User Interfaces

EECS 3461 – Sections A & B

Fall 2021

Resource Pack: Interaction I

What are the kinds of interactive systems?

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Dependencies

This resource pack assumes that you are already familiar with:

- *no dependencies*

Inquiry

Break down the question “what are the kinds of interactive systems?” into smaller pieces

1. What is meant by a user interface?
2. What is a digital technology artefact?
3. What types of digital platforms are used in interactive systems?
4. What is meant by digital artefact *posture*?

1. What is meant by a user interface?

What is a user interface?

What is a user interface?

such a seemingly simple question proves to be complicated to answer

Interface, computing definition

In the computing domain:

- an *interface* is a shared boundary across which two or more separate components exchange information

so let's imagine *user interface* refers to the boundary between:

- digital technology artefacts (pieces of digital technology) that are capable of sensing and articulating
- one or more humans

Unpacking

- There are several terms that need to be unpacked
  - digital technology artefact
  - sensing
  - articulating
  - the ‘one or more’ part of one or more humans

We’ll discuss *digital technology artefact* next…

we’ll leave *sensing*, *articulating*, and the ‘*one or more*’ part for a later resource pack

2. What is a digital technology artefact?

Digital technology

What do we mean by *digital technology*?

Often, when we hear the term *digital technology*, we think of an object, a product, or some other tangible item

However, there is also another view that *digital technology* is a process and is not an object

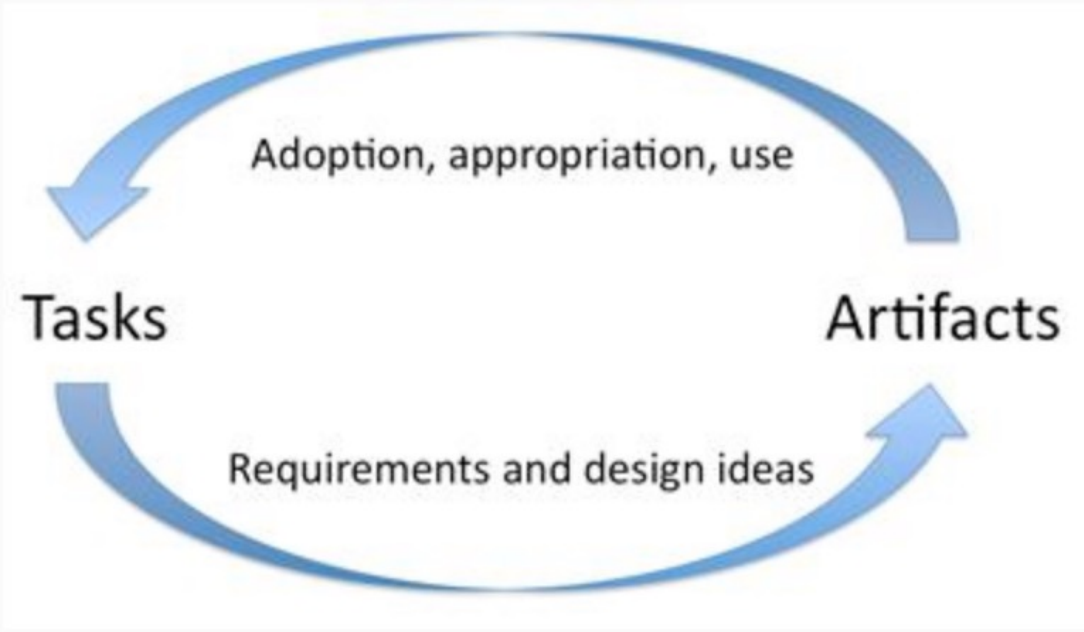
Technology as process

- some components of the 'technology as process' view include:
  - the task-artifact cycle
  - media theory
  - inscription

The "Task-Artifact Cycle"

"Human activities implicitly articulate needs, preferences and design visions. Artifacts are designed in response, but inevitably do more than merely respond. Through the course of their adoption and appropriation, new designs provide new possibilities for action and interaction. Ultimately, this activity articulates further human needs, preferences, and design visions."

(Carroll, 2009)



Co-evolution

"We become what we behold. We shape our tools and then our tools shape us."

Culkin, often incorrectly attributed to Marshall McLuhan (1964), Understanding Media: The Extensions of Man.
and idea expressed by McLuhan

Inscription

- dominant interests get reflected in the form and functioning of the technology, a process referred to as "inscription" (Latour 1992).

> Designers thus define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways, A large part of the work of innovators is that of "inscribing" this vision of (or prediction about) the world in the technical content of the new object.
>
> Akrich (1992, p. 208)

Technology as object

- Akrich identified the 'technical content' of objects
- certainly, the term *digital technology* makes us think of objects, products, or other types of tangible items
- I will use the term *technology artefact* when I want to refer to technology as an object, to avoid confusion with technology as a process

Technology as an assembly

"All technologies are assemblies that orchestrate phenomena to some purpose" (Dron, 2011).

In this framework, technologies can be *hard*, *soft*, or a combination of both.

Hard Technologies

- *hard* technologies are physical technologies
- these include tools and other 'tangible' components that can 'do' things or be used to do things
- examples:
  - digital desktop computers, mobile handsets, raspberry pi single board computers
  - analog 'computers', like the Memex, the Jacquard loom, the abacus
  - non-electronic artefacts, like hammers, hairpins, notepads

Soft Technologies

- *soft* technologies are conceptual assemblies
- these include human-mediated processes
- the humans (as intermediaries) are, in a sense, the "interfaces" of these technologies,
- these assemblies operate among humans, with the humans as mediators (also can use hard technologies)
- examples:
  - categorization schemes and indexing systems (Dewey decimal system, social media tagging systems)
  - systems for decision making (e.g., "weighing pros and cons" or linear optimization)
  - systems for performance measurement (e.g., job performance assessment processes used by HR, course evaluations)
  - bibliographies (systems for listing sources) (a kind of mediating interface between readers and large bodies of literature)

Digital technology artefacts

- A digital technology artefact makes use of a *digital platform*
- A digital technology artefact tends to be configured around a certain *posture*
- A digital technology artefact tends to be organized around a certain *type of interactio*.

- We'll discuss *platform* and *posture* next…
- We'll leave *type of interaction* for a subsequent resource pack

3. What types of digital platforms are used in interactive systems?

Digital platforms for interactive systems

- basically, any digital platform that provides:
  - the capability to detect input actions from the user
  - the capability to articular output actions that can be perceived by the user
- there is a wide array of such platforms…
- these platforms differ in terms of various features, such as:
  - physical form
  - type of display (visual, size and resolution; acoustic, etc)
  - methods for the user to provide input, methods for the platform to produce outputs
  - network connectivity, type of operating system, database capabilities, computational power, etc
  - cost, availability, etc

Digital Platforms

- mobile devices (handsets, cameras, tablets)
- desktop computers with peripherals (e.g., screen, keyboard, and pointing input device, such as mouse, trackpad, etc), often GUI-based
- consoles (gaming, TV set-top boxes, entertainment system components, VR consoles, Xbox+Kinect)
- computer terminals (thin and fat clients, text-based or graphical)

Digital Platforms, con't

- home automation appliances (e.g., Alexa)
- home appliances (e.g., washing machines, refrigerators)
- handheld purpose-built devices (e.g., pen-based devices)
- wearable devices (e.g., 'smart' clothes, 'smart' jewellery, heads-up displays (HUDs), AR HUDs)
- tangible handheld devices (e.g., interactive educational toys)

Digital Platforms, con't

- kiosks (stand-alone functional computing platform that preventing users from accessing system functions)
- in-vehicle systems
- specialized medical and scientific devices (e.g., insulin pumps, weather stations, electronic training mannequins, brain-computer interfaces)
- robots/drones (e.g., electronic companions, delivery drones, anti-poaching drones)

Digital Platforms, con't

- room-based installations (e.g., surgical operating theatres with gesture-based systems, shareable interfaces, 'smart' meeting rooms/classrooms)
- largish physical installations (e.g., tangible interactive installations in museums, tangible interactive learning platforms)
- … other platforms too…

4. What is meant by digital artefact *posture*?

Chapter 9, pp 207-235, Cooper et al., About Face : the Essentials of Interaction Design . Fourth edition. Indianapolis, IN: John Wiley and Sons, 2014.

Artefact Posture

- reminder: *digital artefact* here is a more-general term refers to an interactive system or an interactive product
- *posture* refers to the predominant manner in which the digital artefact "presents itself" to users
- *posture* is a way of talking about how much attention the user devotes to interacting with the digital artefact, and how the digital artefact's behaviors respond to the kind of attention the user devotes to it

Chapter 9, pp 207-235, Cooper et al., About Face : the Essentials of Interaction Design . Fourth edition. Indianapolis, IN: John Wiley and Sons, 2014.

Desktop Postures

- sovereign posture:
  - interactive systems that monopolize users' attention for long, continuous periods of time
  - tend to occupy the full screen
- transient posture
  - interactive system that gets invoked when needed
  - used in an as-needed way: it appears, performs its job, and then quickly leaves (or is dismissed)
- daemonic posture
  - interaction is minimal, system runs in the background (e.g., printer drivers, network connectivity)
  - must occasionally be adjusted to deal with changing circumstances.

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Website Postures

- informational posture:
  - provides a way for users to view content (html and other)
  - search, navigate (as opposed to content creation)
  - example: wikipedia
- transactional posture
  - provides a way for users to accomplish something beyond viewing content, typically through functional elements (query/response model)
  - e.g., Pinterest, Reddit, Amazon
- application posture
  - application delivered through browser; complex behaviours similar to networked desktop application

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Mobile Device Postures

- satellite posture:
  - provides a way for users to retrieve/view content, only only lightweight input and editing features
  - example: Kindle, Podbean, Audible
- standalone posture
  - application delivered through mobile device; complex behaviours similar to networked desktop application
  - example: office suite clients (Word, Excel, etc)

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Kiosk Posture

- similar to desktop sovereign posture
- important differences:
  - attention is more transient than desktop (people move toward and away from kiosk)
  - complexity of functionality: simpler on kiosk
  - input devices: touchscreen or bezel buttons (as opposed to pointing device)
  - body position: in motion (e.g., standing or using mobility aid or wheelchair) vs seated in front of a desktop

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"Console" posture

- aka "ten-foot" interface posture (user is standing 10 feet away)
- similar to mobile device satellite posture
- important differences:
  - input typically via controller or remote control, buttons plus a directional pad
    - directional pad: a flat four-way directional control with one button on each point, usually thumb-operated, often digital (aka Dpad)

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Automotive posture

- similar to kiosk posture
- important differences:
  - divided attention
  - user is seating, not in motion
  - passenger problem: the inability of the system to differentiate between the driver and the passenger

Chapter 9, pp 207-235, Cooper et al., About Face : the Essentials of Interaction Design . Fourth edition. Indianapolis, IN: John Wiley and Sons, 2014.

Smart appliance posture

- similar to desktop transient posture
- typically used to accomplish something very specific
- status information may be presented via daemonic posture

In Sum

- characterizing *user interface* boils down to characterizing interaction and technology
- characterizing technology is nuanced: it refers to both artefacts (physical objects) and a process
- interactive technologies use a large variety of digital plaforms and adopt a large variety of postures