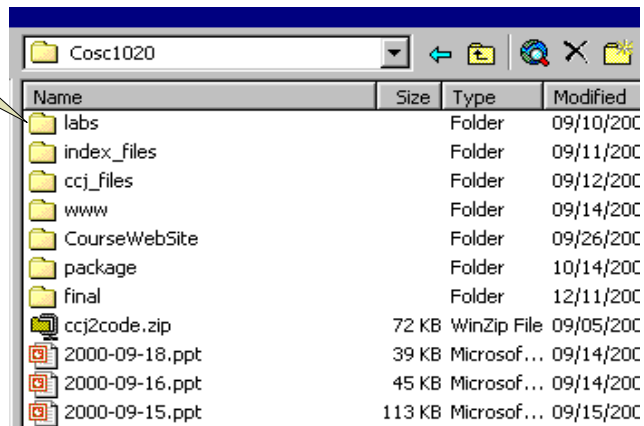
## File System Navigation

LH:

Point-click

RH:

Enter



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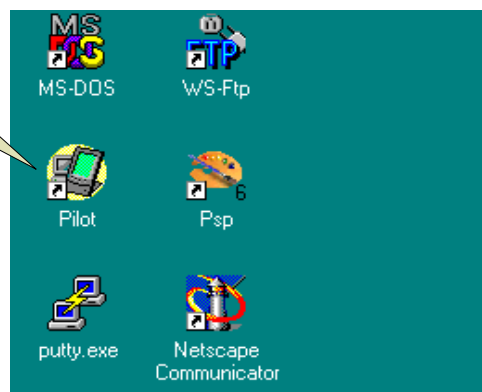
## Launch an Application

LH:

Point-click

RH:

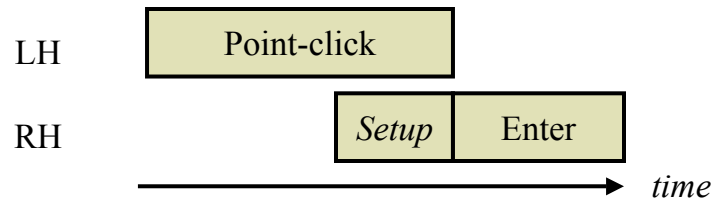
Enter



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# Temporal Analysis

Left-handed user (mouse on left side of keyboard)



Right-handed user (mouse on right side of keyboard)

?

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# Savings

- Small time savings but...
- These tasks are extremely frequent

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## Observations (1 of 2)

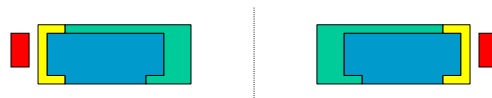
- Having heard this talk, product designers will redesign the desktop to give right handers the same opportunities as left handers!

No! Keyboard layout is stable and ingrained. Changes are evolutionary, not revolutionary.

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## Observations (2 of 2)

- The ideal LH and RH desktop interfaces are mirror images!



No! Left handers are not mirror images of right handers. Left handers are more adept at using their non-dominant hand for trigger actions (e.g., Enter, DEL, Backspace)

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## Scrolling and Bimanual Control

- Scrolling is a classic example of a task well suited to delegation to the non-dominant hand

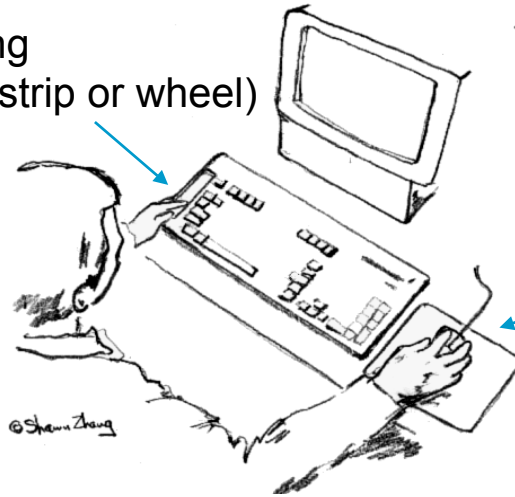
Task	Characteristics
Non-dominant Hand	<ul style="list-style-type: none"><li>• Precedes/overlaps other tasks</li><li>• Sets frame of reference</li><li>• Minimal precision needed (coarse)</li></ul>
Dominant Hand	<ul style="list-style-type: none"><li>• Follows/overlaps scrolling</li><li>• Works within frame of reference</li><li>• Demands precision (fine)</li></ul>

Does this sound familiar?

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## Two-handed Pointing + Scrolling

Scrolling  
(touch strip or wheel)



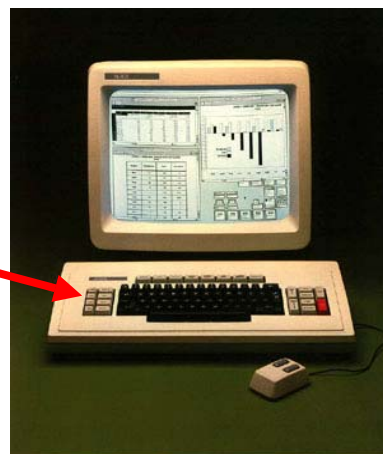
Pointing

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## Postscript

- Xerox Star, circa 1981

Dedicated cut, copy,  
and paste keys on left  
side of keyboard  
(ideal for RH users)




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## Plan

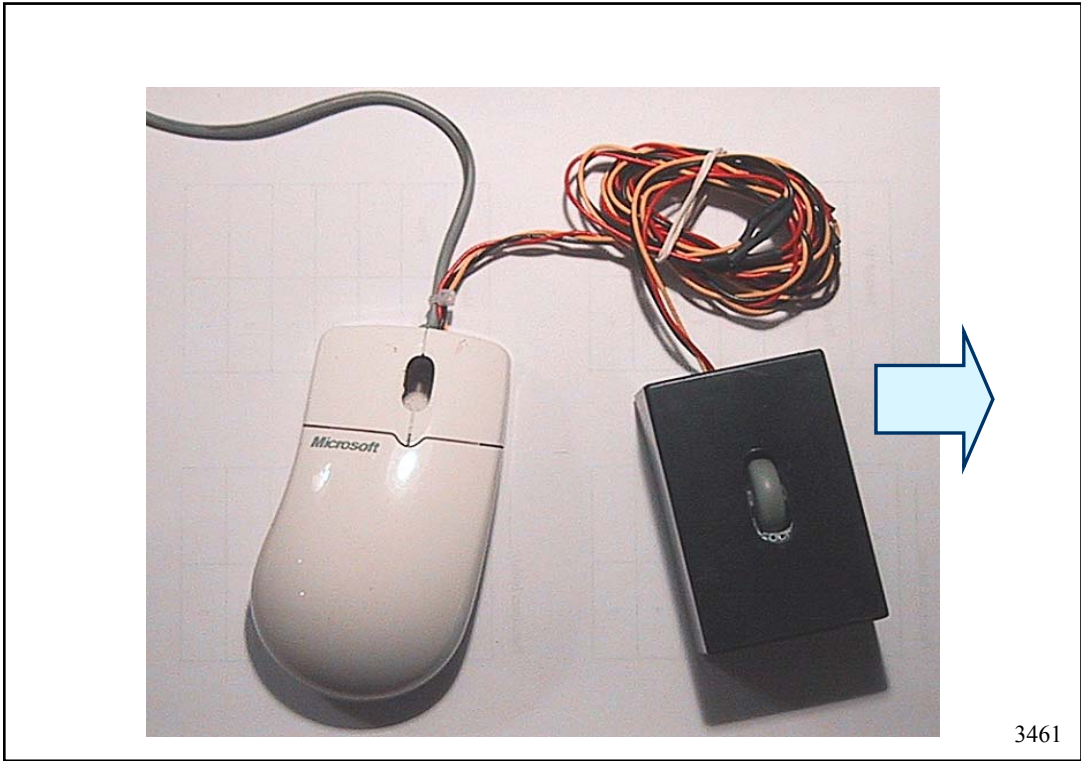
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## Microsoft Presentation

- I visited Microsoft in Redmond, WA in February 1998 and gave this "speech" to the Hardware Ergonomics Group
- In fact, I gave it twice in the same day
  - Morning audience: "Mouse Group"
  - Afternoon audience: "Keyboard Group"
- My talk included a demo with my re-engineered *IntelliMouse* 

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## Re-Engineered *IntelliMouse*

- Wheel removed and placed in separate chassis, positioned on opposite side of keyboard:



- Two years later



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# Microsoft Office Keyboard



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Thank you!

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