



HCI: History in 3 Waves

Stephen Gilbert

Week I

<https://youtu.be/QUQsqBqxoR4?t=7s>



Some Computer History

Charles Babbage (1822)

Difference Engine:
a mechanical calculator.

Analytical Engine:
1st general purpose computer

Designed but never built.

Ada Lovelace:
1st computer
programmer

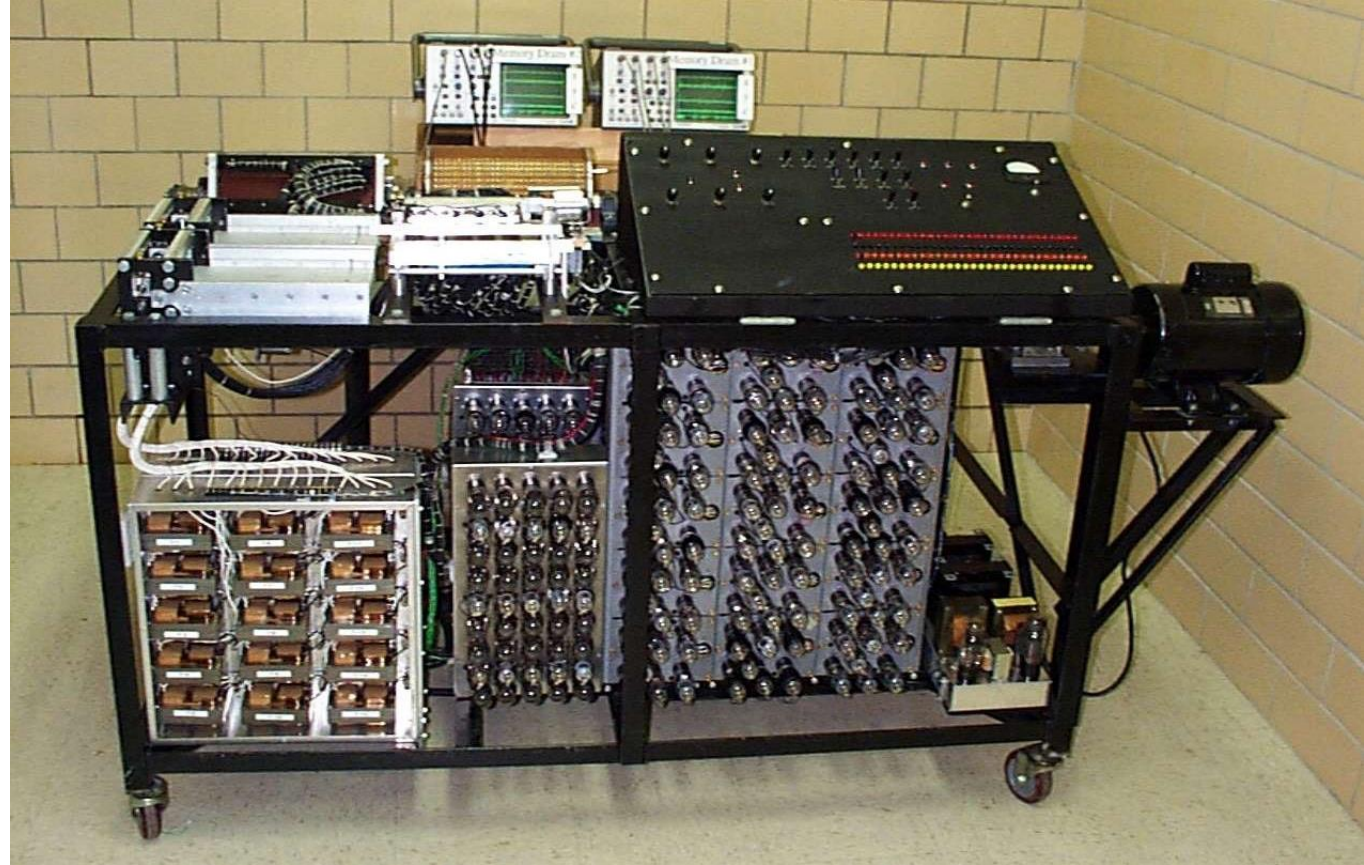


Lady Ada (Limor
Fried)

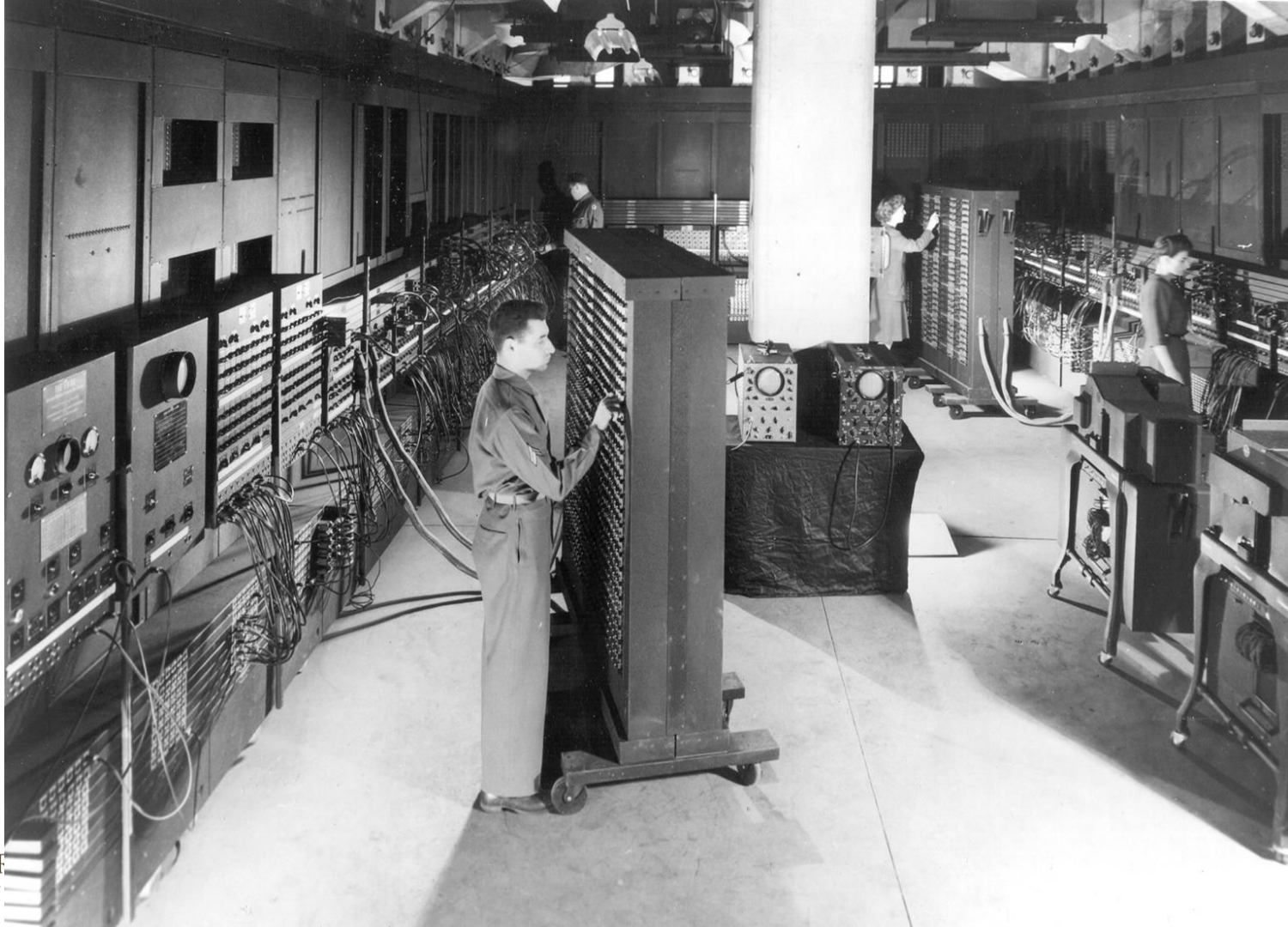
Atanasoff-Berry Computer (1941)

First electronic
digital computing
device

At Iowa State!

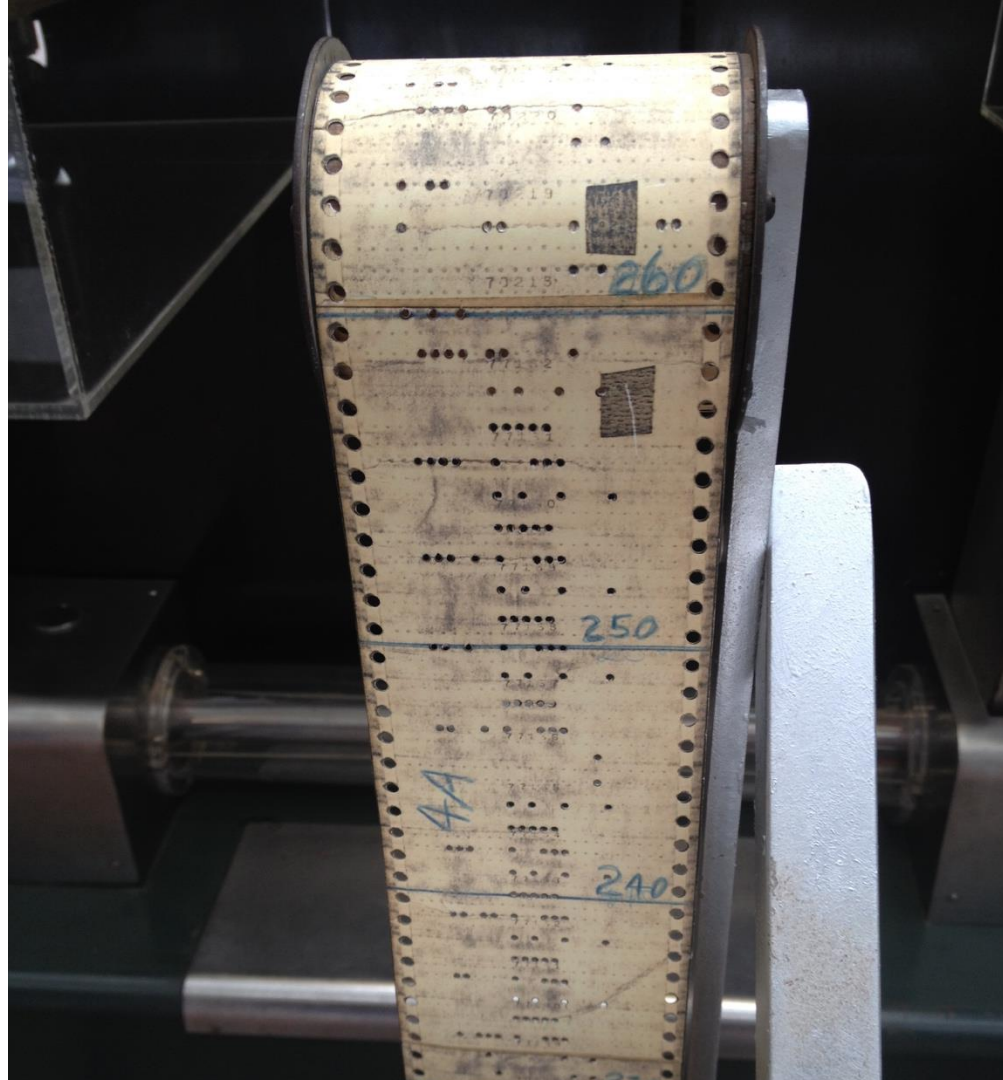


Eniac (1943)



Harvard Mark I (1944)

Paper tape
readers with
physical
patches



IBM SSEC (1948)



From IBM Archives

Programming Languages

Moving beyond punch cards

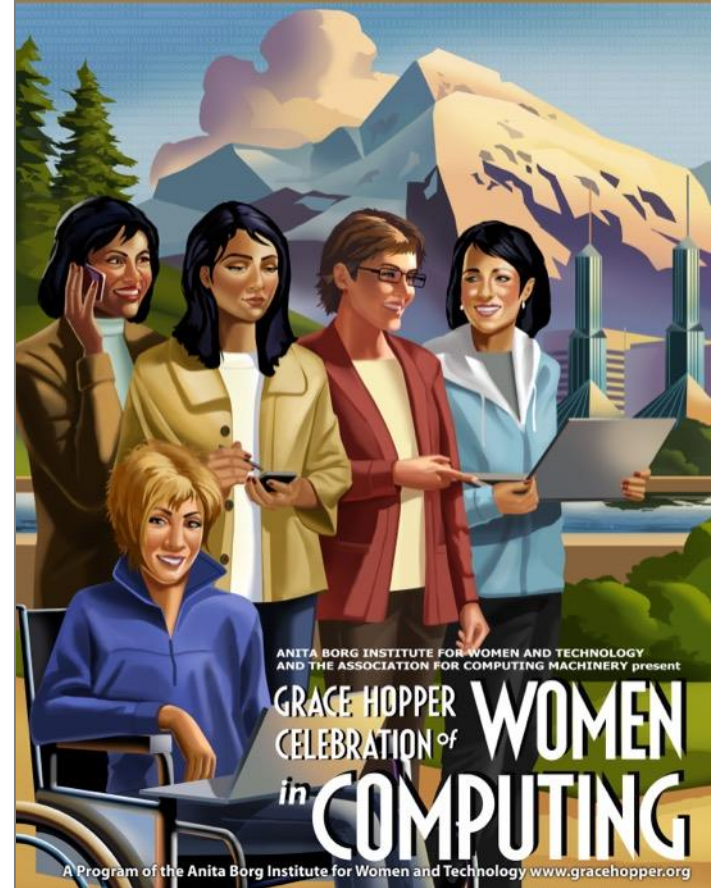
FORTRAN, 1957 from IBM

– Dorothy Vaughan

COBOL, 1960

– Grace Hopper, “Mother of COBOL”

Still “Batch Processing” – no interaction



Figures

Vannevar Bush (1945)

“As We May Think” in *Atlantic Monthly*

“wholly new forms of encyclopedias will appear, ready made with a mesh of **associative trails** running through them, ready to be dropped into the **memex** and there amplified”

<http://www.theatlantic.com/doc/194507/bush>

J.C.R. Licklider

1960 – Described “Man-Computer Symbiosis”

- Time-sharing
- Networking
- Human-centered focus

Ivan Sutherland

MIT Ph.D. thesis: Sketchpad, 1963

Light pen

Hierarchy: pictures &
subpictures

Icons

Copying

3D rotation



Douglas Englebart

NLS: oNLine System

“Mother of all demos” at 1968 conference

- Hypertext
- Windows
- Audio + video conferencing
- File version control
- Mouse & control box

Note: no Unix, no ARPAnet/Internet yet



Alan Kay

Dynabook, 1969

Xerox PARC

“Imagine having your own **self-contained knowledge manipulator** in a portable package the size and shape of an ordinary **notebook**. Suppose it had enough power to out-race your senses of sight and hearing, enough capacity to store for later retrieval **thousands of page-equivalents** of reference materials, poems, letters, recipes, records, drawings, animations, musical scores...”

Personal Computers

IBM XT/AT, 1981

- Command line
- Many sold

Xerox Star, 1981

- WIMP GUI
(Windows, Icons, Menus, Pointers)
- Commercial failure



Mark Dean
Dennis Moeller

Apple Lisa, 1983

- Based on Xerox Star
- Failed

Apple Macintosh, 1984



1987: Apple's Knowledge Navigator vision



Takes place in 2011

What does it get right?

What's wrong?

What do we still need to do?

Notes:

- iPhone 2007
- iPad 2010
- Siri 2011



HCI History: 3 Waves

First

Wave

Treat human like a machine.

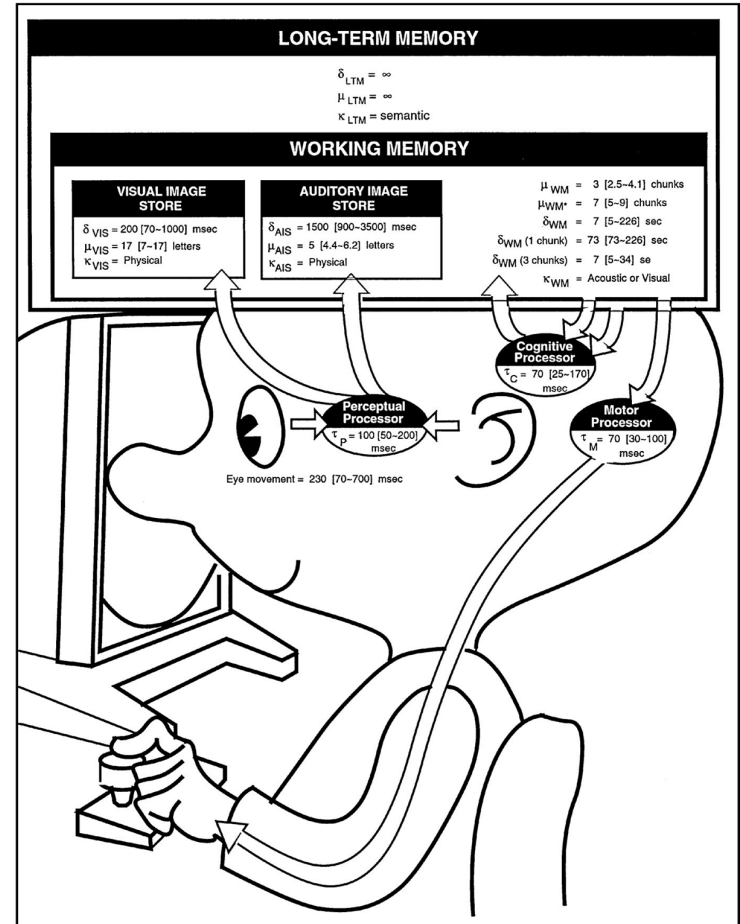
What can it do?

Cognitive Science

Psychophysics

Human Factors

People at desks at work.



LONG-TERM MEMORY

$$\delta_{LTM} = \infty$$

$$\mu_{LTM} = \infty$$

$$\kappa_{LTM} = \text{semantic}$$

WORKING MEMORY

VISUAL IMAGE STORE

$\delta_{VIS} = 200 [70-1000] \text{ msec}$
 $\mu_{VIS} = 17 [7-17] \text{ letters}$
 $\kappa_{VIS} = \text{Physical}$

AUDITORY IMAGE STORE

$\delta_{AIS} = 1500 [900-3500] \text{ msec}$
 $\mu_{AIS} = 5 [4.4-6.2] \text{ letters}$
 $\kappa_{AIS} = \text{Physical}$

$$\mu_{WM} = 3 [2.5-4.1] \text{ chunks}$$

$$\mu_{WM^*} = 7 [5-9] \text{ chunks}$$

$$\delta_{WM} = 7 [5-226] \text{ sec}$$

$$\delta_{WM} (1 \text{ chunk}) = 73 [73-226] \text{ sec}$$

$$\delta_{WM} (3 \text{ chunks}) = 7 [5-34] \text{ se}$$

$$\kappa_{WM} = \text{Acoustic or Visual}$$

Perceptual Processor

$$\tau_P = 100 [50-200] \text{ msec}$$

Cognitive Processor

$$\tau_C = 70 [25-170] \text{ msec}$$

Motor Processor

$$\tau_M = 70 [30-100] \text{ msec}$$

Eye movement = 230 [70-700] msec

Gilbert, SPIRE-EIT 2019

Stroop

Tell me the colors of the words on the next 2 slides.

E.g.

RED

BLUE

1

BLACK

RED

GREEN

BLACK

BLUE

RED

BLACK

GREEN

BLUE

RED

2

RED

BLACK

BLUE

GREEN

RED

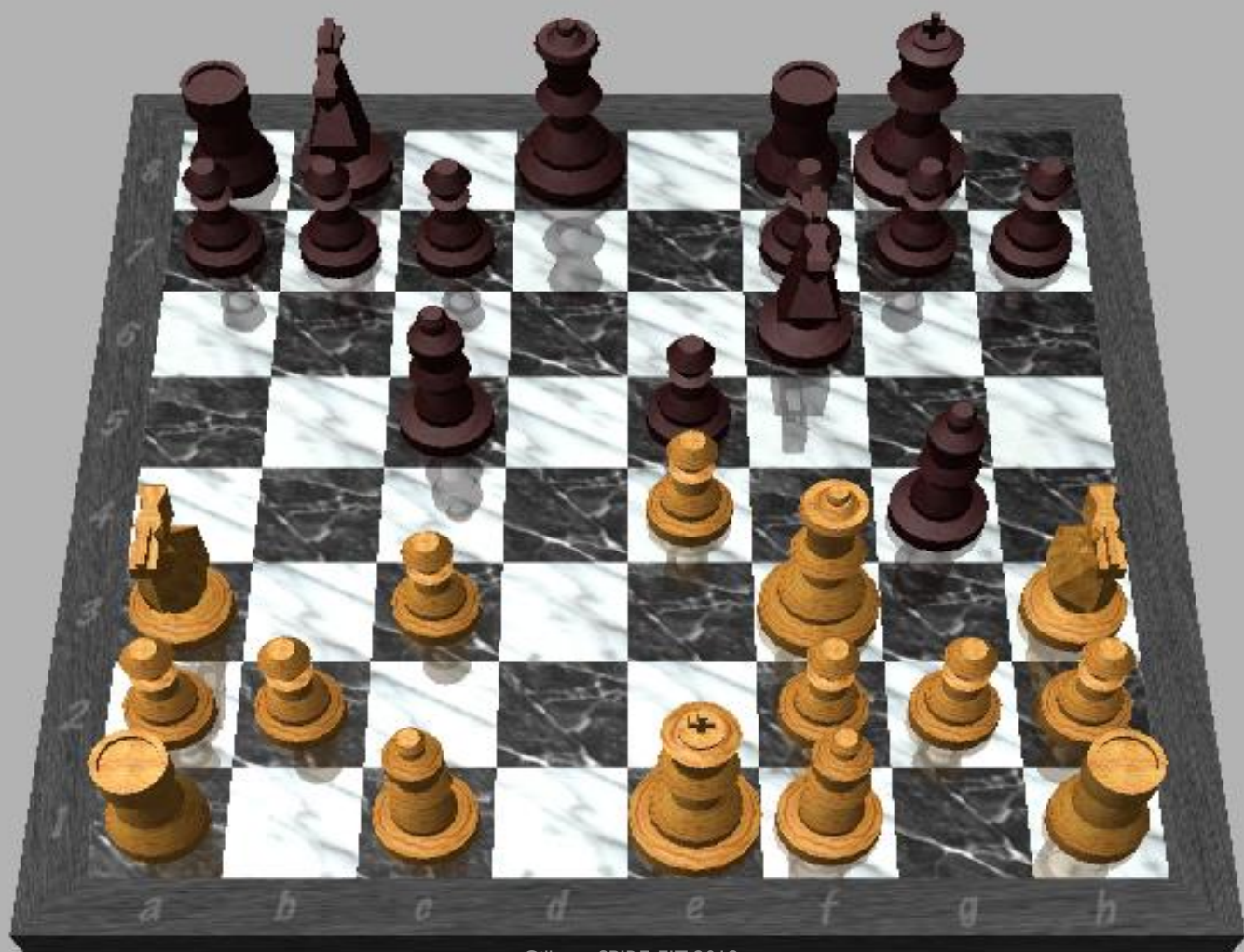
BLUE

RED

BLACK

GREEN

BLACK



Chess

Who is winning?

Chess

Who is winning?

How do you know?

Chess

Who is winning?

How do you know?

What do you remember?

Experts vs. Amateurs

QUICK! How many items do I have in my shopping cart?

The screenshot shows the iStock website interface. At the top, there is a search bar with the text "Search for stock photos, illustrations, video, audio and editorial photos" and a search button. The user's profile "sgilbert92" is visible in the top right corner. The main navigation bar includes links for Photos, Illustrations, Video, Audio, Ways to pay, Participate, and Help. The current search results are for "Lightbox: MAIN LIGHTBOX" with 15 results. The page features a grid of image thumbnails, including a camera, a hand pointing to a strategy diagram, two people working on a laptop, a woman and child, and a collection of blue icons. The bottom of the page has a dark navigation bar with "My Account", "Buy iStock Credits", "Lightboxes", and "Cart (0)".

QUICK! How many items do I have in my shopping cart?

The screenshot shows an Amazon search results page for the query "attention wickens". The page header includes the Amazon logo, navigation links like "Stephen's Amazon.com", "Today's Deals", "Gift Cards", "Sell", and "Help", and a promotional banner for "See Your Experian Score and Report Today" with an "Enroll Now" button. The search bar shows the query "attention wickens" and a "Go" button. Below the search bar, it indicates "1-16 of 58 results for 'attention wickens'" and a "Choose a Department to sort" dropdown. The main content area displays two book results. The first result is "Applied Attention Theory" by Christopher D. Wickens and Jason S. McCarley (Nov 1, 2007). It shows a paperback price of \$40.49 (down from \$45.95), a Kindle Edition for \$29.95, and a 5-star rating. The second result is "Attention: From Theory to Practice (Series in Human-Technology Interaction)" by Arthur F. Kramer, Douglas A. Wiegmann and Alex Kirlik (Dec 28, 2006). It shows a hardcover price of \$71.05 to rent (down from \$84.99 to buy) and a Kindle Edition for \$48.49 (down from \$85.00). A left sidebar contains filters for "Books" (Medical Applied Psychology, Industrial Manufacturing Systems, Technology, Industrial Ergonomics, Industrial Health & Safety) and "Refine by" (Eligible for Free Shipping, Avg. Customer Review).

amazon [Try Prime](#) Stephen's Amazon.com Today's Deals Gift Cards Sell Help See Your Experian Score and Report Today. [Enroll Now](#) Ad

Shop by Department Search All attention wickens Go Hello, Stephen Your Account Try Prime Cart 1 Wish List

1-16 of 58 results for "attention wickens" Choose a Department to sort

Show results for

Books >

- Medical Applied Psychology
- Industrial Manufacturing Systems
- Technology
- Industrial Ergonomics
- Industrial Health & Safety
- + See more

+ See All 2 Departments

Refine by

Eligible for Free Shipping
Free Shipping by Amazon

Avg. Customer Review

- ★★★★★ & Up
- ★★★★☆ & Up
- ★★★☆☆ & Up
- ★★☆☆☆ & Up
- ★☆☆☆☆ & Up

Applied Attention Theory by Christopher D. Wickens and Jason S. McCarley (Nov 1, 2007)

\$45.95 **\$40.49** Paperback [Prime](#)
Only 4 left in stock - order soon.

\$29.95 Kindle Edition
Auto-delivered wirelessly

More Buying Choices - Paperback
\$40.49 new (18 offers)
\$36.73 used (10 offers)

★★★★★ (4)
FREE Shipping
Trade-in eligible for an Amazon gift card
Books: See all 58 items

Attention: From Theory to Practice (Series in Human-Technology Interaction) by Arthur F. Kramer, Douglas A. Wiegmann and Alex Kirlik (Dec 28, 2006)

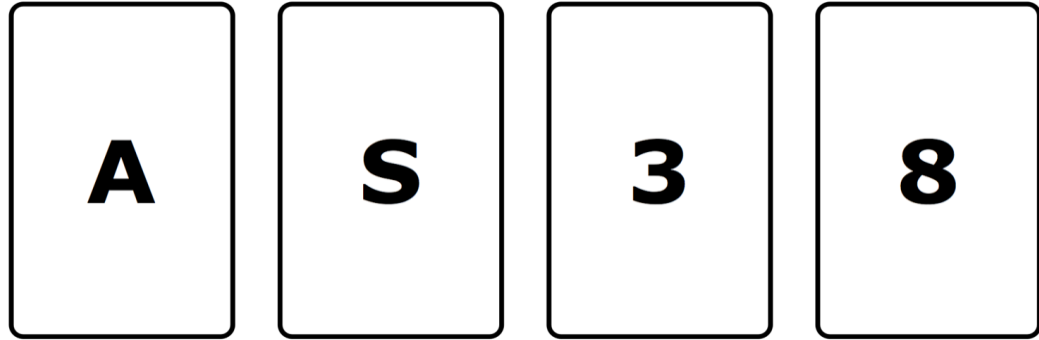
\$71.05 to rent Hardcover [Prime](#)
\$84.99 to buy
Usually ships in 1 to 2 months

\$85.00 **\$48.49** Kindle Edition
Auto-delivered wirelessly

More Buying Choices - Hardcover
\$70.85 new (10 offers)
\$62.00 used (9 offers)

FREE Shipping
Trade-in eligible for an Amazon gift card
Excerpt
Page 12: ... insisted to Chris Wickens that attention should be modeled as ... See a random page in this book.
Books: See all 58 items

Reasoning



Fact:

- All cards have letter on one side and number on the other

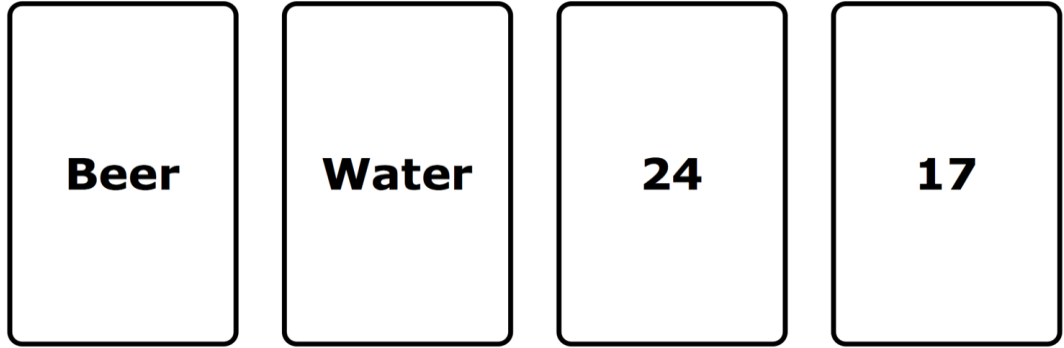
Rule:

- If there's a vowel on one side, there's an odd number on the other side.

Question:

- Which card(s) do you turn over to verify the rule?

Reasoning (2)



Fact:

- All cards represent people - the person's drink is on one side, age is on the other.

Rule:

- If the person is drinking alcohol, he or she must be over 21

Question:

- Which card(s) do you turn over to verify the rule?

What's missing from the First Wave?

Second

~~Wave~~
The whole human
Groups of Humans
Situating action / intent

CSCW
Participatory Design

Workplace groups
Technology is separate



Flight 1549: Lands in the Hudson (2009)



What's missing from the Second Wave?

Third

Wave

Social dynamics

Culture

Emotion

Affective computing

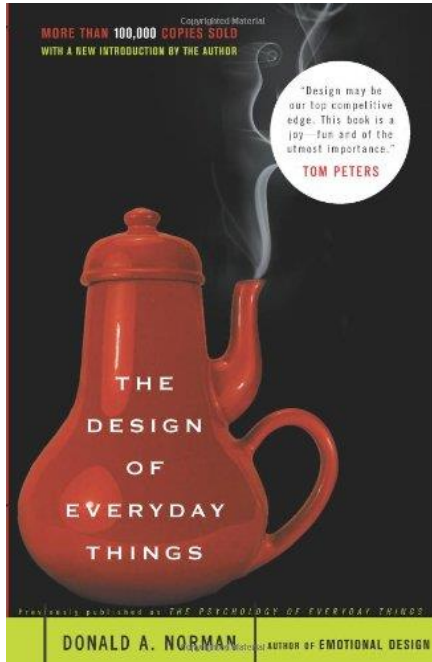
Human-Agent

Teaming

Non-work activities



HCI Homework: Bad Usability Scavenger Hunt



Find 2 interfaces that are frustrating for the user (websites or physical items: Doors, Chairs, Game Controllers, etc.) and capture them (photo or screenshot) by end of Friday.

Describe:

- The user's task and context
- What is working/not working, what could make it better
- Blog them: start post title with **"HCI: "**
- Due by end of Friday