The Future of Interaction

Technology Trends

Sensors & Implicit Interaction

New Modalities: Gesture & Voice

Visions of the future

Computing Today

The Steady March of Progress…

- Technological advancement happens whether we like it or not.
- Interaction research needs to ~~lead~~ keep up.
  - Interaction for new and novel devices (e.g. a smartphone, tablet, kiosk)
  - Changing how we perform tasks (e.g. in-car navigation should work with voice)
  - Expanding interaction to address different contexts (e.g. control music while running) or to be more inclusive.

Relevant Trends for UI Research

1. Internet of Things

- Computers are becoming ever smaller, and networkable.
- Allows for the capture and processing of data from many sources.
- Supports ubiquitous computing + instrumented environments
- More personalized computing
  - Notebook
  - Tablet
  - Smartphone
  - Smartwatch
  - Glasses, Rings
  - Appliances
  - Vehicles

Relevant Trends for UI Research

2. Virtual Reality

- View and interact with an artificial environment
- How do you handle input in virtual space? How do you handle input in an augmented environment?
- Uses for VR tech? Gaming, Training (medical, military)...
- The headset. Ah, the headset.

Using VR to help manage pain.

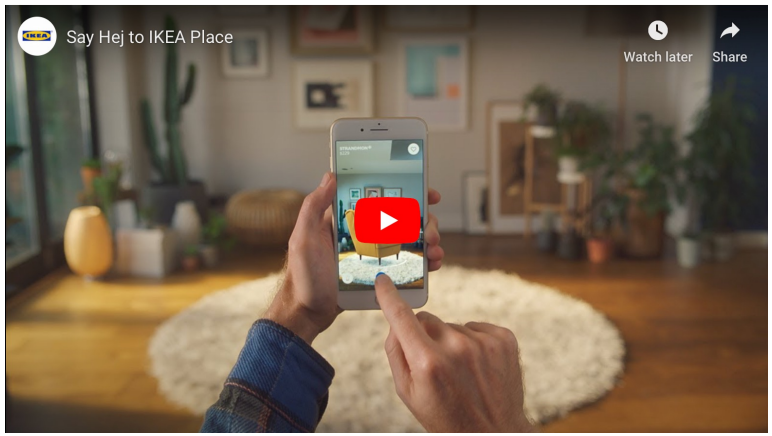
Relevant Trends for UI Research

3. Augmented Reality

- Blur the lines between virtual and physical; augment the physical environment.

AR added a novel element to Pokemon Go.

Gatwick Airport Map: provides real-time guidance to your gate (using beacons for location tracking).



Ikea Place: overlay furniture on a real-time video display of your room.

Interaction for Hands-Off Systems (VR, AR)

Gestural Interaction in Minority Report

http://www.ted.com/talks/john_underkoffler_drive_3d_data_with_a_gesture (5:30-9:15)

https://vimeo.com/49216050

Current State of the Art

https://www.youtube.com/watch?v=TX9qSaGXFyg

Mouse -> Touch-> Touchless

Mouse is a three-state input device.

Touch Interface is a two-state input device.

Touchless Interface is a one-state input device.

The challenge is that in-air gesture system is always on, and there is no mechanism that will differentiate gestures from non-gestures.

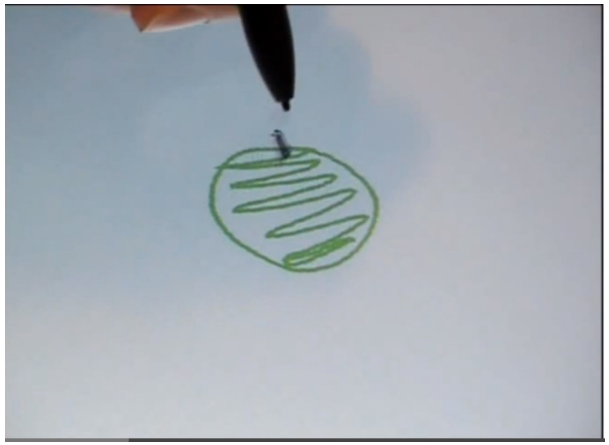
Consider a user who needs to sneeze, scratch his head, stretch, gesture to another person in the room, what would this mean for the three input devices?

Solution: Reserved Actions

Take a particular set of gestural actions and reserve them so that those actions are always used for navigation or commands.

Wigdor, 2011

pigtail gesture



http://www.youtube.com/watch?v=WPbiPn1b1zQ

hover widget

Question: for hover widget, which type error is more common (false negative or false positive) and why?

- user might accidentally lift their pen and move it
- user might exit the zone without realizing it *

Solution: Reserving a Gesture

A delimiter is an indicator that you want to start or stop the recognition of a gesture.

Example: to engage, user pushes past an invisible plane in front

Advantages?

- provides an a priori indicator to the recognizer that the action to follow is intended to be treated as a gesture or not.
- enables the complete gestural space to be used

Disadvantages?

- where should this invisible plane be? This may be different for different users, or different for the same user over time

Solution: Multi-Modal Input

iPhone is a touch input device, so … Why does have a button? Wigdor, 2011

The key problem is that users need to be able to exit their application and return to the home screen in a reliable way.

What's the alternative?

- a reserved action for exit

The multi-modal solution enable touch input to be sent to the application, while hardware buttons control universal parameters (e.g., volume) and navigation (e.g., go home, use Siri).

Why can we **now** design without buttons? e.g. iPhone X

Solution: Multi-Modal Input

Advantage over Reserved Action or Clutch: Wigdor, 2011

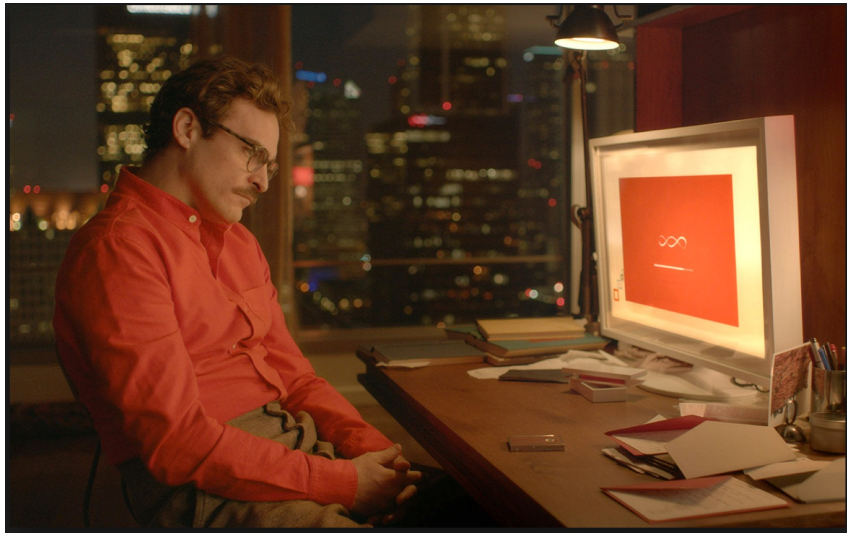
- does not reduce the vocabulary of the primary modality

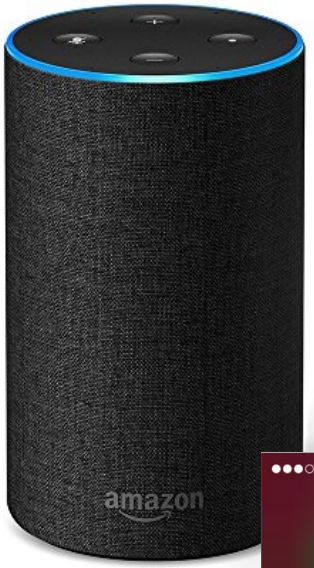
Some other examples

- CTRL-drag becomes copy instead of move
- speech + gesture (e.g., the “put that there” system)

Put That There (MIT, 1980)
http://www.youtube.com/watch?v=-bFBr11Vq2s

Speech Interfaces (SUI)





"My fellow Americans, I'm pleased to tell you I just signed legislation which outlaws Russia forever. The bombing begins in five minutes."

— Ronald Reagan

Speech systems suffer from the "Live Mic" problem.

https://en.wikipedia.org/wiki/We_begin_bombing_in_five_minutes

INDY/LIFE

An Alexa-enabled Echo Dot pictured at Amazon Headquarters in Seattle, Washington, on 20 September, 2018 (Getty)

AMAZON ADMITS EMPLOYEES LISTEN TO ALEXA CONVERSATIONS

Amusing Alexa conversations were reportedly shared internally among Amazon workers

Anthony Cuthbertson | @ADCuthbertson |
Thursday 11 April 2019 13:30 |

A system designed to monitor and respond to voice input will, not surprisingly, listen to everything that you say.

GUI to SUI: Challenges

Trust and Privacy Concerns

- Difficult to dictate private information in public; users are often uncomfortable
- Ethics of services storing private information!

Discourse segment pop-up / navigation / context

- How do you “navigate” a voice based interface? e.g. telephone based systems

Lack of Visual Feedback

- Users need immediate feedback if response is slow
- No way to display state information (e.g. track a multi-step task).
- When to ask for confirmation? What if the user did not say “yes” or “no”?

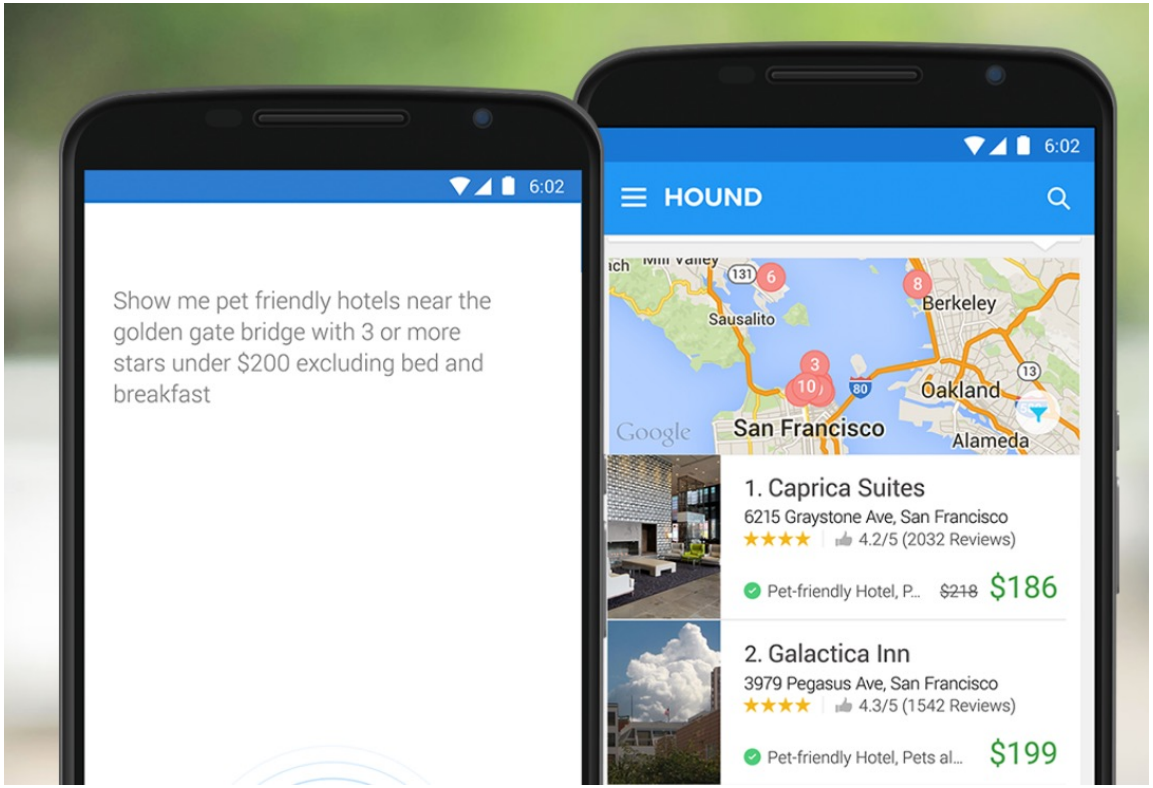
Users want to use “human” language

- Manager to Alexa: "Next Monday — Can I get into John’s calendar?"

SoundHound - modern example

http://www.soundhound.com/hound

https://www.youtube.com/watch?v=M1ONXea0mXg



AT&T's Vision (1993)

https://www.youtube.com/watch?v=yFWCoeZjx8A

Microsoft Vision (2015)

https://www.youtube.com/watch?v=w-tFdreZB94