CS 338: Graphical User Interfaces

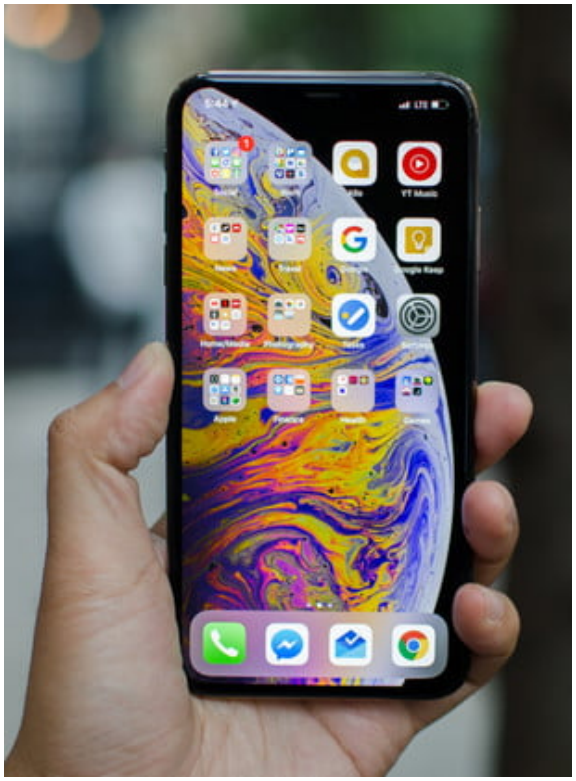
Lecture 9-2:
Interfaces off the Desktop

We've come full circle...

- In the first lecture, we talked about interfaces being everywhere.
- Our focus has been on GUIs this term.
- Let's generalize the basic ideas and get a sense of what's to come...

Handhelds

- One burgeoning venue for new interfaces is on handheld computers



Handhelds

- Designing for handhelds (Cooper)
  - Think about how the device will be held and carried.
    - size, shape, weight
    - articulation (e.g., flip-top)
    - every factor can greatly affect usability!
  - Think about whether the device can/should be one-handed or two-handed
    - phone needs 1 hand, pen tablet needs 2 hands
    - it's ok for one-handed to need 2 hands sometimes, but it should be for occasional functions
      - e.g., text messaging

Handhelds

- Designing for handhelds
  - Consider whether the device is a satellite or stand-alone.
    - some of the most successful devices are satellites
      - don't try to duplicate all functionality...
        e.g., entering data
      - instead, concentrate on viewing...
        e.g., iPod
      - make the device do one thing extremely well ??
  - Avoid use of pluralized and pop-up windows.
    - there's no screen real estate for many windows
    - applications should typically take over the screen,
      avoiding modeless dialogs, and handling modal-type errors by other means (e.g., intelligence)

Handhelds

- Designing for handhelds
  - Integrate functionality and minimize navigation.
    - avoid lots of separate applications with different fn's
    - best: seamless navigation from one fn to the next
      - e.g., phone rings --> shows name and number, click on name --> shows address and info, ...
  - Specify the right controls for the device.
    - touch-screen handhelds need large buttons
    - pen-based handhelds can go smaller
      - users must still be able to write/click easily
    - avoid dragging or other maneuvering w/dexterity

Handhelds

- Designing for handhelds
  - Don't require shifting input modes.
    - the person has a pen/finger input... stick to it!
    - one difficulty: pointing vs. typing
      - optional accessories always fine, but avoid requiring them
  - Don't require (a lot of) scrolling.
    - clearly show when there is more information
    - at the same time, show this in another screen
    - has touch input changed this?

Kiosks

- Kiosk = specialized computer accessible to the general public
- At first glance, like desktop GUIs...
  - can include buttons, menus, etc.
  - may or may not have a pointer
- But really, kiosks are very different...
  - only used infrequently/rarely by any user
  - typically have one specific goal to achieve
  - typically don't have keyboard or mouse
  - typically used in noisy environments

Kiosks

- Two basic types of kiosks:
  - (1) Transactional : tightly scoped with a very specific purpose
    - e.g., ATM, airport ticketing machines
    - goal for machine & user: complete the transaction as quickly and painlessly as possible
  - (2) Explorational : intended for learning
    - e.g., information kiosks in museums, malls
    - the "transaction" simply involves information
    - unlike transactional systems, these try to engage the user to stick around and learn
      - aesthetics and easy navigation are key

Kiosks

- Designing for kiosks
  - Touch screens are the typical input.
    - of course, hardware buttons could be used to reduce cost, but have less flexibility
  - Touchable objects should be large, high contrast, and well separated on-screen.
    - at least a few finger widths of size, separation!
  - Avoid keyboard-like input if possible.
    - keyboards on-screen lead to awkward & slow interaction
    - though sometimes can't be avoided (e.g., plane tickets) could be made easier (e.g., enter first letters)
  - Avoid drag-and-drop and scrolling.

Kiosks

- Designing for kiosks
  - Exploit context!
    - one of the most critical aspects of a kiosk is context — where is it, and where are you?
    - this can guide how the kiosk gives information
    - e.g., information kiosks -- "you are here"
    - e.g., navigational kiosks -- "make a right at the end of the corridor, then a left..."
    - e.g., museum kiosks -- "the exhibit in front of you shows the platypus in its native environment..."

Kiosks

- Amtrak example for multi-ride ticket…
  - (1) insert credit card (2 purposes!)
  - (2) "what kind of card is that?"
  - (3) "what do you want to buy?"
    - one-way, round-trip, multi-ride
  - (4) "what is your destination?"
    - (what about your departure city?)
    - first: New York, Washington, Newark, Boston
    - then: all cities
  - (5) confirm details & process payment
  - [(6) confirm credit card id # — sometimes]

Research Question of the Day

- We've often talked about making GUIs intelligent.
- How might kiosks be made intelligent?
- Since context is so important for kiosks,
  how might they better understand their context to facilitate interaction?

Research Question of the Day

- Christian & Avery developed an intelligent kiosk that interacts with the people around it
- Key points:
  - avatar (talking head)
  - machine vision of surrounding env't

Christian, A.D., & Avery, B. L. (2000). Speak Out and Annoy Someone: Experiences with Intelligent Kiosks. In Proceedings of CHI 2000.

Research Question of the Day

- Kiosk modes:
  - Attraction mode
    - kiosk shows interesting pictures
    - avatar looks at people as they walk by
      - machine vision finds and tracks them
  - Interaction mode
    - if the avatar notices someone "hanging around" (staying still in front of the kiosk for a while),
      it switches to interaction mode
    - greets person and displays introduction screen
    - after client browses site and walks away,
      avatar says goodbye

Research Question of the Day

- Test deployment
  - 4.5 months in CyberSmith cafe in Harvard Square
  - 4000 people "interactions"
- Lessons learned
  - Vision system
    - system made to track 1 or few people, but sometimes crowds would gather 'round
    - in this case, can't track individuals, and occasionally it's just a group of people walking around it
      - conversation goes nowhere fast
    - background can cause problems, should be tuned

Research Question of the Day

- Lessons learned
  - Avatar
    - focal point of attention for users, naturally
      - "it looked at me, so I went over to see what it was"
      - but users not even explicitly aware that it tracked them as they moved!
    - synthesized speech not as good as recorded speech
    - unfortunately, most popular feature: poking the face!
      - avatar would give groan or joke when poked
      - so users would do it over and over and over...
    - later development: redirecting gaze to all people
      - probabilistically look at people besides the primary
      - has big effect on people's perceived attentiveness

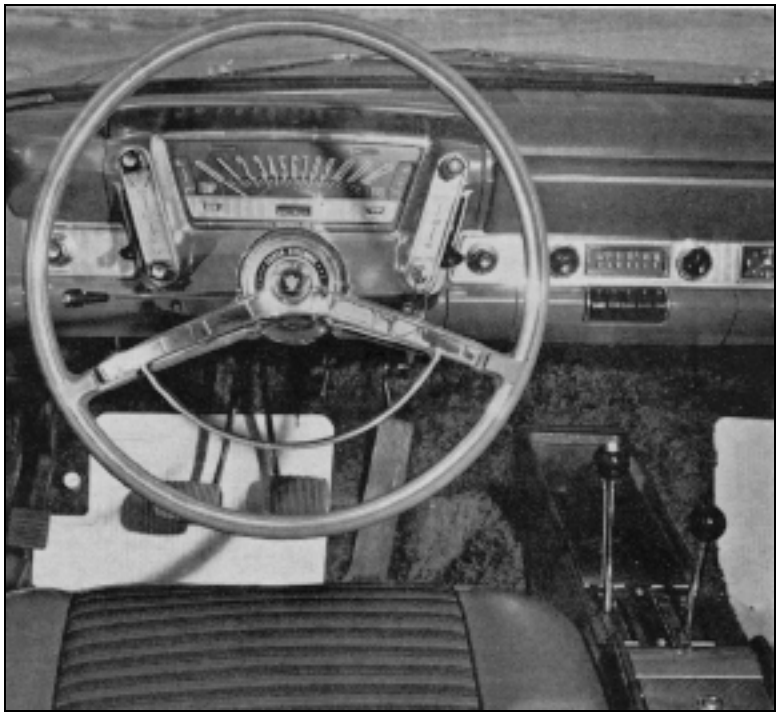
Interfaces in the car

- Vehicles used for 91% of all personal travel
- Average American spends 80 minutes in their car every day — up from about 60 minutes just over a decade ago
- And "driver inattention" has become the primary cause of vehicle crashes (22.7%)
  - ahead of excessive speed (18.7%)
  - ahead of alcohol impairment (18.2%)

Interfaces in the car

- Driver distraction

1960s



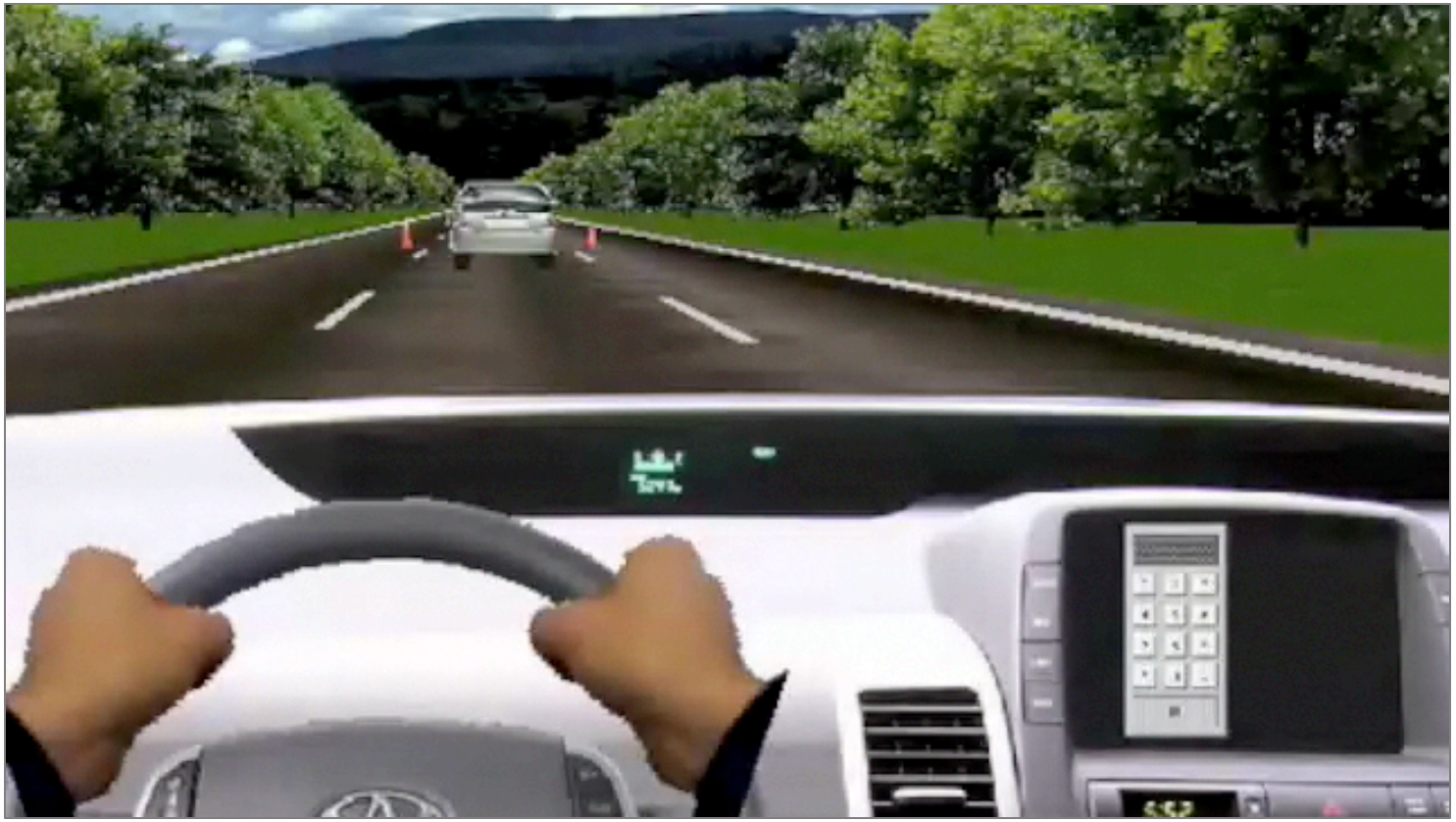
Today

Interfaces in the car

- Examples of driver distraction
  - Cell-phone use can affect…
    - lane keeping: ability to maintain central position
    - speed control: ability to maintain safe distance
    - general attention: ability to see/react to hazards
    - risk of collision 4 times greater w/ phone use; same risk factor as drunk driving (!)
  - Cognitive distraction
    - often we think of distraction coming from the competition of modalities
      - e.g., vision for driving vs. vision for dialing
    - but even thinking can distract!
      - e.g., conversations (over phone vs. with passenger?)

Distract-R

- Using engineering models to predict how new interfaces might distract drivers…(https://youtu.be/5BhuhDcHB9c)



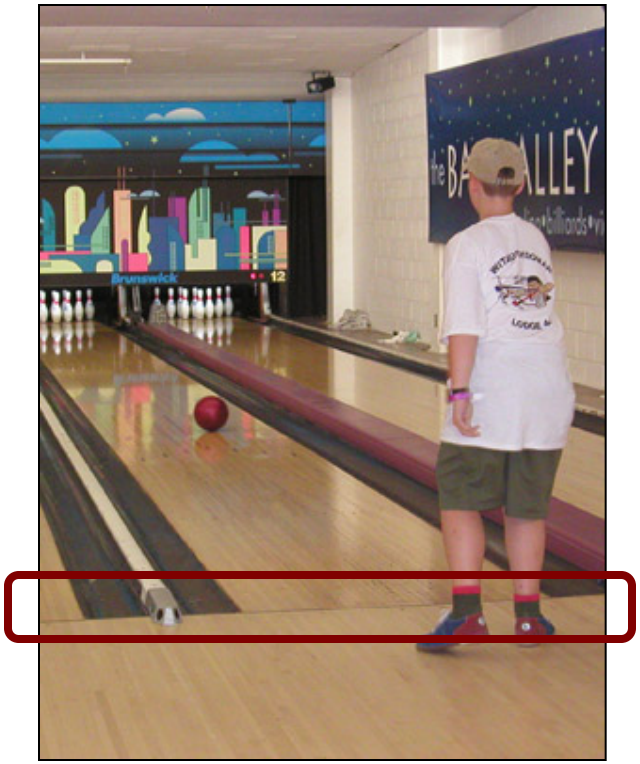
Technology in Sports

- Many technology issues have arisen in sports
  - baseball bats, tennis rackets, golf balls/clubs
- Many possibilities for ubiquitous technology
  - hockey: sensors on puck, goal line, blue line
  - football: line of scrimmage

- Do we want technology to referee sports?
- When does it work well? or not so well?
- How well must it work before we use it?
- Does technology ruin the "spirit" of sports?
- (Does technology kill the "art" in martial arts?)

Bowling & Simple Tech

- Foul line: step on/over the line → "BEEP"
- Pin counting: knock down *n* pins, it scores it



Bowling & Simple Tech

Caveat:
Values are only 👍, –, 👎
and are just my guesses!

- Good / bad points?
  - systems are everywhere
  - reasonably accurate **
  - reasonably consistent
  - bowlers understand it
  - doesn't distract from game
  - doesn't change play
  - people generally ok with it **

👍 Adoption Rate/Value

👍 Accuracy

👍 Predictability

👍 Aware of Capability

👍 Distraction

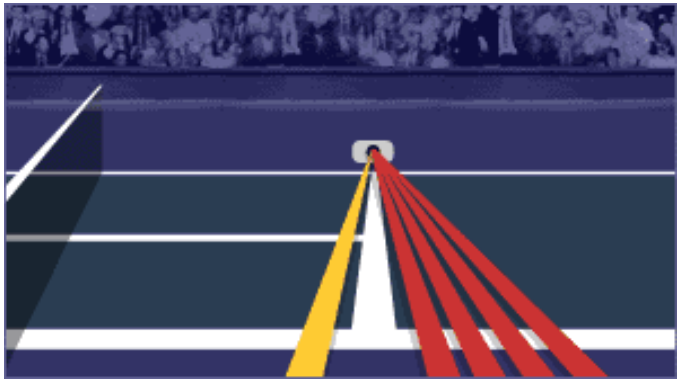
👍 Behavior Changes

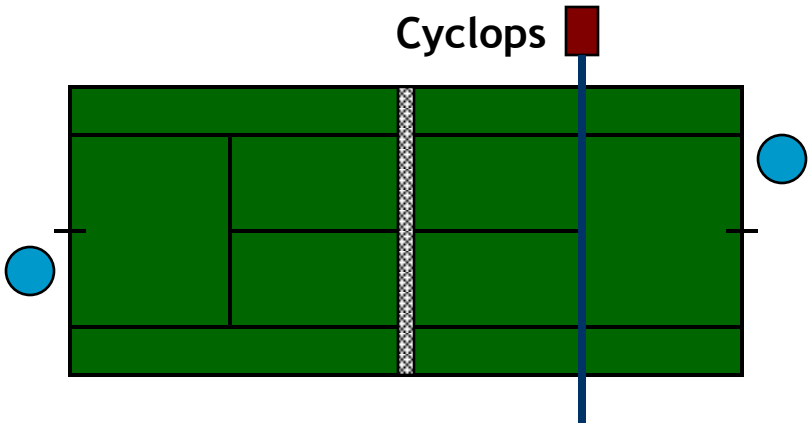
👍 Social Acceptance

Examples of less important factors:
Privacy, Collaboration, Customization, ...

Tennis & Cyclops

- Cyclops system for calls on the service line
  - detects whether serve is 'in' or 'long'
  - not used for 'wide'
  - not used for subsequent hits
  - umpire can overrule
- Created a stir but stuck around
  - 1980 - 2006
  - (now: Hawk-Eye)





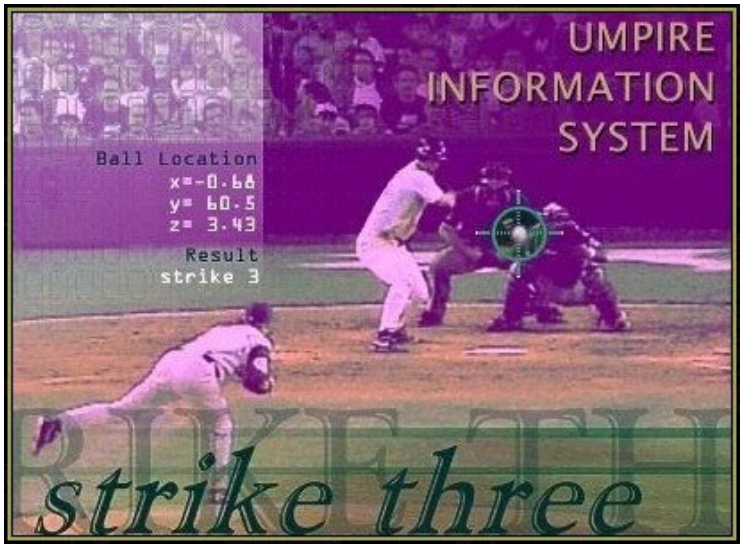
Tennis & Cyclops

- Good / bad points?
  - systems are in some tourneys
  - very accurate
  - very consistent
  - players understand it
  - distracts somewhat from game
  - doesn't change players' serve
  - players neutral on its merits

	Adoption Rate/Value
👍	Accuracy
👍	Predictability
👍	Aware of Capability
	Distraction
👍	Behavior Changes
	Social Acceptance

Baseball & Questec

- Questec system for judging umpire accuracy
  - cameras monitor plate, judges ball/strike
  - installed at 13 ballparks
  - MLB: 'Umpires whose calls do not match Questec 90% of the time are below standard'
  - lots of dissent...
    - Curt Schilling fined for smashing QT cameras
    - Darren Holmes: "This system is one of the worst things that has happened in baseball"



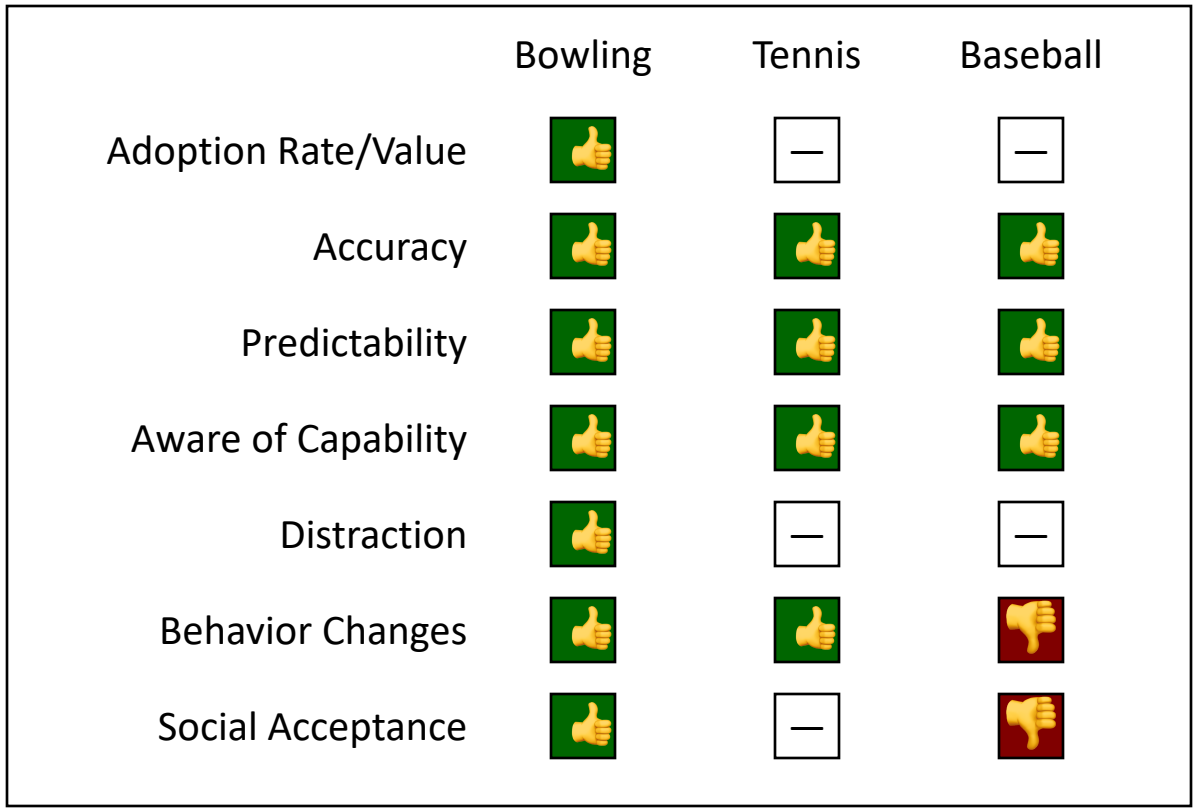
Baseball & Questec

- Good / bad points?
  - only in some parks
  - fairly accurate
  - fairly consistent
  - players/umpires understand it
  - distracts somewhat from game
  - definitely changes play
  - players/umpires hate it

	Adoption Rate/Value
👍	Accuracy
👍	Predictability
👍	Aware of Capability
	Distraction
👎	Behavior Changes
👎	Social Acceptance

In Summary...

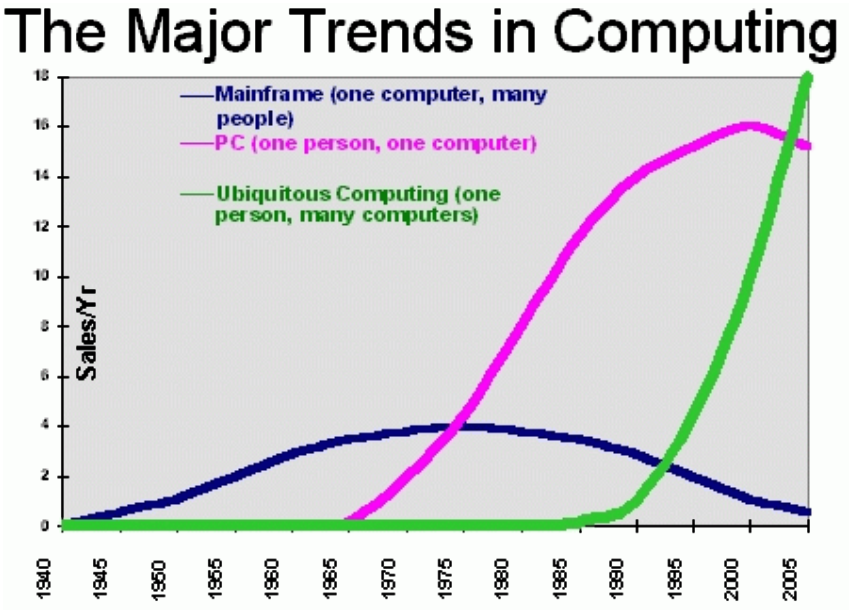
- Quick-and-dirty brainstorming leads to a common set of measures for sports tech.



Ubiquitous computing

- At first, we had 1 mainframe for many people
- Nowadays, we have roughly 1 computer per person
- Ubiquitous Computing = many computers per person... small, lightweight, invisible computers

"UC is roughly the opposite of virtual reality. Where virtual reality puts people inside a computer-generated world, ubiquitous computing forces the computer to live out here in the world with people. Virtual reality is primarily a horsepower problem; ubiquitous computing is a very difficult integration of human factors, computer science, engineering, and social sciences."
— Mark Weiser



Ubiquitous computing

- Latest development: tabs, pads, & boards
- Tabs = inch-scale machines that approximate active Post-It notes
- Pads = foot-scale ones that behave something like a sheet of paper (or book or magazine, etc.)
- Boards = yard-scale displays that are the equivalent of a blackboard or bulletin board
- One room might have >100 tabs, 10-20 pads, and 1-2 boards!

Ubiquitous computing

- Tabs
  - tiny inch-scale computers everywhere
  - example: active badges

> "In our experimental embodied virtuality, doors open only to the right badge wearer, rooms greet people by name, telephone calls can be automatically forwarded to wherever the recipient may be, receptionists actually know where people are, computer terminals retrieve the preferences of whoever is sitting at them, and appointment diaries write themselves."

  - could also be used for calendar, phone, etc.

Ubiquitous computing

- Pads
  - cross between laptop & sheet of paper
  - big difference: "scrap computers"
    - pick 'em up anywhere, use a bit, leave 'em
  - "antidote to windows"
    - modern OS's emulate the desktop metaphor, but screen sizes have remained relatively stable
    - pads can be put anywhere, and spread out over an actual desktop (or wherever)
    - pads can be used like books, e.g., read comfortably on your lap

Ubiquitous computing

- Boards
  - poster-sized objects, perhaps 40-60"
  - display on a wall, write on it with "chalk"
  - example: prototyping interfaces
    - one test had two groups across the Atlantic, simultaneously composing and discussing
    - of course, product can be saved, printed, archived in histories, etc.
  - another idea as bulletin boards, advertising or simply information
    - could be tuned to surrounding people using badges
      - you see only info most important to you

Ubiquitous computing

- Computer science (+ social) issues
  - hardware issues
    - low power, wireless communication
    - pen (or chalk, ...) input
  - networking issues
    - new protocols everywhere
  - "interaction substrates"
    - differences in interaction given physical sizes
      - pads are tiny, maybe too tiny for even handwriting
      - boards are huge, people may not reach everything
  - privacy and security
    - now computers know exactly where you are; do you want everyone to know this??

The Final Word

- Interfaces are everywhere.
- GUIs are a good start...
  - Many of today's interfaces are GUIs.
  - Many of the basic concepts for GUIs are applicable for other interfaces, and for software design and development in general.
- But GUIs are just the beginning of the fun!