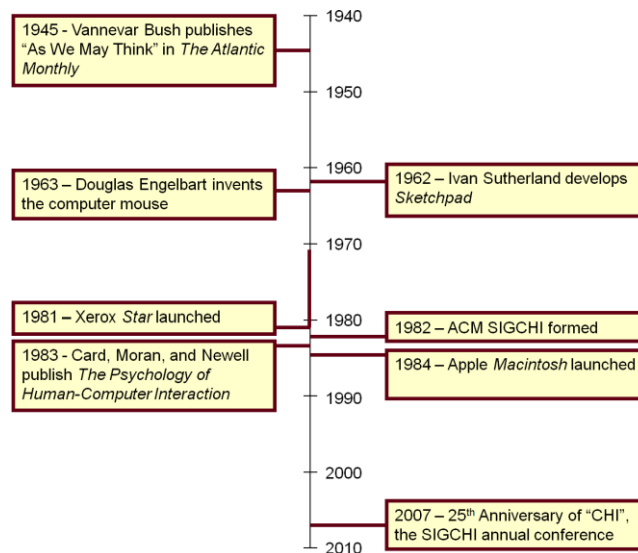


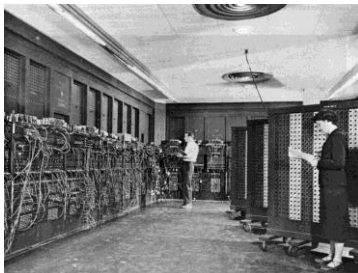
# Human-Computer Interaction

- Emerged in 1980s
- It owes a lot of older disciplines: **ergonomics**, cognitive and experimental psychology, sociology, anthropology, computer science, linguistics
- Human factors (ergonomics):
  - Is both a science and a field of engineering;
  - It is concerned with human capabilities, limitations and performance, and with the design of systems which are efficient, safe, comfortable, and even enjoyable for the humans who use them;
  - It is also an art in the sense of respecting and promoting creative ways for practitioners to apply their skills in designing systems.
  - Human Factors in Computing Systems (CHI)

# Significant Event Timeline



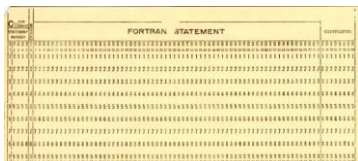
3



**ENIAC (1940s)**



**UNIVAC (1950s)**



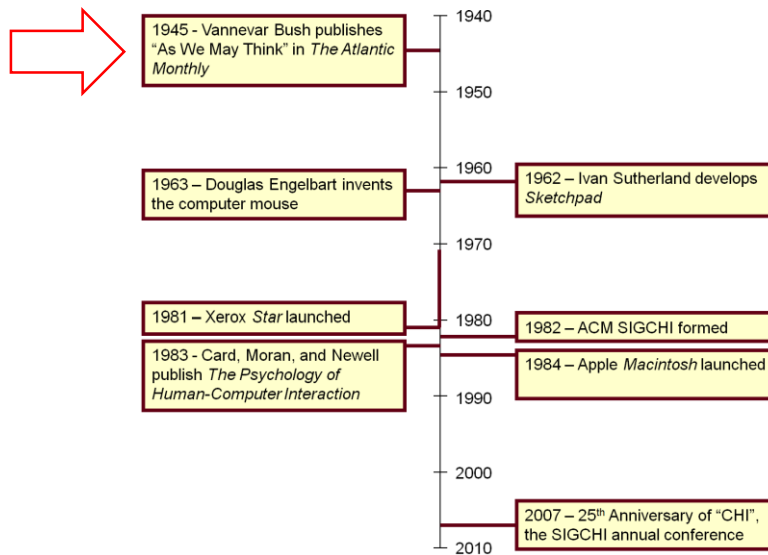
**1920s - 1950s**



**VI (1976 - ...)**

4

## Significant Event Timeline



5

## "As We May Think" Vannevar Bush (1945)



6

# Reprinted in...



## As we may think

Full Text: [pdf](#)

Author: [Vannevar Bush](#) Director of the Office of Scientific Research and Development

Published in:

· Magazine

interactions [Interactions Homepage](#) [archive](#)

Volume 3 Issue 2, March 1996

Pages 35 - 46

[ACM](#) New York, NY, USA

[table of contents](#) [doi>10.1145/227181.227186](#)



1996 Article



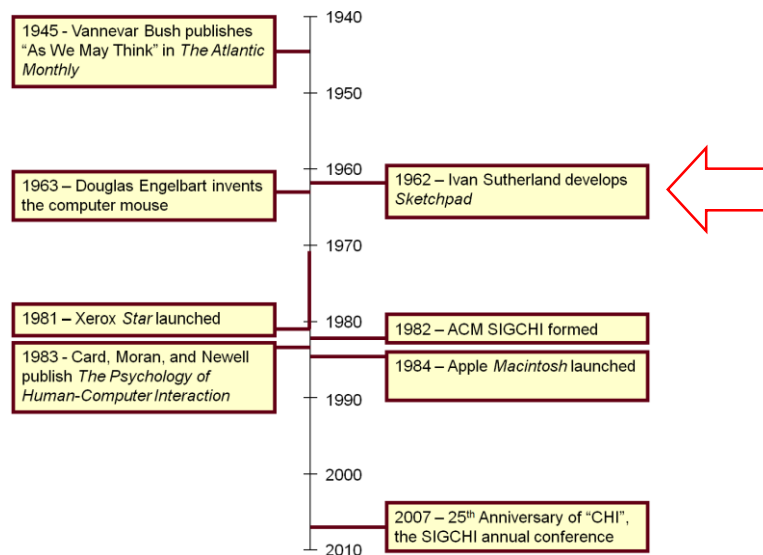
[Bibliometrics](#)

· Downloads (6 Weeks): 54  
· Downloads (12 Months): 446  
· Citation Count: 19

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## Significant Event Timeline



8

# Sketchpad

## Ivan Sutherland (1962)



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# Sketchpad

*Heretofore, most interaction between man and computers has been slowed down by the need to reduce all communication to written statements that can be typed; in the past, we have been writing letters to rather than conferring with our computers. (Sutherland, 1963)*



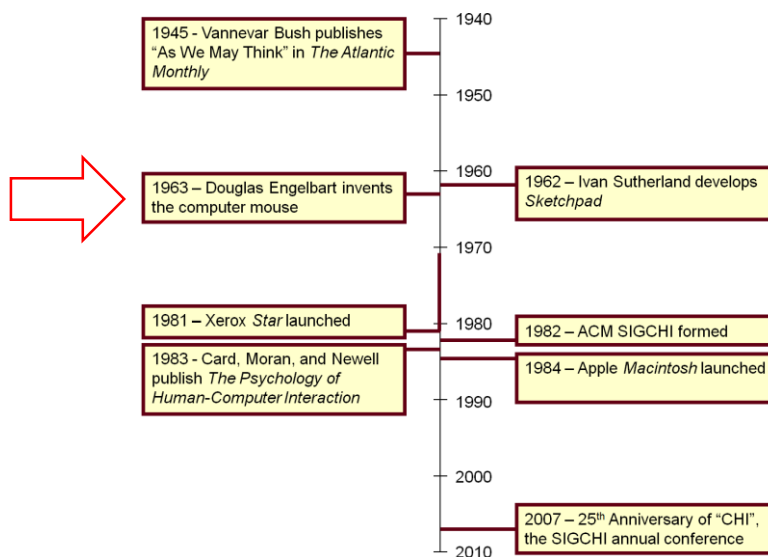
10

## *Sketchpad*: “Direct Manipulation”

- Direct manipulation: correspond at least loosely to manipulation of physical objects
- Features:
  - Incremental action and rapid feedback
  - Reversibility
  - Exploration
  - Syntactic correctness of all actions
  - Replacing language with action
- Term coined by Ben Shneiderman<sup>1</sup>

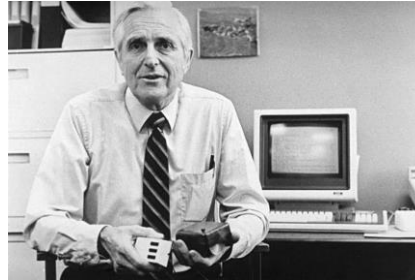
<sup>1</sup> Shneiderman, B., Direct manipulation: A step beyond programming languages, in *IEEE Computer*, 1983, August, 57-69.

## Significant Event Timeline



# Invention of the Mouse

## Doug Engelbart (1963)



- Turing award in 1997
- ACM SIGCHI Lifetime Achievement Award in 1998

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## Read About Doug Engelbart at...


[Click here](#)

[Click here](#)

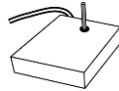
14

# HCI's First User Study<sup>1</sup>

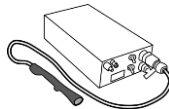
A comparative evaluation of...



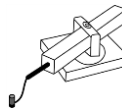
Mouse



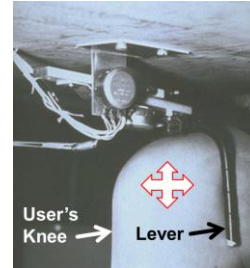
Joystick



Lightpen



Grafacon



Knee-controlled lever

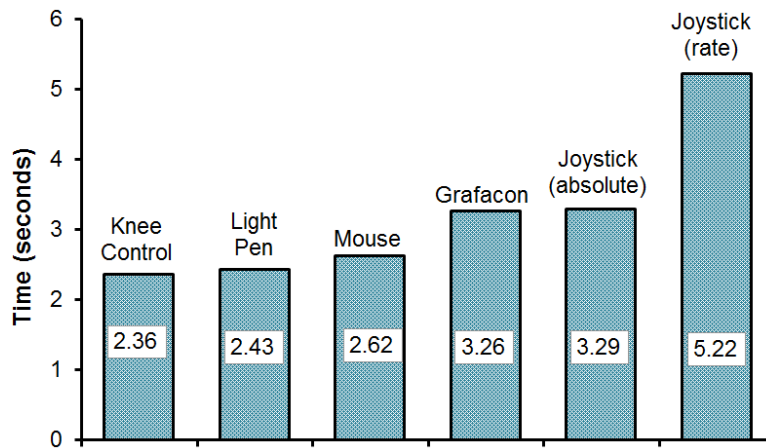
<sup>1</sup> English, W. K., Engelbart, D. C., & Berman, M. L. (1967). Display selection techniques for text manipulation. *IEEE Transactions on Human Factors in Electronics*, HFE-8(1), 5-15.

## Experiment Design and Procedure

- Participants: 13
- Independent variable
  - “Input method” with six levels: mouse, light pen, Grafacon, joystick (position-control), joystick (rate-control), knee-controlled lever
- Dependent variables
  - Task completion time, error rate
  - (Note: task completion time = access time + motion time)
- Within-subjects, counterbalanced
- Task:
  - Press spacebar, acquire device, position cursor on target, select target



## Results – Speed



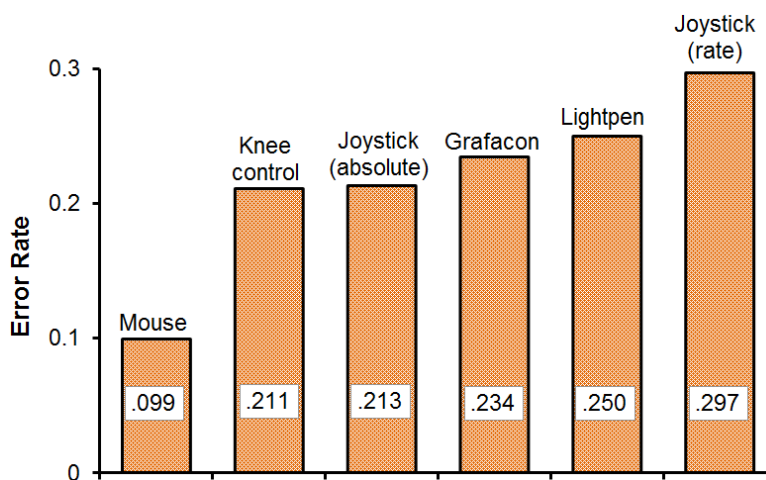
Notes:

<sup>1</sup> Access time with the knee-controlled lever was zero (since the device is always “acquired”).

<sup>2</sup> Light pen use is fatiguing, since the user’s arm is held in the air in front of the display.

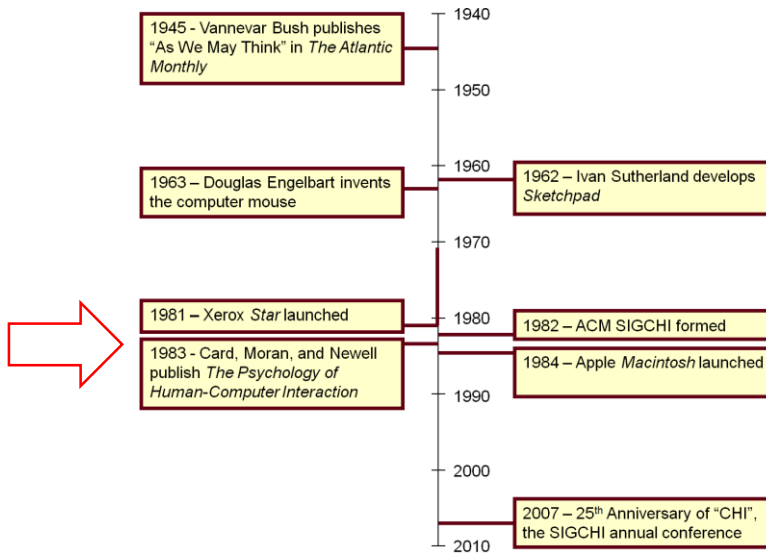
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## Results – Accuracy



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## Significant Event Timeline



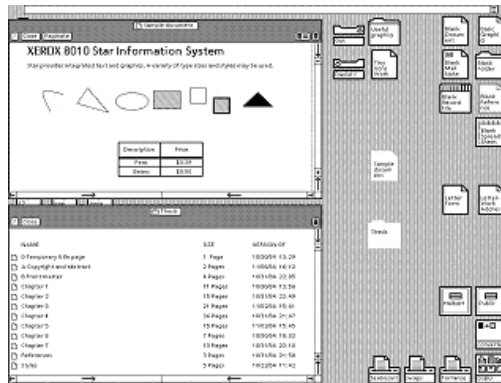
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## Xerox *Star*

- First commercially released computer system with a GUI (Graphical User Interface)
- It had windows, icons, menus and a pointing device (WIMP)
- It supported direct manipulation and what-you-see-is-what-you-get (WYSIWYG) interaction

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## Xerox Star (1981)



Price: 16,000 \$

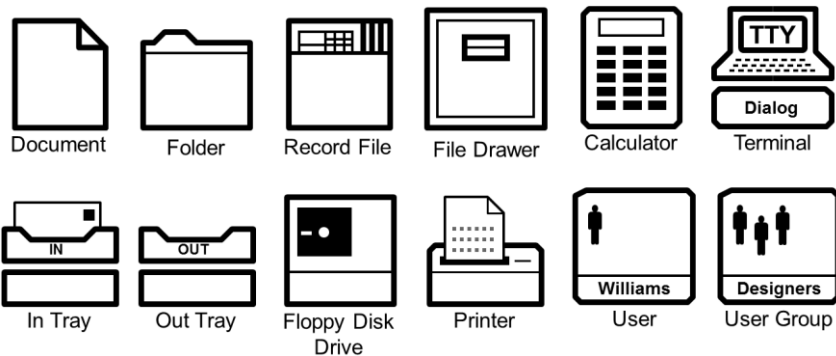
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## Desktop Metaphor

- Xerox Star used the Desktop Metaphor
  - Brings concepts from the office desktop to screen display: the user finds pictorial representations (icons) for things like documents, folders, trays and accessories
  - Metaphores are important in HCI: the user has existing knowledge from another domain
- Hidden details to increase usability: *open a document* instead of *invoke an editor*

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## Star GUI Icons



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## Birth of HCI - 1983

- Notable events:
  1. First ACM SIGCHI conference (1983)
  2. Publication of *The Psychology of Human-Computer Interaction* by Card, Moran, and Newell (1983)
  3. Apple *Macintosh* announced via brochures (December, 1983) and launched (January, 1984)

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## ACM SIGCHI Mission

The ACM Special Interest Group on Computer-Human Interaction is the world's largest association of professionals who work in the research and practice of computer-human interaction. This interdisciplinary group is composed of computer scientists, software engineers, psychologists, interaction designers, graphic designers, sociologists, and anthropologists, just to name some of the domains whose special expertise come to bear in this area. They are brought together by a shared understanding that designing useful and usable technology is an interdisciplinary process, and believe that when done properly it has the power to transform persons' lives.

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## SIGCHI Web Site

**SIGCHI Ambassadors**  
Read 12 new SIGCHI Ambassadors' stories  
[Go to stories](#)

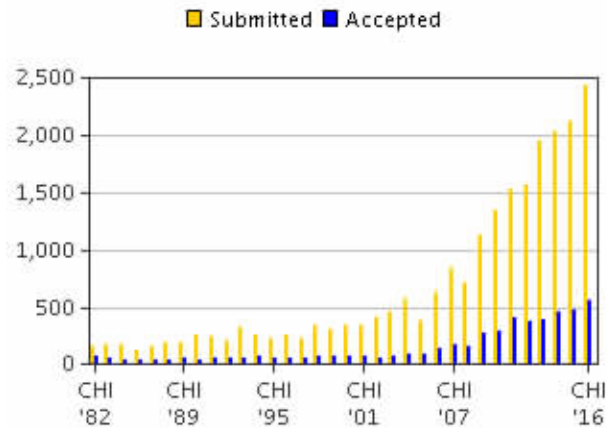
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<b>CHIIR '20</b> Sponsor: SIGCHI SIGIR CHIIR '20: Conference on Human Information Interaction and Retrieval	March 14 - 18, 2020 No Available Proceeding yet	Vancouver, BC, Canada	<a href="#">CHIIR '20 Website</a>
<b>IUI '20</b> Sponsor: SIGCHI IUI '20: 25th International Conference on Intelligent User Interfaces	March 17 - 20, 2020 No Available Proceeding yet	Cagliari, Italy	<a href="#">IUI '20 Website</a>
<b>HRI '20</b> Sponsor: SIGCHI HRI '20: ACM/IEEE International Conference on Human-Robot Interaction	March 23 - 26, 2020 No Available Proceeding yet	Cambridge, United Kingdom	<a href="#">HRI '20 Website</a>

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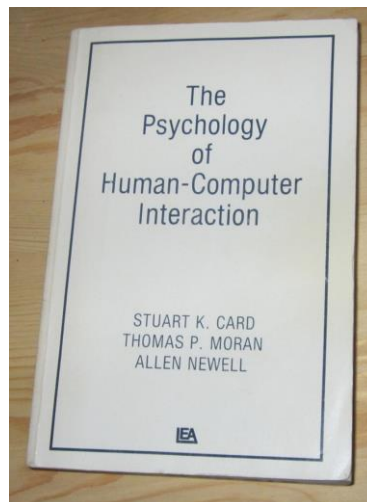
# SIGCHI Conference Publications

## The ACM CHI Conference on Human Factors in Computing Systems



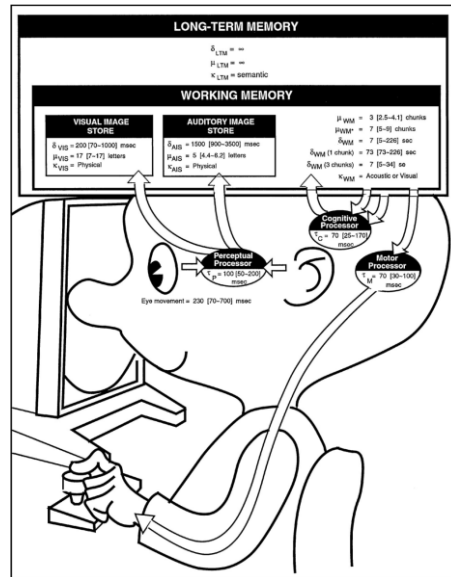
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## *The Psychology of Human-Computer Interaction* Card, Moran, and Newell (1983)



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# The Model Human Processor



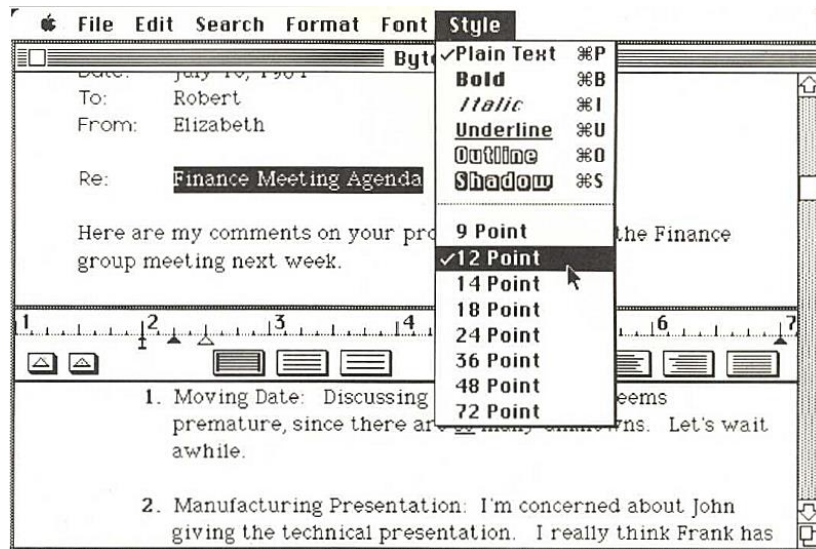
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## Apple Macintosh (1984)



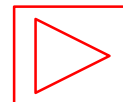
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## MacWrite Software



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## Apple Macintosh Commercial (1984)

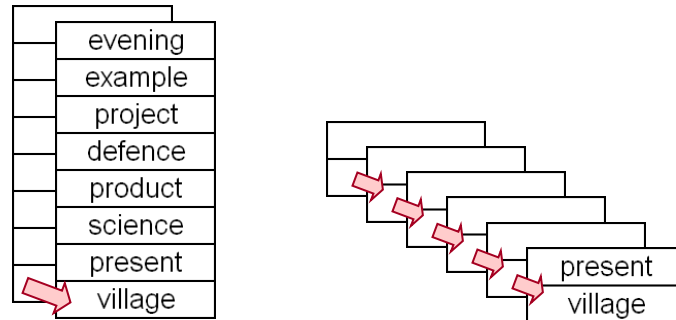


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## Growth of HCI (1983-...)

- Example of an early research topic
  - Breadth vs. depth in menu design



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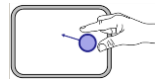
## HCI Research

- Research precedes products
- Consider...
  - Two-finger gestures
    - Apple *iPhone*, 2007
  - Acceleration-sensing
    - Nintendo *Wiimote*, 2005
  - Wheel mouse
    - Microsoft *Intellimouse*, 1996
  - Single-stroke text input
    - Palm's *Graffiti*, 1995
- Were these ideas born out of engineering or design brilliance? Not really...

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- Two-finger gestures:

~~2007?~~



1978 <sup>1</sup>

- Acceleration-sensing:

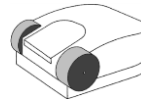
~~2005?~~



1998 <sup>2</sup>

- Wheel mouse:

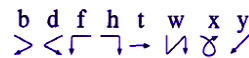
~~1996?~~



1993 <sup>3</sup>

- Single-stroke text input:

~~1995?~~



1993 <sup>4</sup>

<sup>1</sup> Herot, C. F., & Weinzapfel, G. (1978). One-point touch input of vector information for computer displays. *Proc SIGGRAPH '78*, 210-216, New York: ACM.

<sup>2</sup> Harrison, B., Fishkin, K. P., Gujar, A., Mochon, C., & Want, R. (1998). Squeeze me, hold me, tilt me! An exploration of manipulative user interfaces. *Proc CHI '98*, 17-24, New York: ACM.

<sup>3</sup> Venolia, D. (1993). Facile 3D manipulation. *Proc CHI '93*, 31-36, New York: ACM.

<sup>4</sup> Goldberg, D., & Richardson, C. (1993). Touch-typing with a stylus. *Proc CHI '93*, 80-87, New York: ACM.

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# QUESTION TIME

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