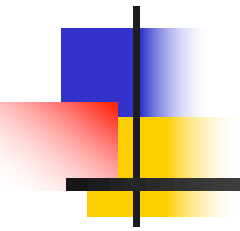
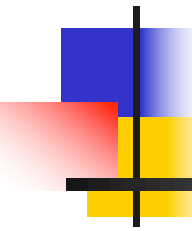


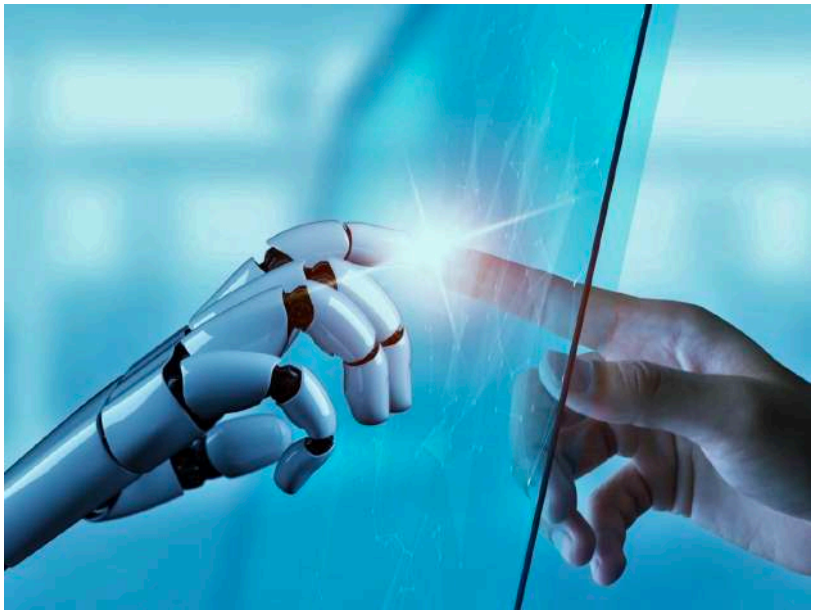
Human-Computer Interaction

Lecturer: Wei Liang（梁玮）



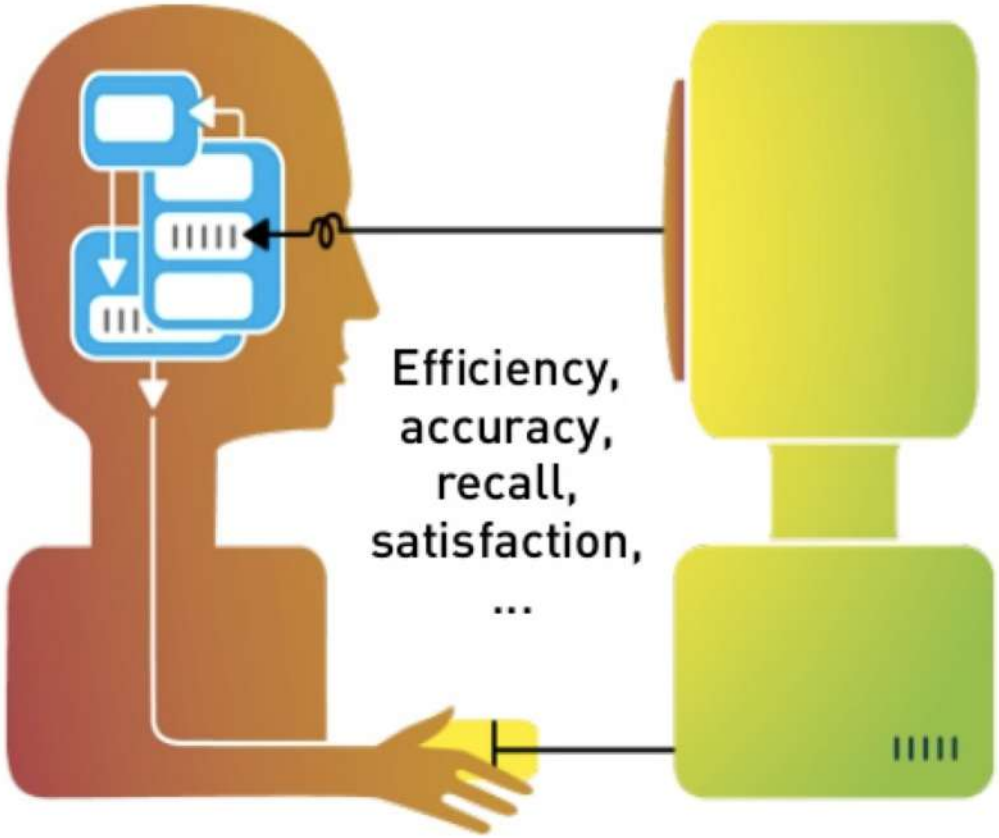
Chapter1 Introduction

What is HCI?



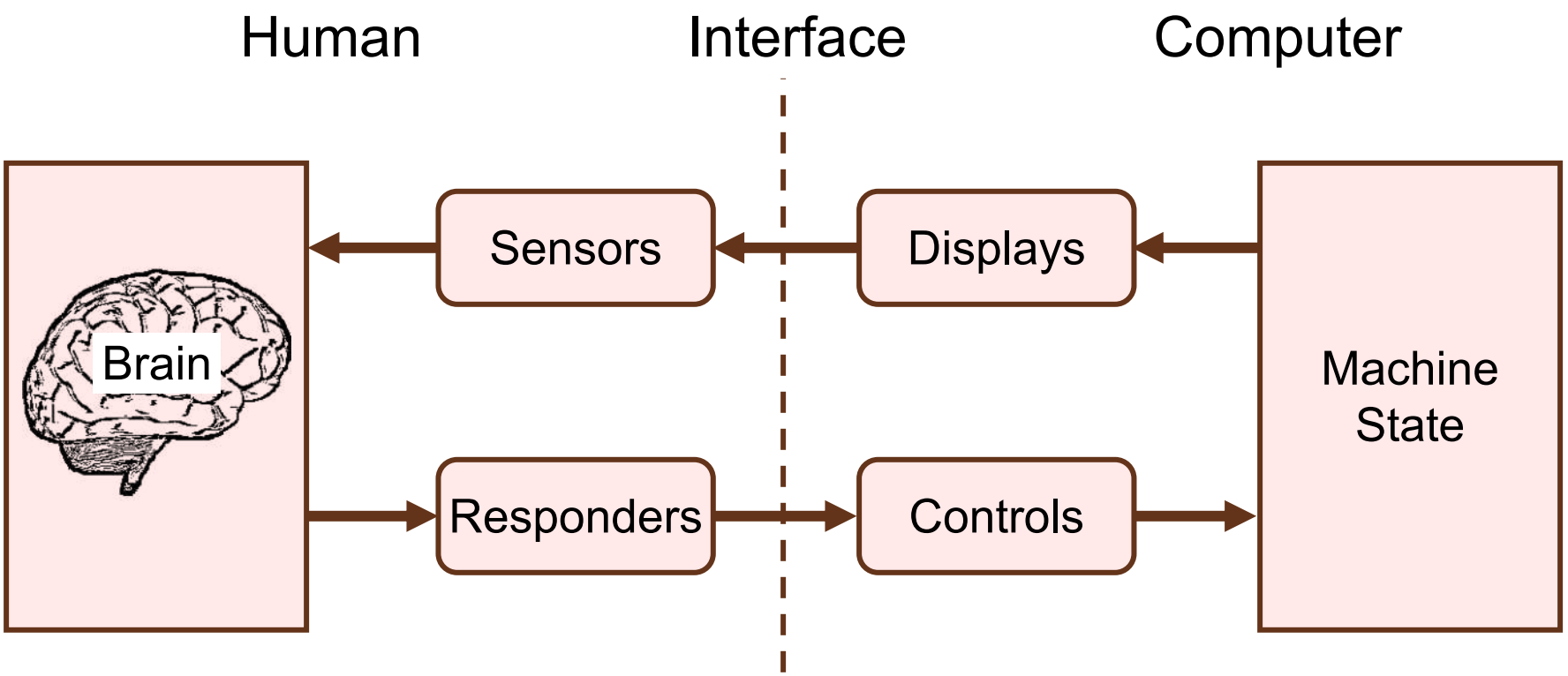
Human–computer interaction (HCI) is research in the design and the use of computer technology, which focuses on the interfaces between people (users) and computers.

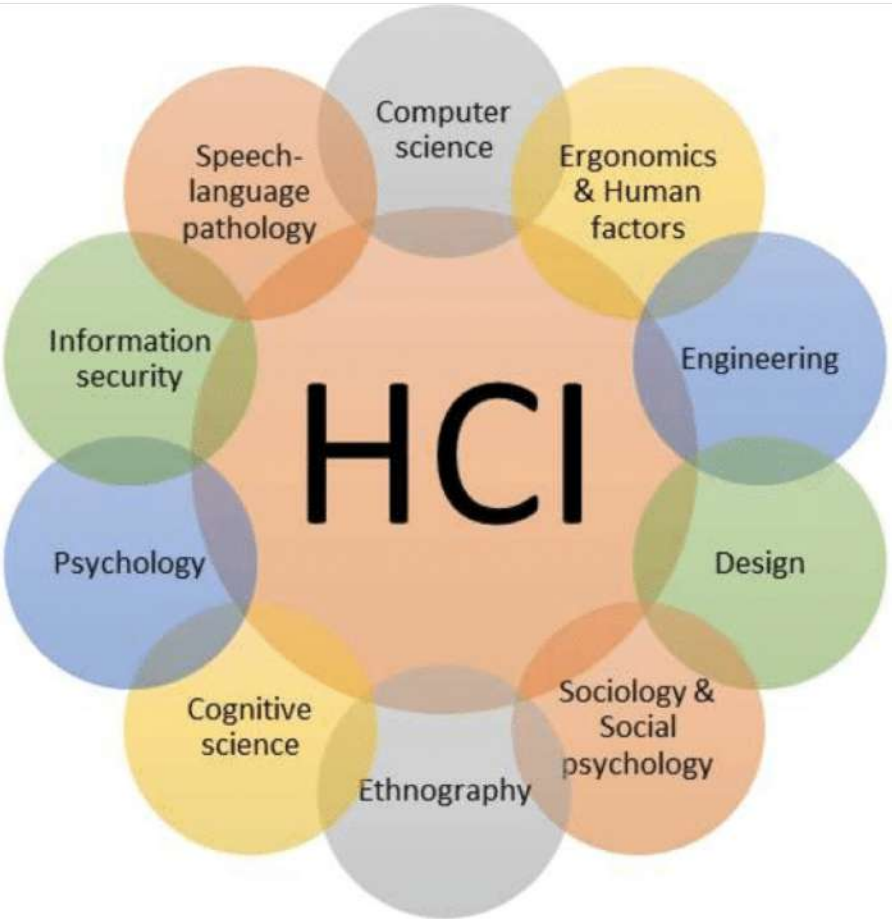
HCI researchers observe the ways humans interact with computers and design technologies that allow humans to interact with computers in novel ways.

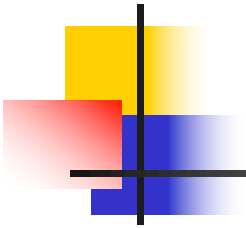

Efficiency,
accuracy,
recall,
satisfaction,
...

Personal devices

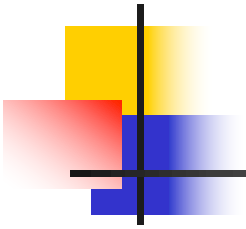
Smart home


Human
Interface
Computer
Brain
Sensors
Displays
Machine State
Responders
Controls


HCI
Computer science
Ergonomics & Human factors
Engineering
Design
Sociology & Social psychology
Ethnography
Cognitive science
Psychology
Information security
Speech-language pathology



- There were human. (many many years ago)
- There were computer. (1940s)
- There was HCI. (1980s)



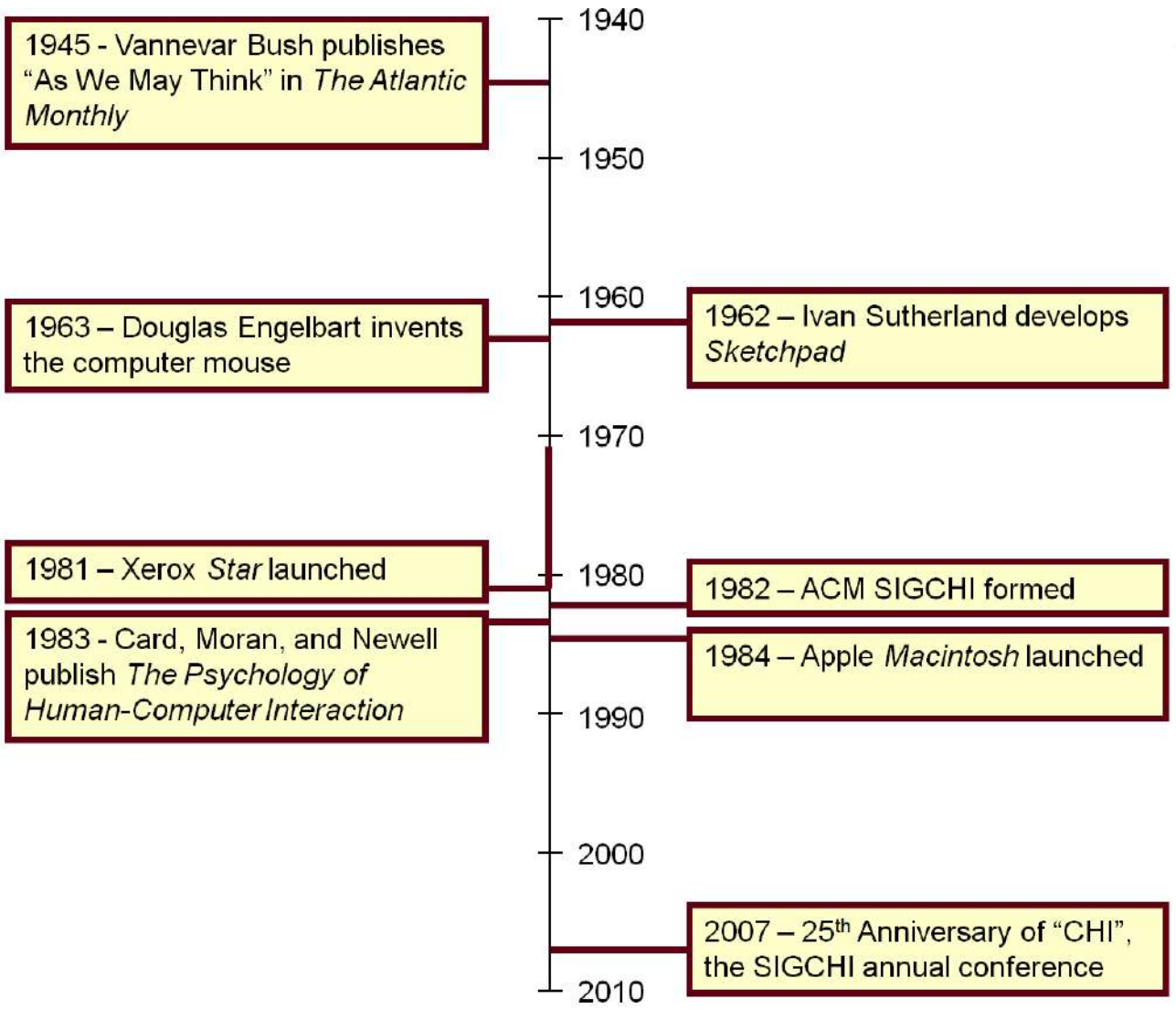
Human factors

Concerned with

- human capabilities, limitations, and performance.

- designing systems efficient, safe, comfortable, and even enjoyable for the humans who use them.

Significant Event Timeline



"As We May Think"
Vannevar Bush (1945)

Sketchpad
Ivan Sutherland (1962)

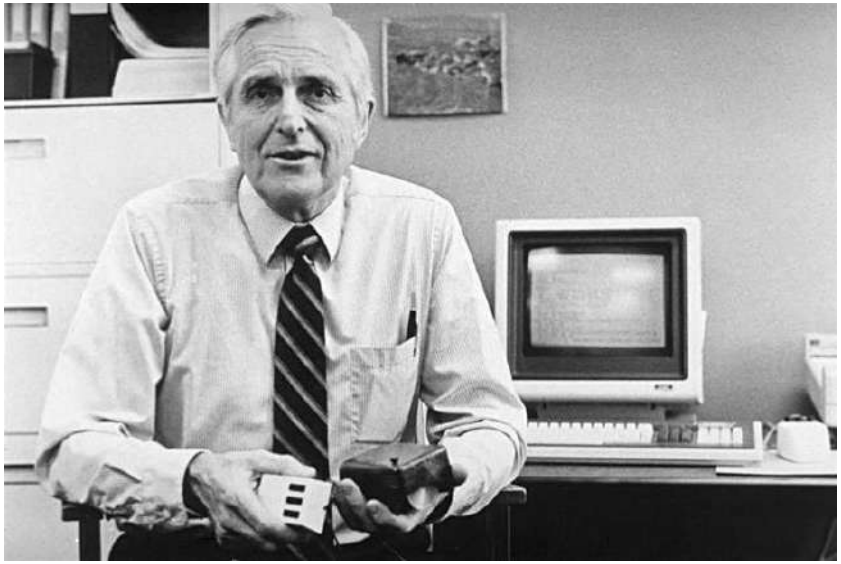
Sketchpad: "Direct Manipulation"

Direct manipulation features:

- Visibility of objects
- Incremental action and rapid feedback
- Reversibility
- Exploration
- Syntactic correctness of all actions
- Replacing language with action

Invention of the Mouse

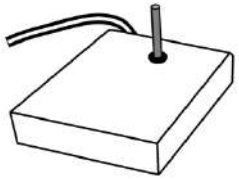
Doug Engelbart (1963)



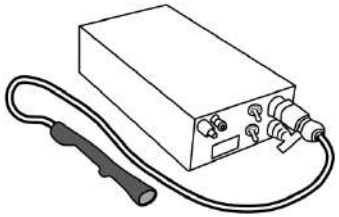
HCI's First User Study[1]

A comparative evaluation of…

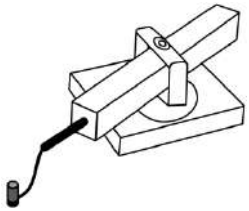
Mouse



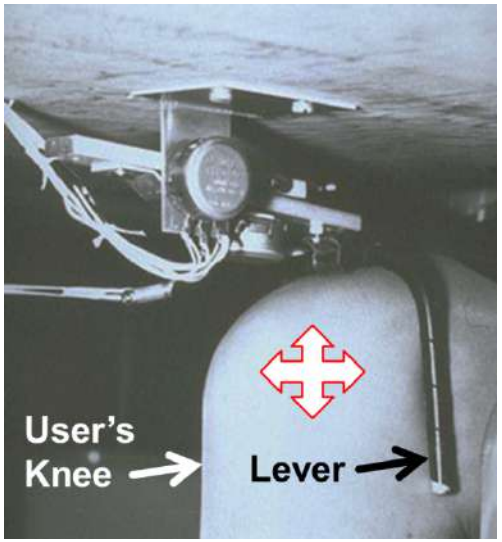
Joystick



Lightpen

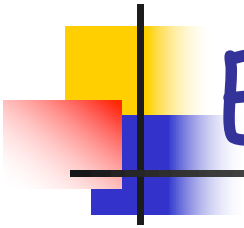


Grafacon



Knee-controlled lever

[1] 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

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

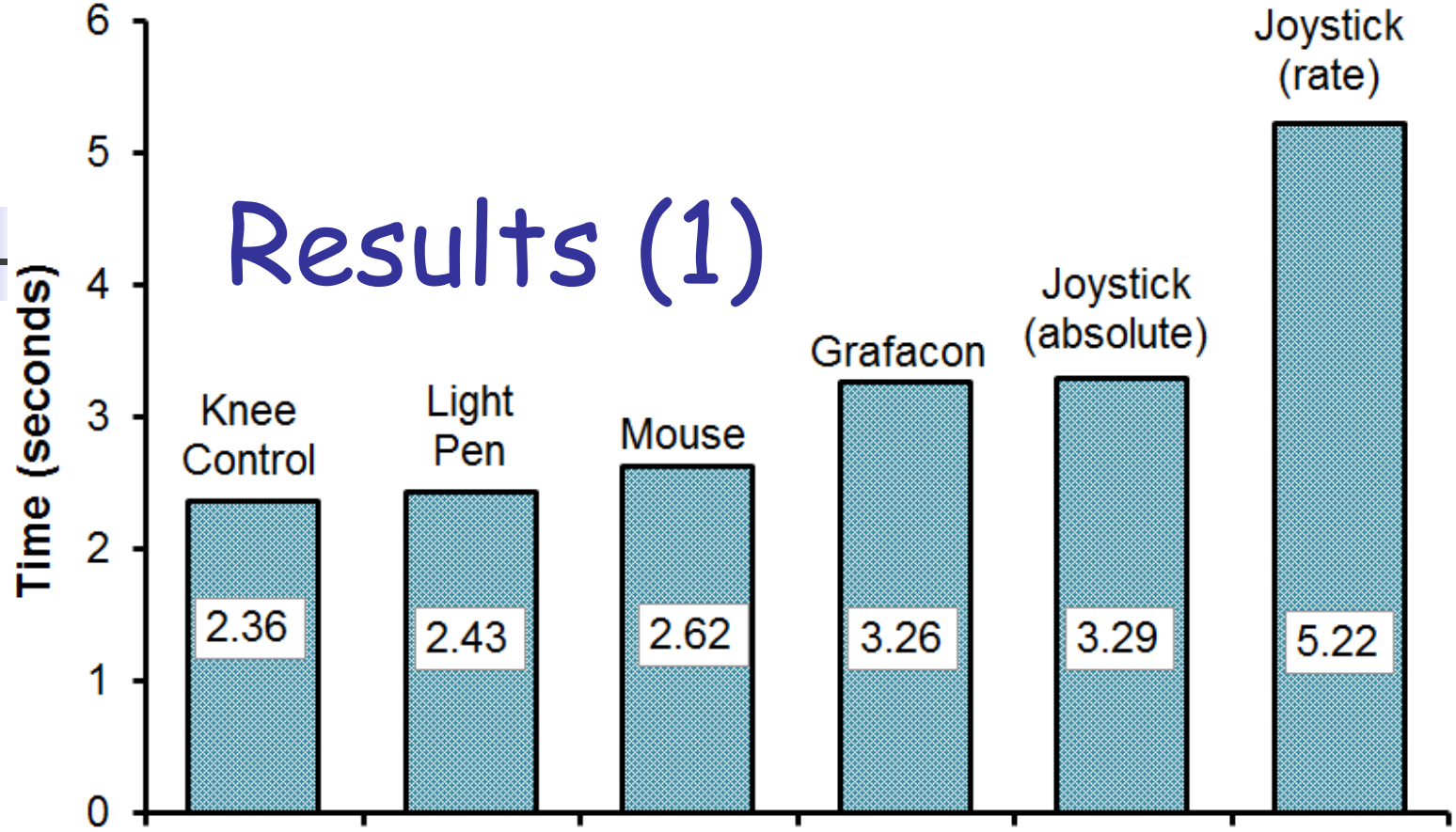
(Note: task completion time = access time + motion time)

Within-subjects, counterbalanced

Task:

- Press spacebar, acquire device, position cursor on target, select target

Results (1)

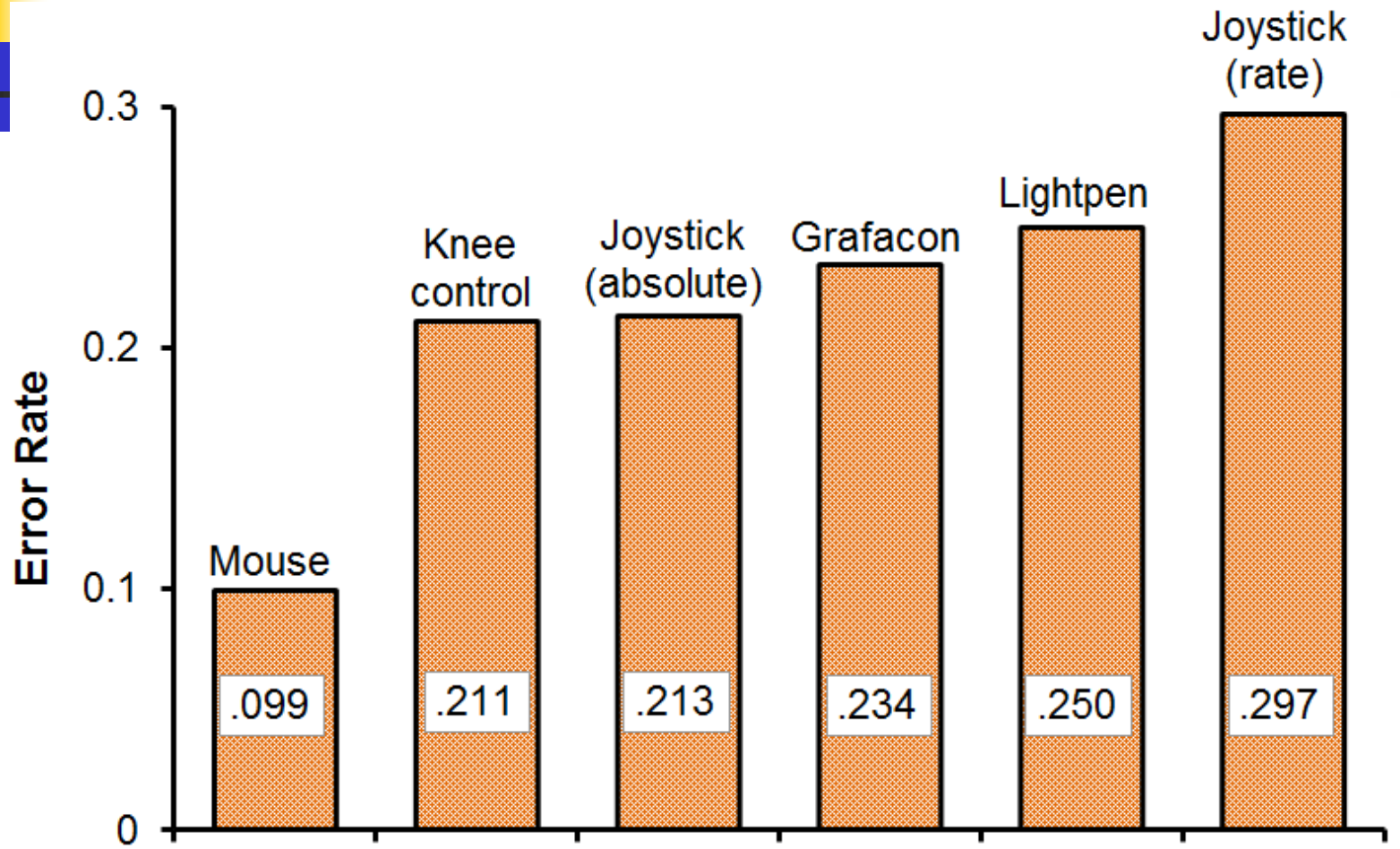


Notes:

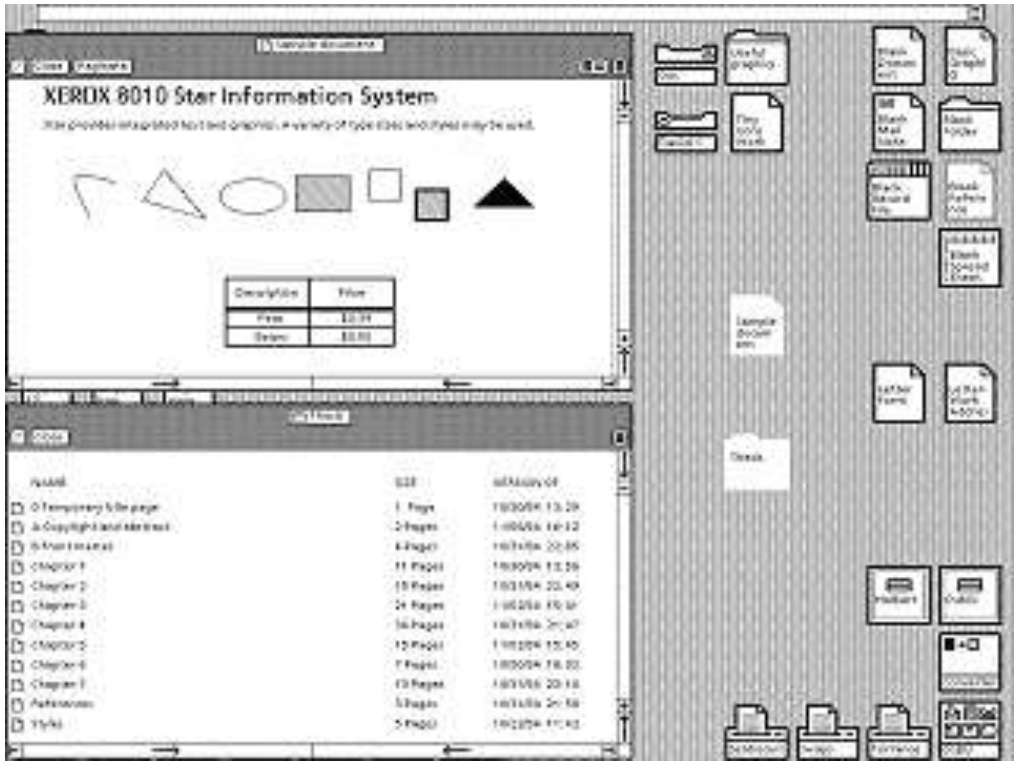
[1] Access time with the knee-controlled lever was zero (since the device is always "acquired").

[2] Light pen use is fatiguing, since the user's arm is held in the air in front of the display.

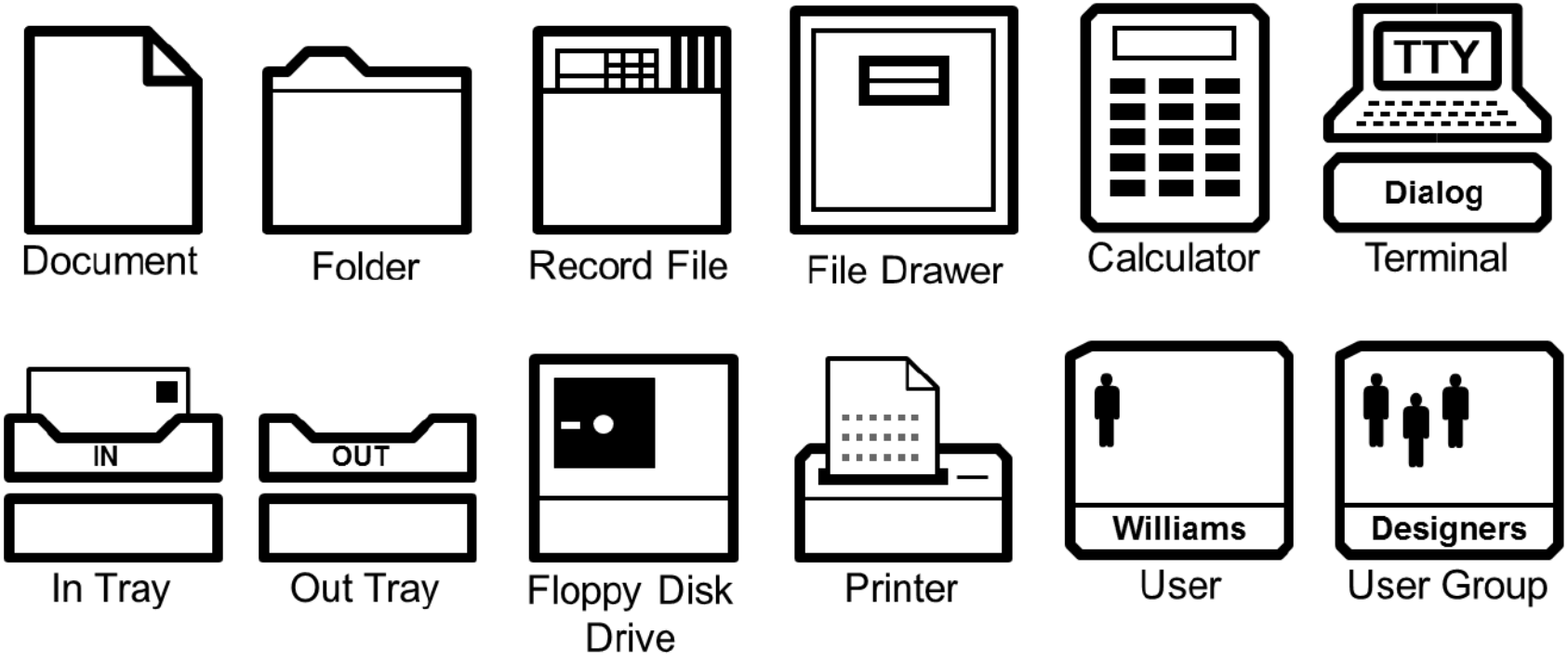
Results (2)


Error Rate
0.3
0.2
0.1
0
Mouse
.099
Knee control
.211
Joystick (absolute)
.213
Grafacon
.234
Lightpen
.250
Joystick (rate)
.297

Xerox *Star* (1981)



Star GUI Icons



Birth of HCI - 1983

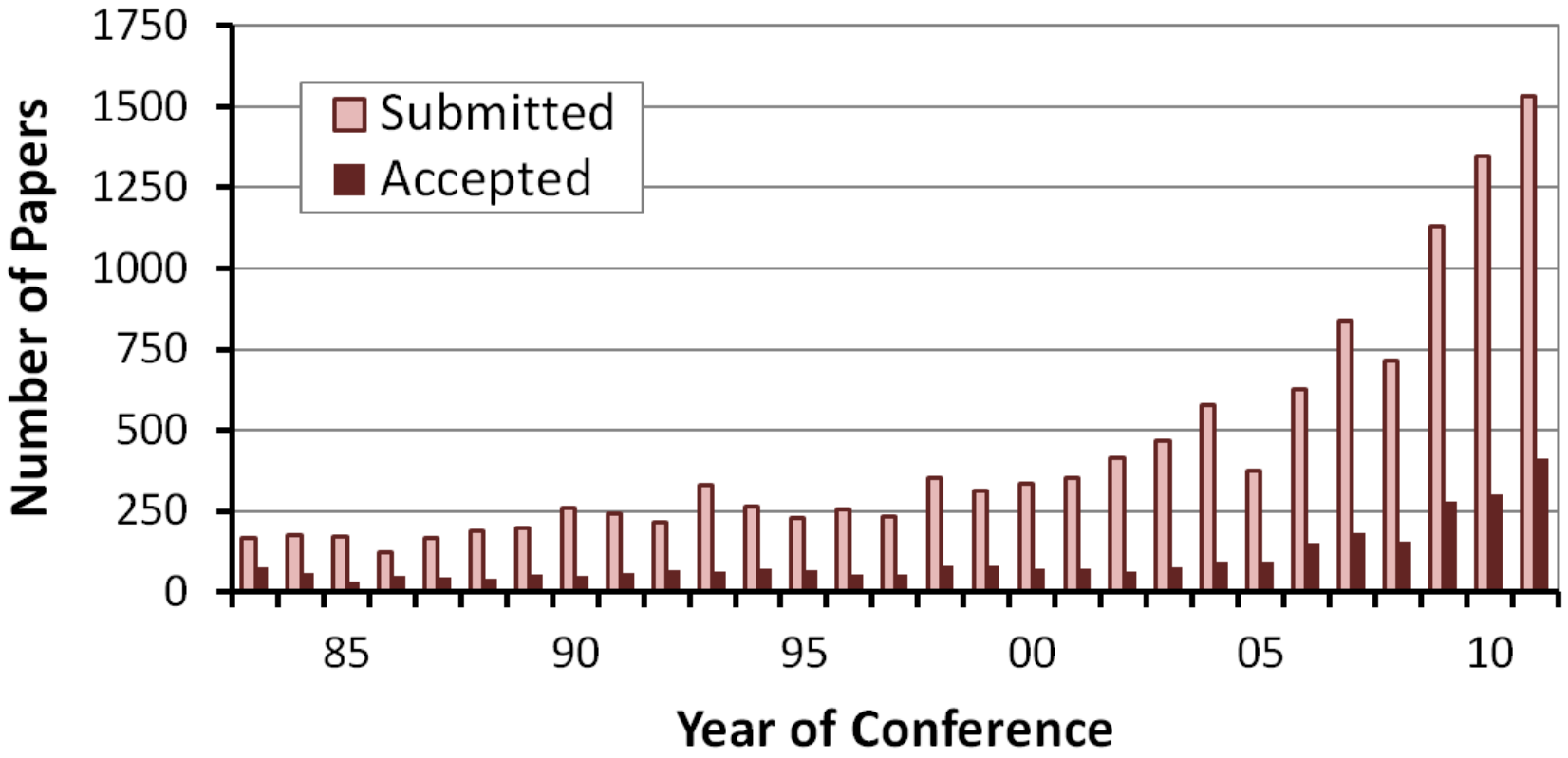
Notable events:

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

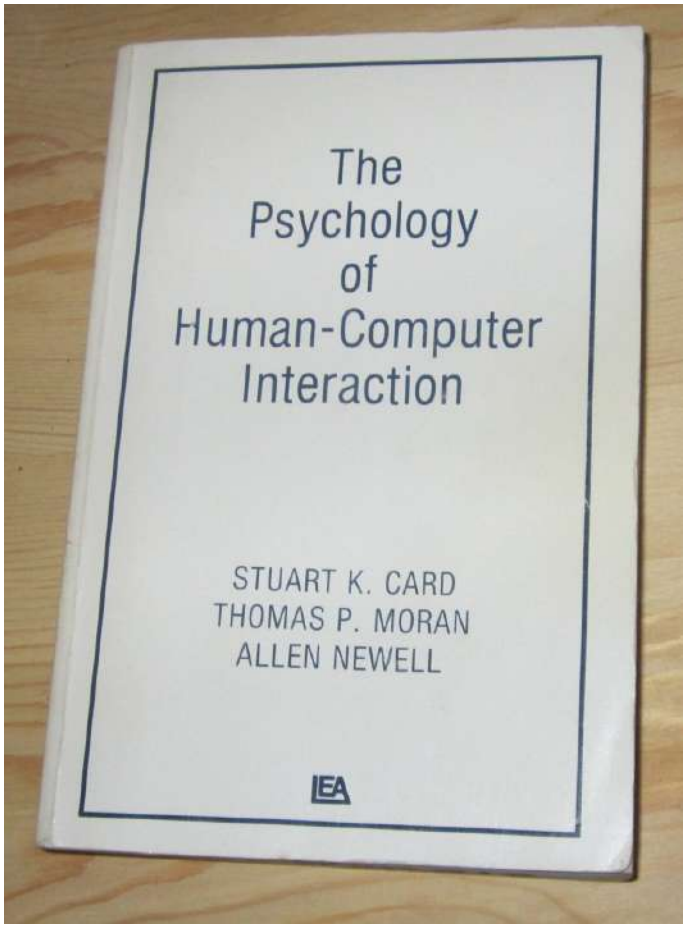
ACM SIGCHI Mission

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.

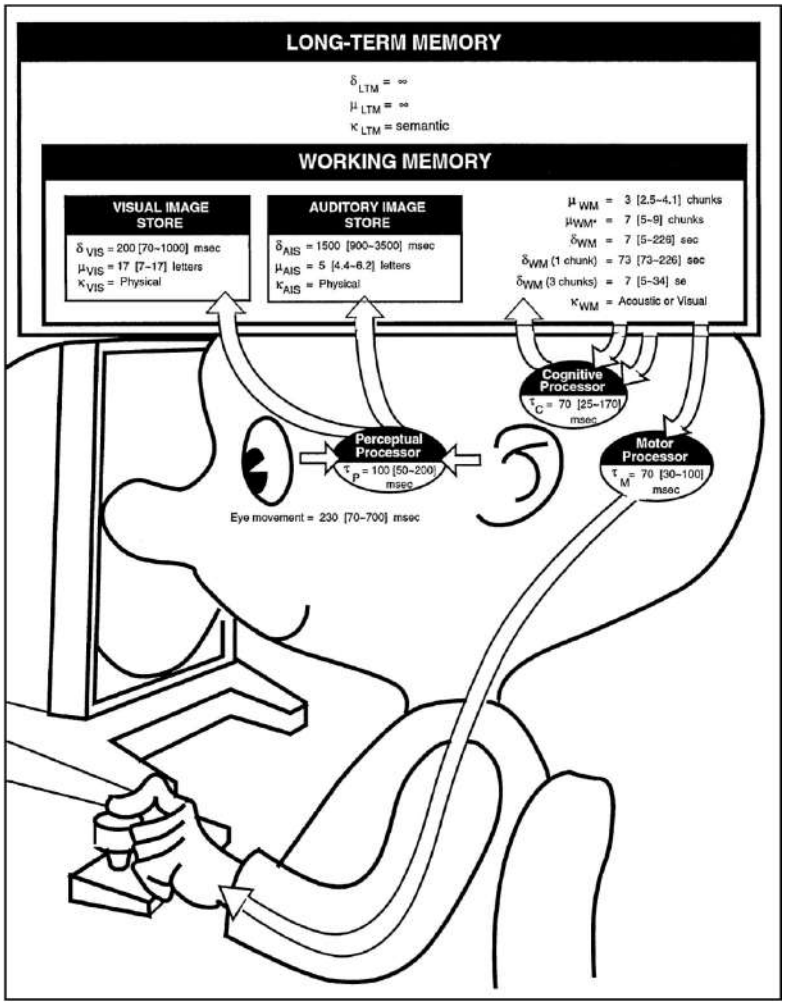
SIGCHI Conference Publications



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

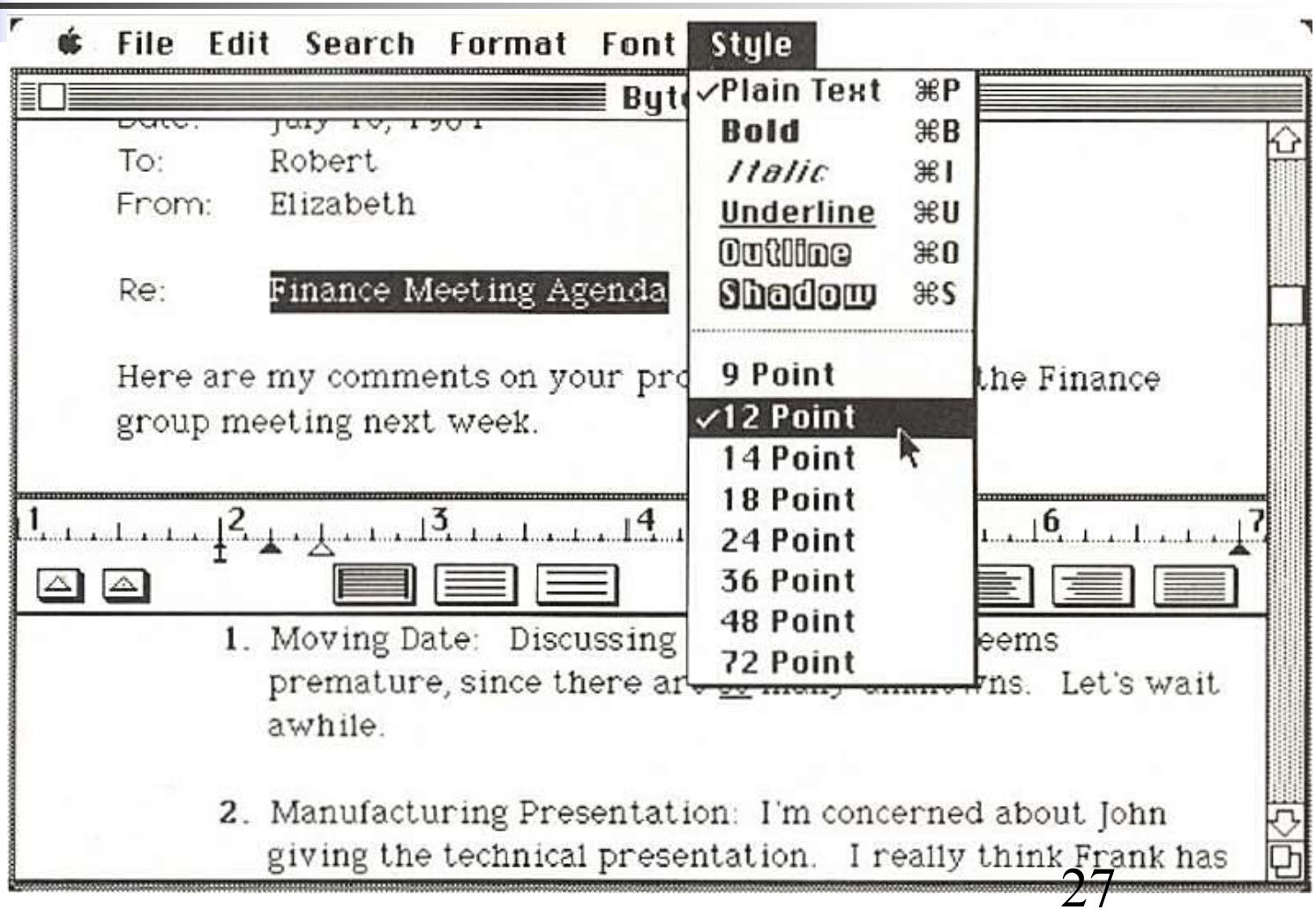


The Model Human Processor



Apple *Macintosh* (1984)

MacWrite Software



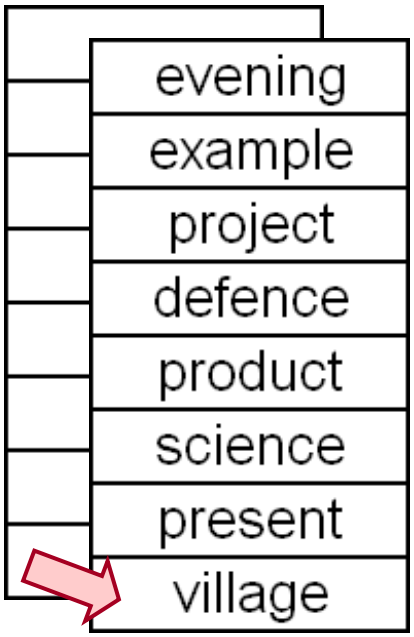
Apple *Macintosh* Timeline

1976	April – Apple Computer Inc. founded in Cupertino, California.
1977	Launch of Apple II. Sells for $1300 U.S. with 4KB RAM. Hugely successful (more than one million units sold). Works with a text-based command-line interface.
1978	*Lisa* project started . Goal of producing a powerful (and expensive!) personal computer.
1979	September – *Macintosh* project started. Goal of producing a low-cost easy-to-use computer for the average consumer. December – Apple and Xerox sign an agreement that allows Xerox to invest in Apple. In return Apple's engineers visit Xerox PARC and see the Xerox *Alto*. The GUI ideas in the *Alto* influence *Lisa* and *Macintosh* development.
1980	December – Apple goes public through initial public offering (IPO) of its stock.
1981	May – Xerox *Star* launched at the National Computer Conference (NCC) in Chicago. Members of the *Lisa* design team are present and see the *Star* demo. They decide to re-vamp the *Lisa* interface to be icon-based. August – IBM PC announced. Highly successful, but embodies traditional text-based command-line interface.
1982	*Lisa* and *Macintosh* development continue. Within Apple, there is an atmosphere of competition between the two projects
1983	January – *Lisa* released. *Lisa* incorporates a GUI and mouse input. Sells for $10,000 U.S. In the end, *Lisa* is a commercial failure. December -- brochures distributed in magazines (e.g., *Time*) pre-announcing the *Macintosh.*
1984	January 22 – *Macintosh* ad plays during Super Bowl XVIII. January 24 – *Macintosh* released. Sells for $2500 U.S.

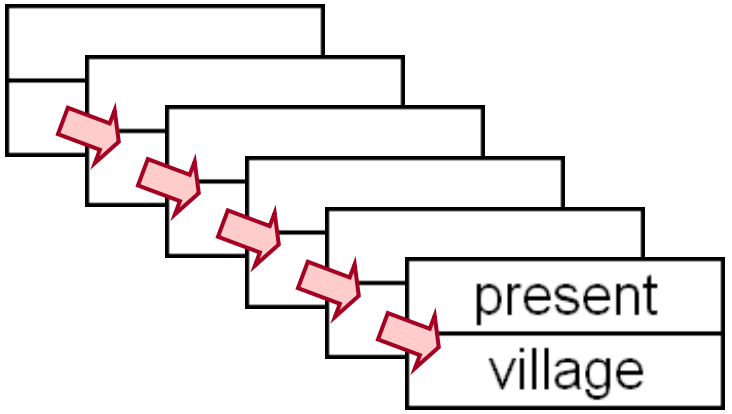
Growth of HCI (1983-…)

Example of an early research topic

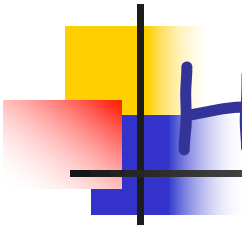
Breadth vs. depth in menu design



8*8 choices in a broad hierarchy



2*2*2*2*2*2 choices in a deep hierarchy

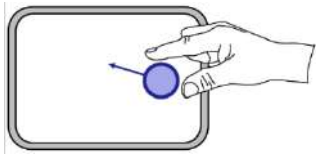
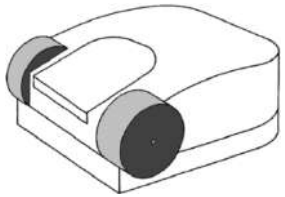
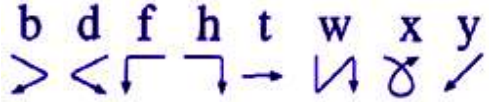


HCI Research

Consider…

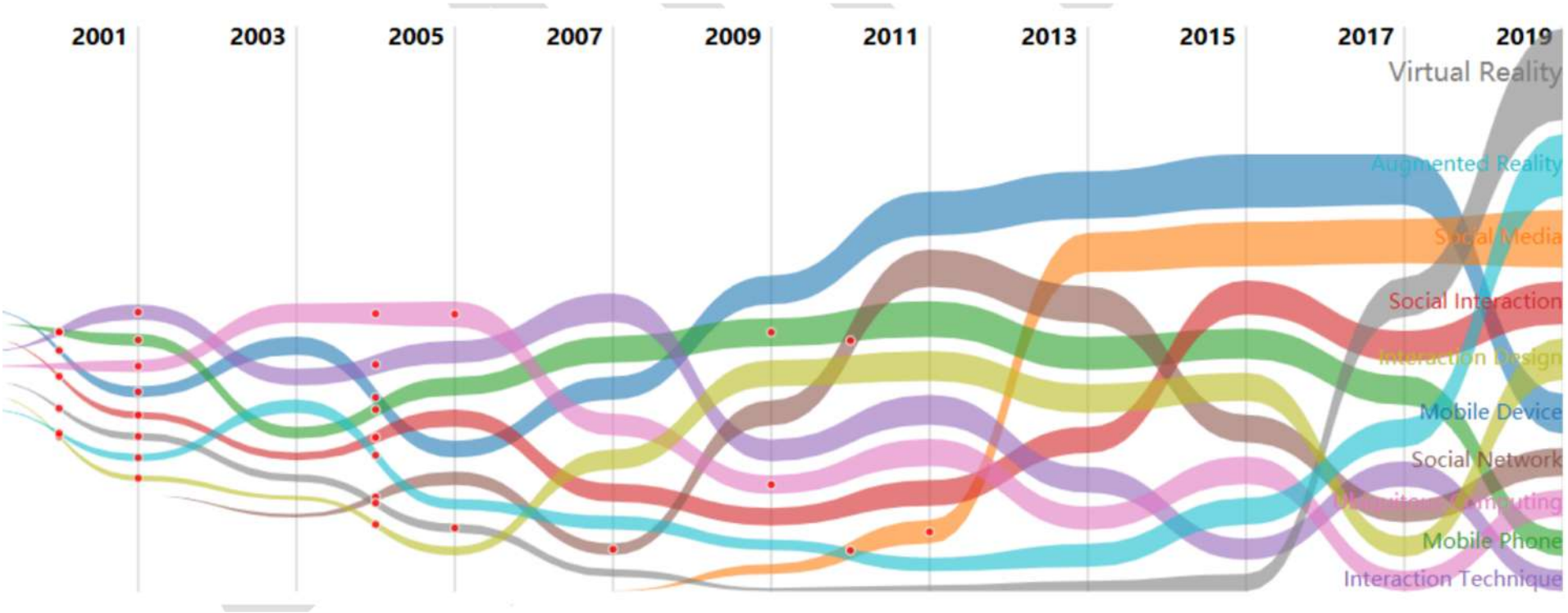
- Two-finger gestures (Apple *iPhone*, 2007)
- Acceleration-sensing (Nintendo *Wiimote*, 2005)
- Wheel mouse (Microsoft *Intellimouse*, 1996)
- Single-stroke text input (Palm's *Graffiti*, 1995)

Were these ideas born out of engineering or design brilliance? Not really…

- Two-finger gestures: ~~2007?~~  **1978** [1]
- Acceleration-sensing: ~~2005?~~  **1998** [2]
- Wheel mouse: ~~1996?~~  **1993** [3]
- Single-stroke text input: ~~1995?~~  **1993** [4]

[1] Herot, C. F., & Weinzapfel, G. (1978). One-point touch input of vector information for computer displays. *Proc SIGGRAPH '78*, 210-216, New York: ACM.
[2] 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.
[3] Venolia, D. (1993). Facile 3D manipulation. *Proc CHI '93*, 31-36, New York: ACM.
[4] Goldberg, D., & Richardson, C. (1993). Touch-typing with a stylus. *Proc CHI '93*, 80-87, New York: ACM.

Trend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2017
2019
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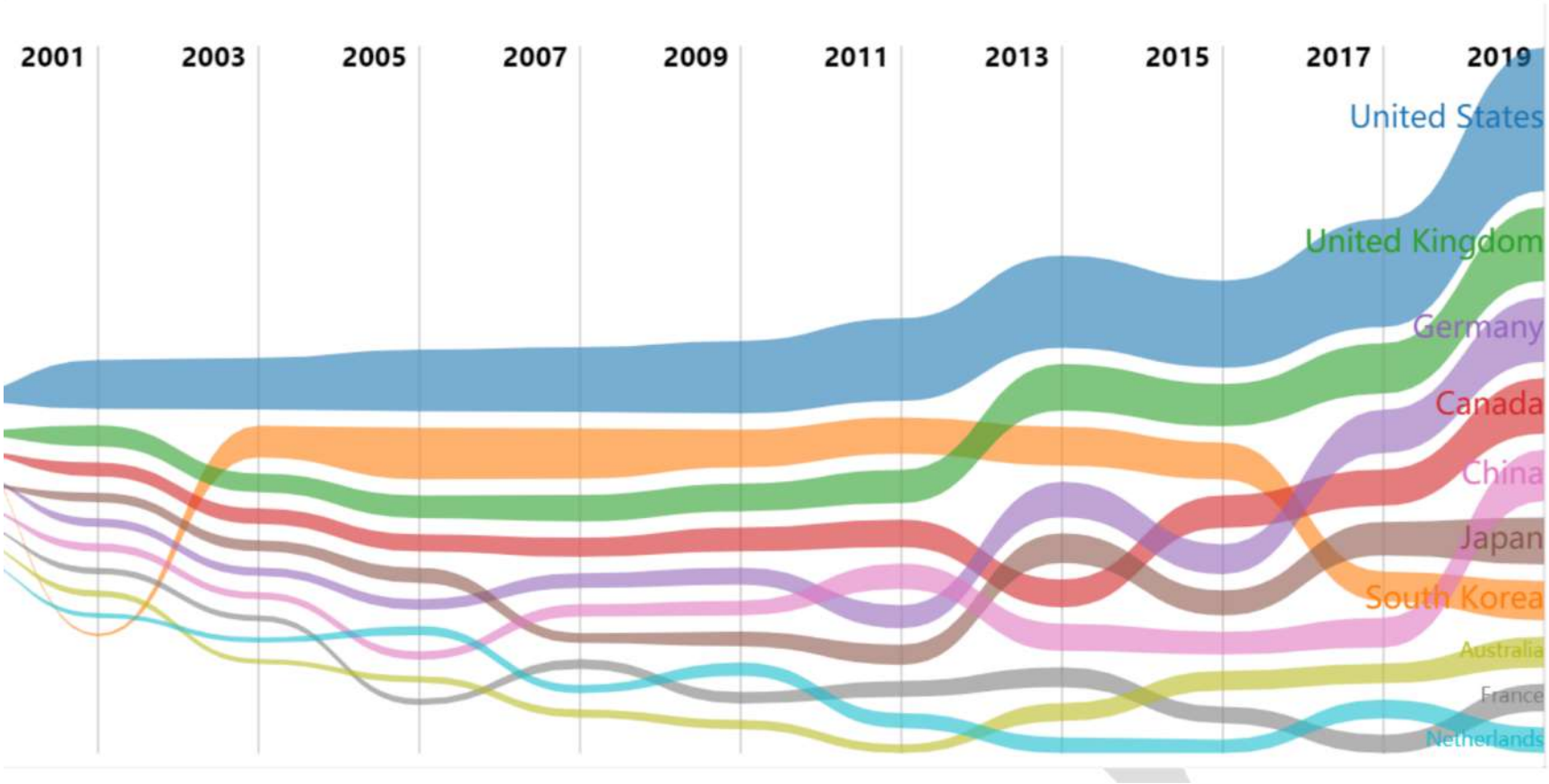
Augmented Reality
Social Media
Social Interaction
Interaction Design
Mobile Device
Social Network
Mobile Phone
Interaction Technique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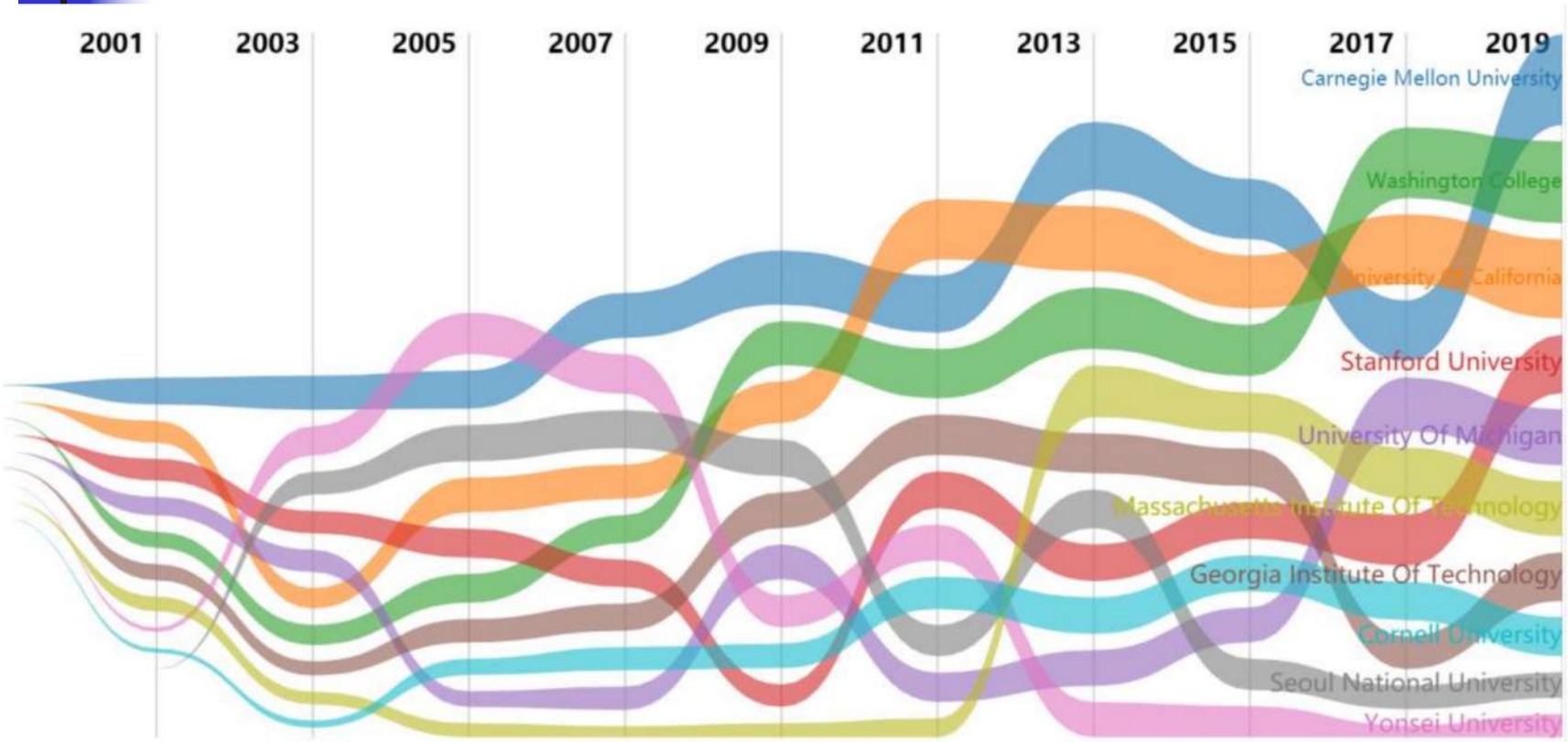
Netherlands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Carnegie Mellon University
Washington College
University Of California
Stanford University
University Of Michigan
Massachusetts Institute Of Technology
Georgia Institute Of Technology
Cornell University
Seoul National University
Yonsei University


大西洋
印度洋
中华人民共和国
Saiph Savage
Alcides Velasquez
Rodrigo De Oliveira
Hernan Badenes
Nicola J. Bidwell
Gary Marsden
Lynne Baillie
Margot Brereton
Ewa Luger
Benedikt Ley
加拿大
墨西哥
巴西
俄罗斯
澳大利亚
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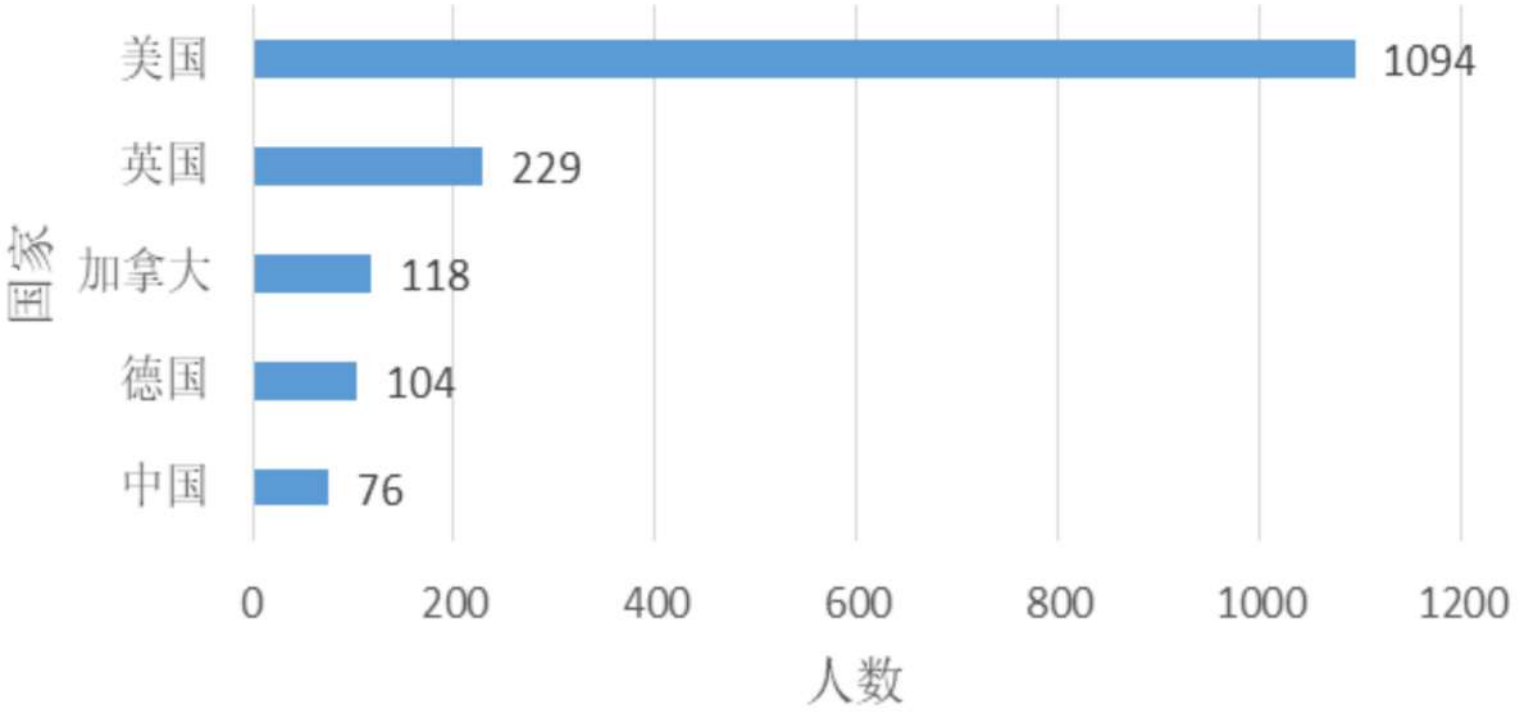
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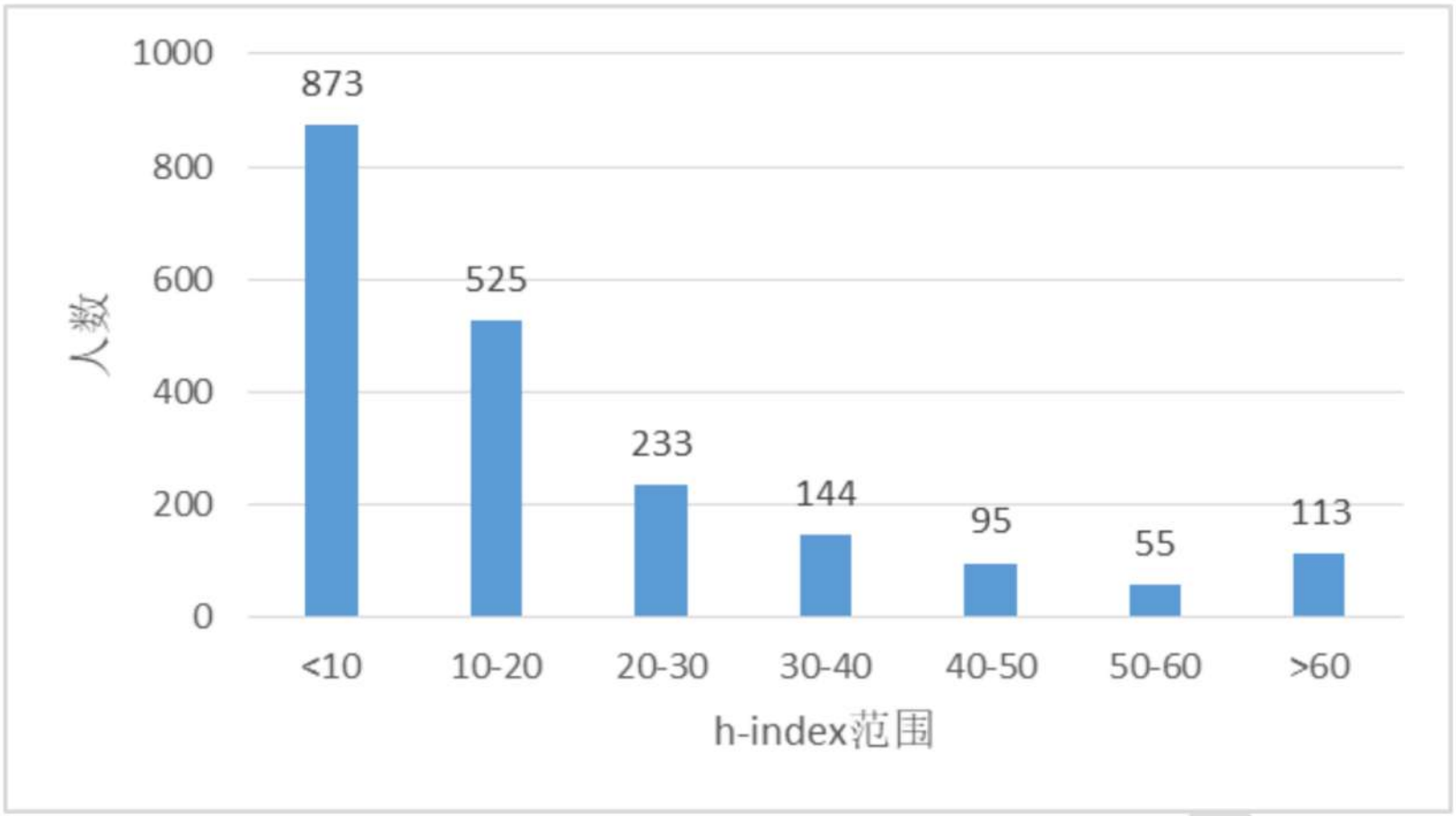
人数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20-30
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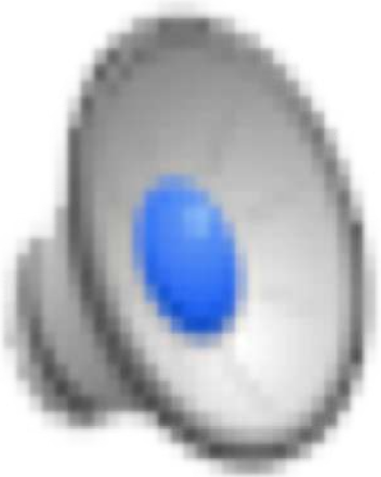
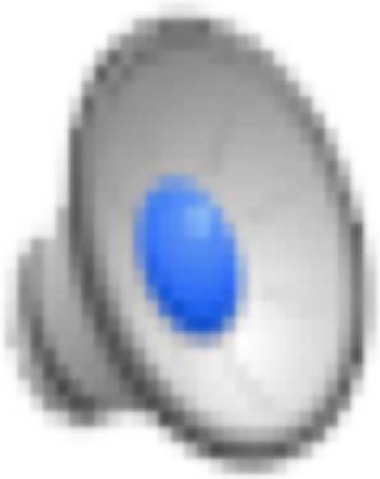
40-50
50-60
>60
h-index范围


蒙古
Margot Brereton
朝鲜
日本
28
24
23
中华人民共和国
2
Zhiwen Yu
Xiangshi Ren
15
Fanglin Chen
6
Peter Henry
Feng WANG
21
孟加拉国
5
Joke Kort
缅甸
印度
6
老挝
泰国
柬埔寨
5
斯里兰卡
马来西亚
帕劳

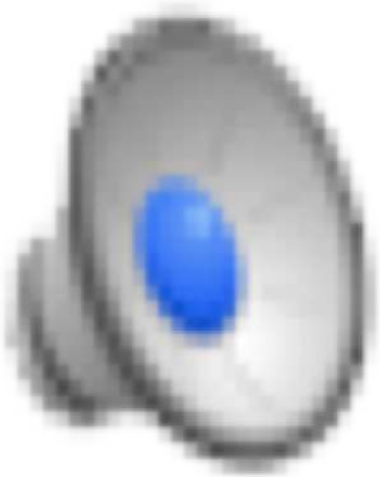
Based on Computer Vision



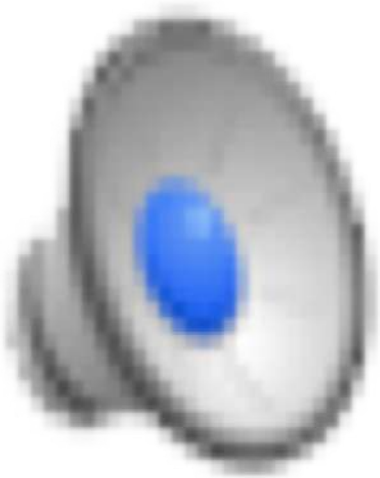
Based on Virtual Reality



Based on Augmented Reality



In the future, maybe...



Extended reading

The Future of Human Computer Interaction - Nobel Week Dialogue 2015:

The Future of Intelligence（Video）