User Experience Design I
(Interaction Design)

Day 9 (July 5th, 2018, 9am-12pm):

Interaction Beyond the Desktop

This lecture is focusing

on four types of interaction **“beyond the desktop”:**

- (1) Shareable interfaces
- (2) Tangible interfaces
- (3) Wearable interfaces
- (4) Robotic interfaces
- …

Tangible, Embedded and Embodied Interaction (TEI)

source: [8]

(1) Shareable interfaces

- Shareable interfaces are designed for more than one person to use
  - provide multiple inputs and sometimes allow simultaneous input by co-located groups
  - large wall displays where people use their own pens or gestures
  - interactive tabletops where small groups interact with information using their fingertips, e.g., Mitsubishi's DiamondTouch and Sony's Smartskin

source: [8]

A smartboard

source: [8]

DiamondTouch Tabletop

source: [8]

Advantages

- Provide a large interactional space that can support flexible group working
- Can be used by multiple users
  - can point to and touch information being displayed
    - simultaneously view the interactions and have same shared point of reference as others
- Can support more equitable participation compared with groups using single PC

source: [8]

Research and design issues

- More fluid and direct styles of interaction involving freehand and pen-based gestures
- Core design concerns include whether size, orientation, and shape of the display have an effect on collaboration
- Horizontal surfaces compared with vertical ones support more turn-taking and collaborative working in co-located groups
- Providing larger-sized tabletops does not improve group working but encourages more division of labor

source: [8]

(2) Tangible interfaces (TUI)

- Type of sensor-based interaction, where physical objects, e.g., bricks, are coupled with digital representations
- When a person manipulates the physical object/s it causes a digital effect to occur, e.g. an animation
- Digital effects can take place in a number of media and places or can be embedded in the physical object

source: [8]

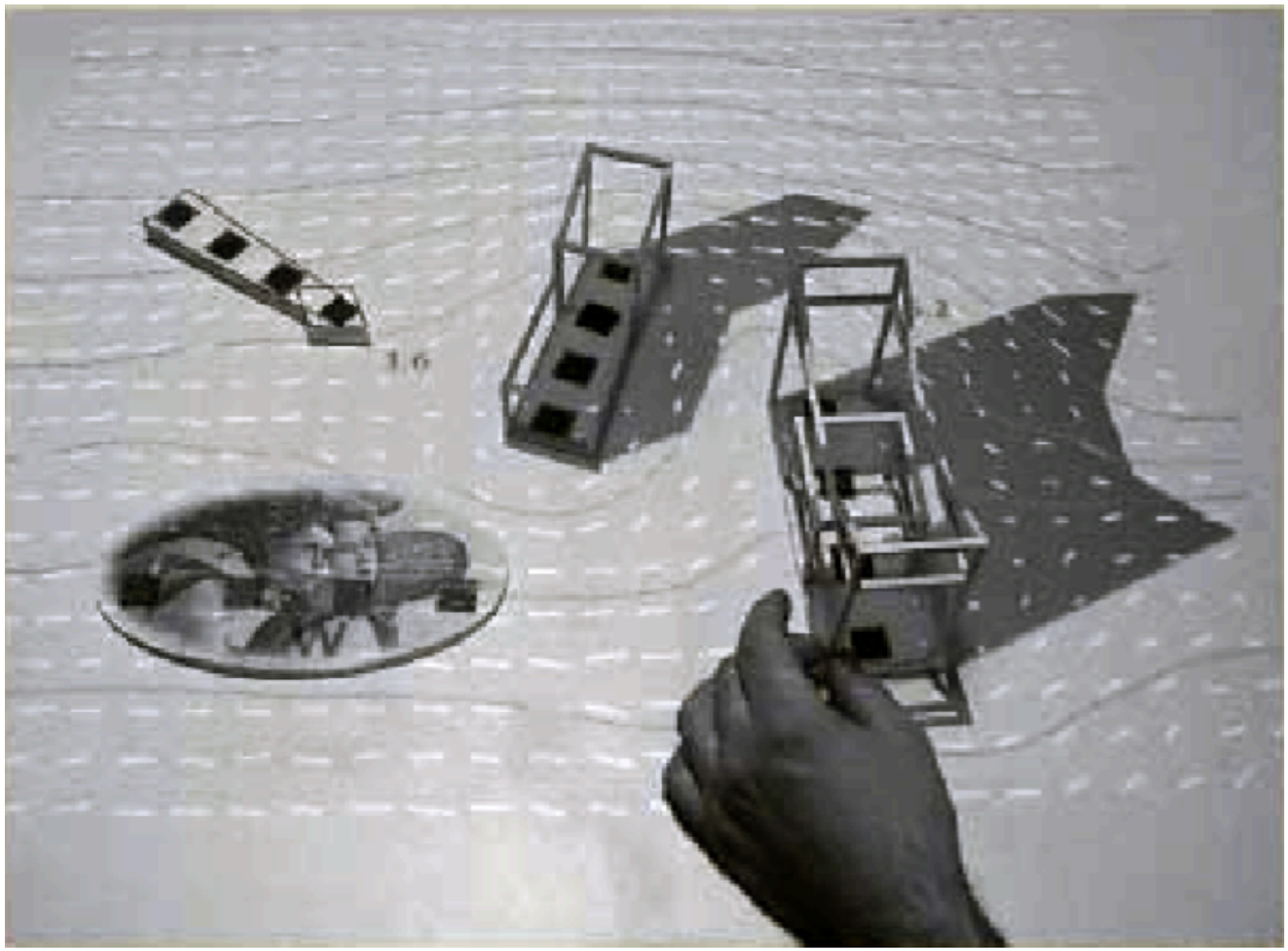
SIMON & IMOGEN'S HOUSE

Examples

- **Chromarium cubes**
  - when turned over digital animations of color are mixed on an adjacent wall
  - facilitates creativity and collaborative exploration
- **Tangible Video Editor**
  - depict video clips embedded in the blocks
  - vary depending on how they are connected together
- **Urp**
  - physical models of buildings moved around on tabletop
  - used in combination with tokens for wind and shadows -> digital shadows surrounding them to change over time

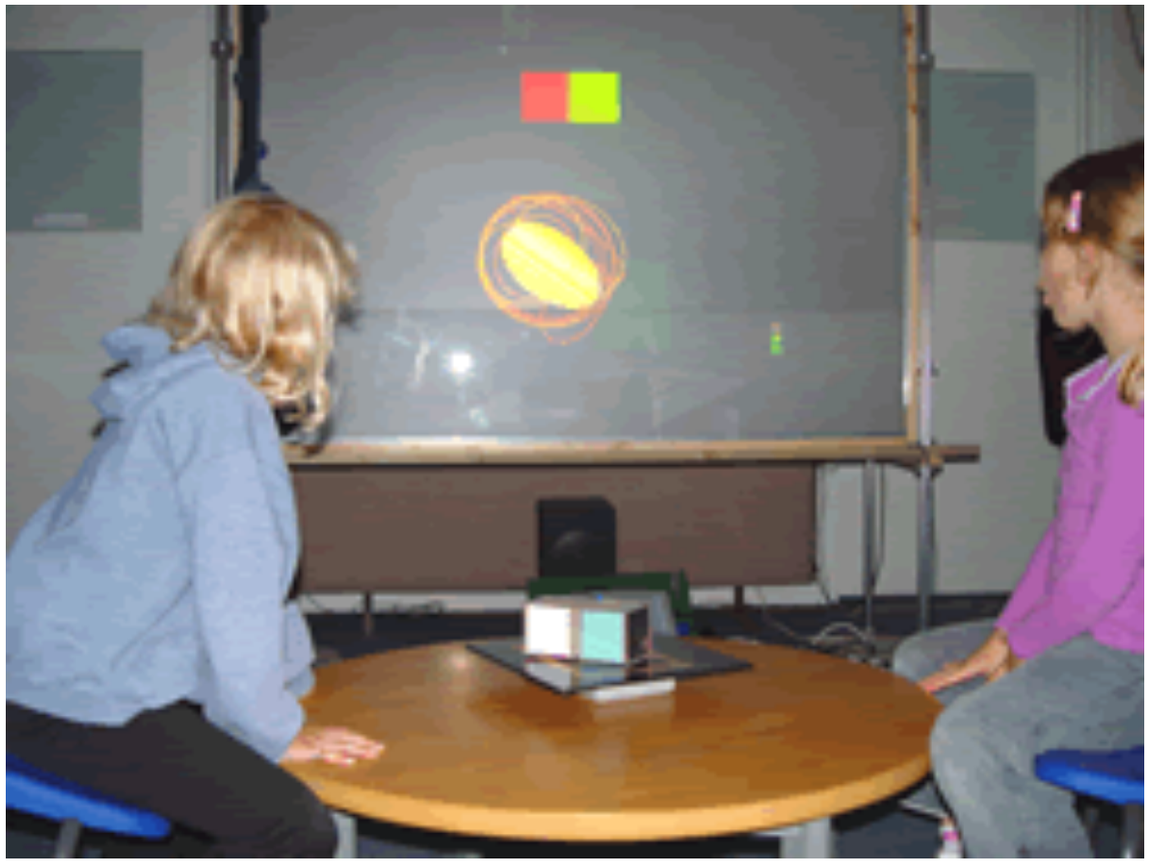
source: [8]

Urp (1999)



source: [8]

Chromarium cubes (2003)



source: [8]

Tangible Video Editor (2007)

https://static1.squarespace.com/static/4f57841c24ac1bb6d947d820/50f70505e4b02f24b699978f/50f70505e4b0b5231e4d1b63/1358365963068/TVE-1.jpg

Reactable

https://www.youtube.com/watch?v=Mgy1S8qymx0

source: [8]

Benefits

- Can be held in both hands and combined and manipulated in ways not possible using other interfaces
  - allows for more than one person to explore the interface together
  - objects can be placed on top of each other, beside each other, and inside each other
  - encourages different ways of representing and exploring a problem space
- People are able to see and understand situations differently
  - can lead to greater insight, learning, and problem-solving than with other kinds of interfaces
  - can facilitate creativity and reflection

source: [8]

Research and design issues

- Develop new conceptual frameworks that identify novel and specific features
- **The kind of coupling to use between the physical action and digital effect**
  - If it is to support learning then an explicit mapping between action and effect is critical
  - If it is for entertainment then can be better to design it to be more implicit and unexpected
- What kind of physical artefact to use
  - Bricks, cubes, and other component sets are most commonly used because of flexibility and simplicity
  - Stickies and cardboard tokens can also be used for placing material onto a surface

source: [8]

(3) Wearable interfaces

- First developments was head- and eyewear-mounted cameras that enabled user to record what seen and to access digital information
- Since, jewellery, head-mounted caps, smart fabrics, glasses, shoes, and jackets have all been used
  - provide the user with a means of interacting with digital information while on the move
- Applications include automatic diaries and tour guides

source: [8]

https://www.bhphotovideo.com/images/images2500x2500/htc_99haln002_00_vive_vr_system_1337110.jpg

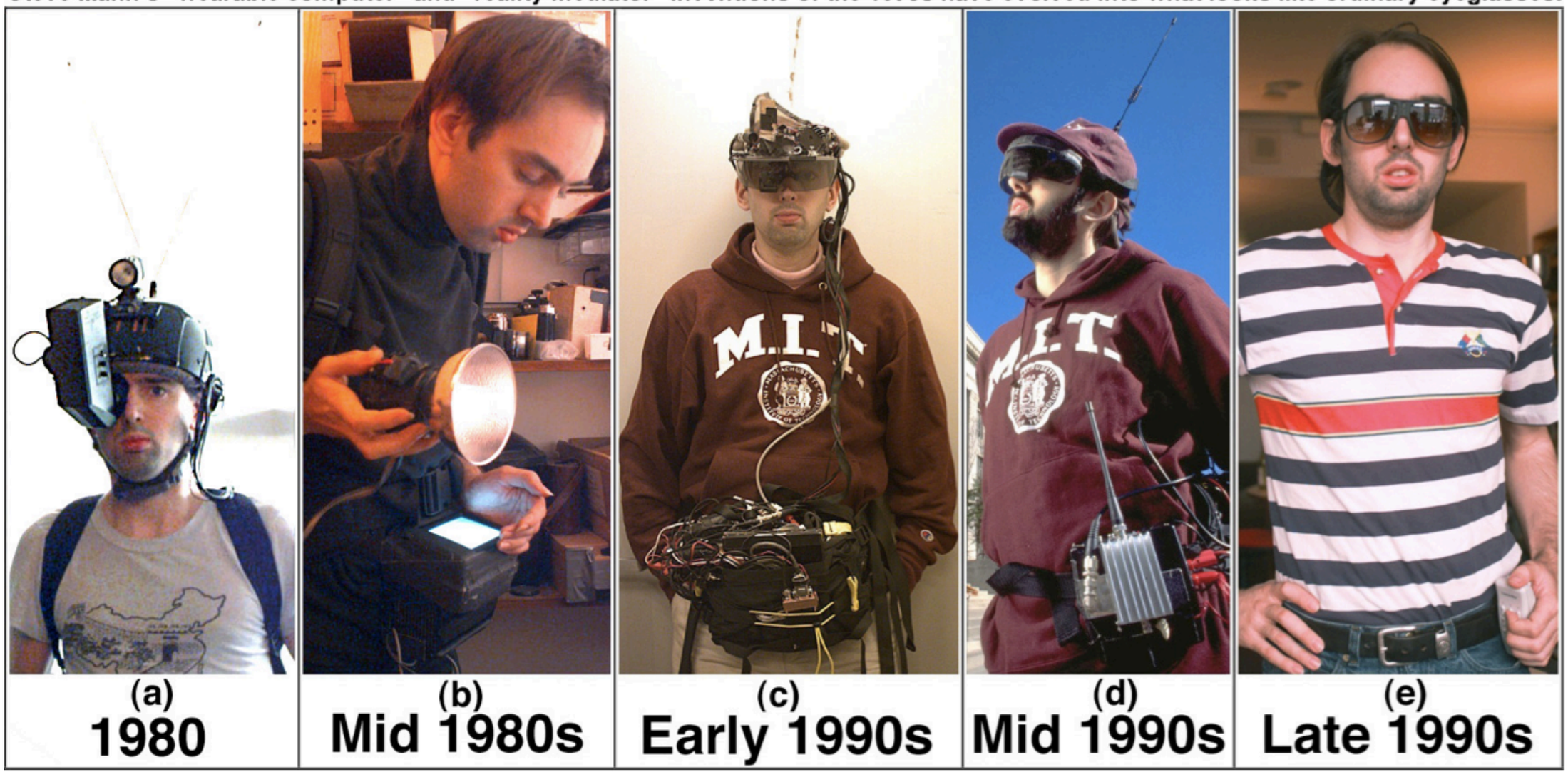
http://picscdn.redblue.de/doi/pixelboxx-mss-75760097/fee_786_587_png/OCULUS-Rift-Virtual-Reality-Headset---Touch-Motion-Controller

"If history is any indication, we should assume that any technology that is going to have a significant impact over the next 10 years is already 10 years old!”

Bill Buxton

Steve Mann - pioneer of wearables

Steve Mann's "wearable computer" and "reality mediator" inventions of the 1970s have evolved into what looks like ordinary eyeglasses.



source: [8]

Research and design issues

- **Comfort**
  - needs to be light, small, not get in the way, fashionable, and preferably hidden in the clothing
- **Hygiene**
  - is it possible to wash or clean the clothing once worn?
- **Ease of wear**
  - how easy is it to remove the electronic gadgetry and replace it?
- **Usability**
  - how does the user control the devices that are embedded in the clothing?

source: [8]

Skinput 2010

https://www.youtube.com/watch?v=g3XPUdW9Ryg

Skintrack 2016

https://www.youtube.com/watch?v=9hu8MNuvCHE

(4) Robotic interfaces

Four types

- remote robots used in hazardous settings
- domestic robots helping around the house
- pet robots as human companions
- sociable robots that work collaboratively with humans, and communicate and socialize with them – as if they were our peers

source: [8]

Advantages

- Pet robots have therapeutic qualities, being able to reduce stress and loneliness
- Remote robots can be controlled to investigate bombs and other dangerous materials

source: [8]

https://thespoon.tech/wp-content/uploads/2017/01/zume-robot.jpg

Research and design issues

- How do humans react to physical robots designed to exhibit behaviours (e.g., making facial expressions) compared with virtual ones?
- Should robots be designed to be human-like or look like and behave like robots that serve a clearly defined purpose?
- Should the interaction be designed to enable people to interact with the robot as if it was another human being or more human-computer-like (e.g., pressing buttons to issue commands)?

source: [8]

Summary: Which interface?

- Is multimedia better than tangible interfaces for learning?
- Is speech as effective as a command-based interface?
- Is a multimodal interface more effective than a monomodal interface?
- Will wearable interfaces be better than mobile interfaces for helping people find information in foreign cities?
- Are virtual environments the ultimate interface for playing games?
- Will shareable interfaces be better at supporting communication and collaboration compared with using networked desktop PCs?

source: [8]

Summary: Which interface?

- Will depend on task, users, context, cost, robustness, etc.
- Much system development will continue for the PC platform, using advanced GUIs, in the form of multimedia, web-based interfaces, and virtual 3D environments
  - Mobile interfaces have come of age
  - Increasing number of applications and software toolkits available
  - Speech interfaces also being used much more for a variety of commercial services
  - Appliance and vehicle interfaces becoming more important
  - Shareable and tangible interfaces entering our homes, schools, public places, and workplaces

source: [8]

General Summary

- Many innovative interfaces have emerged post the WIMP/GUI era, including speech, wearable, mobile, VR/AR and tangible UI´s
- Many new design and research questions need to be considered to decide which one to use
- Web interfaces are becoming more like multimedia-based interfaces
- An important concern that underlies the design of any kind of interface is **how information is represented to the user** so they can carry out ongoing activity or task

source: [8]

References:

[1] Buxton, W. Sketching User Experiences, *Morgan Kaufmann 2007.*
[2] Blom, J & Chipchase, J : Contextual and cultural challenges for user mobility research*, ACM Press 2005.*
[3] CHI´10 *Panel Discussion on User Research, 2010.*
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[8] Rogers, Y., Preece, J. & Sharp, H. Interaction Design, *Wiley & Sons 2011.*