Lecture 2

Chapter 1, 2.1, 2.2 (Heim)

Interaction Paradigms and Frameworks

Interaction Paradigms

- Innovation in Interaction
- Analyzing Interaction Paradigms

- Credits: Many slides from Heim, Slide Selection partly from Beryl Plimmer

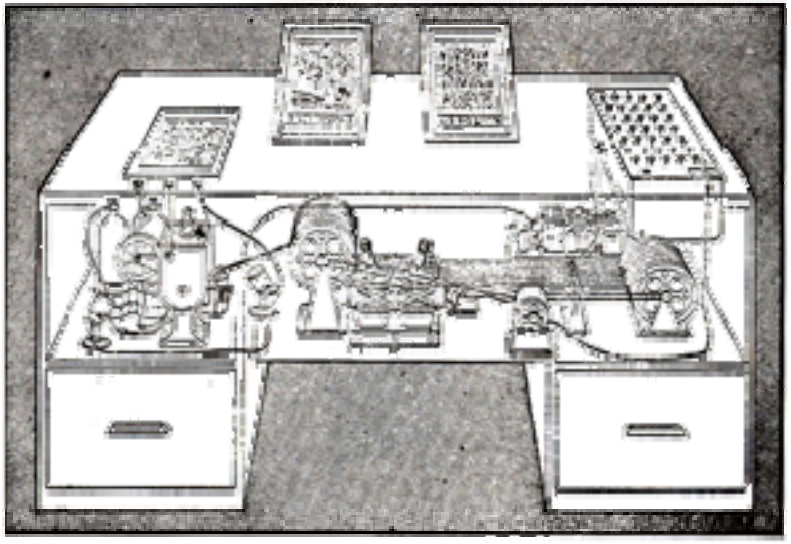
Innovation – Vannevar Bush

- Vannevar Bush, “As We May Think.” *Atlantic Monthly, July 1945*
- Bush envisioned a device that would help people organize information in a meaningful way.
- He called this device the “Memex”

Vannevar Bush – The Memex

A Memex is a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory. (*Bush, 1945)*

- Based on microfilm
- electromechanical

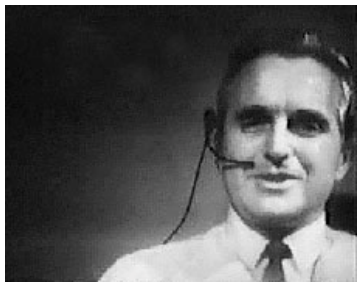


Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures, and letters, then files them in the desk for future reference. LIFE 19(11), p. 123.

Apple II in 1977.

E-book reader

Innovation - Douglas Engelbart (Turing Award 1997)



- oNLine System (NLS) 1968
  - The Mother of All Demos: http://sloan.stanford.edu/MouseSite/1968Demo.html

NLS Mouse and workstation

Ergonomic Keyboard Console

First Mouse

- How do Engelbart's innovations affect us today?

Courtesy Douglas Engelbart and Bootstrap Alliance

Innovation - Ivan Sutherland (Turing Award 1988)

- The Ultimate Display – Ivan Sutherland

The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such a room would be fatal. With appropriate programming such a display could literally be the Wonderland into which Alice walked. (*Sutherland, 1965, 508*)

The Ultimate Display

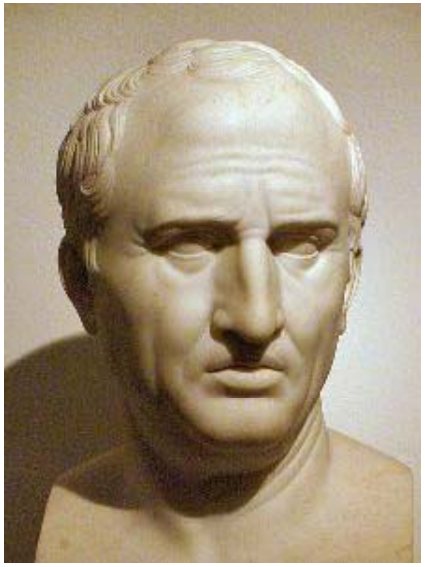
Sketchpad, 1963:
Light pen,
Constraint-based drawing

Analyzing Interaction Paradigms

- 5W + H (Chap 1.3. Heim)
  - What/How
  - Where/When
  - Who/Why
- Frameworks for Understanding Interaction (Chapter 2.1-2.2 Heim)
  - Execution/Evaluation Action Cycle (Norman's model)

5W+H

- Many different names
- old heuristic in fact finding: whodunit
- known since antiquity, used in law, rethorics, journalism
- doesn’t allow yes/no answers



Marcus Tullius Cicero,
106-43 BCE

- Who? Person, actor, group
- What? Fact, act
- When? Time, (opportunity)
- Where? Location, physical environment
- Why? Cause, reason, motive
- How? With what, tools, auxiliary means

Mobile Computing

- Mobile devices can be connected to global positioning systems (GPS)
  - These have touchscreens and voice interaction to alleviate potential visual attention problems during driving

On-board navigation system.
Courtesy BigStockPhoto.com

Ergonomics

Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. [...] Physical ergonomics is concerned with human anatomical, anthropometric ... characteristics... (...working postures, ... workplace layout, safety and health.)

Source: Website 2007 International Ergonomics Association

Charlie Chaplin, Modern Times 1936

Cognitive Environment: Age

- Third Age Suit:
- Restricted joint mobility
- Simulates impaired senses:
- - vision: sensitivity to glare
- - reduced tactile senses
- Weights: reduced strength

- Picture credits:
- Nigel Praities
- www.iboro.ac.uk,

Collaborative Work

- Networks allow members of a group to interact with other members on shared files and documents.
  - This creates a virtual space where people can collaborate and work collectively.
  - Groupware

- Discuss 3 collaborative styles:
  - Email
  - Wiki
  - Instant messenger

Frameworks for Understanding Interaction

- “A framework is basically a structure that provides a context for conceptualizing something”
- A framework here is a reference model. A system of interest can be matched against this reference model.
- We can use these frameworks to:
  - Structure the design process
  - Help us to identify problematic areas within the design
  - Help us to conceptualize the problem space as a whole

Execution/Evaluation Action Cycle (EEC)

- Donald Norman's model concentrates on user's view of the interface

- The structure of an action has four basic part:
  - **Goals:** We begin with some idea of what we want to happen; this is our goal.
  - **Execution:** We must then execute an action in the world.
  - **World:** To execute and action, we must manipulate objects in the world.
  - **Evaluation:** Finally, we must validate our action and compare the results with our goal.

Execution/Evaluation Action Cycle (EEC)

- Goals do not specify particular actions
- Goals and intentions do not have a one-to-one, relationship

- "Delete text" goal
  - Intention that involves the Edit menu
  - Intention that involves the Delete key
- Each intention involves a sequence of actions

Goal > Intention > Actions > Execution

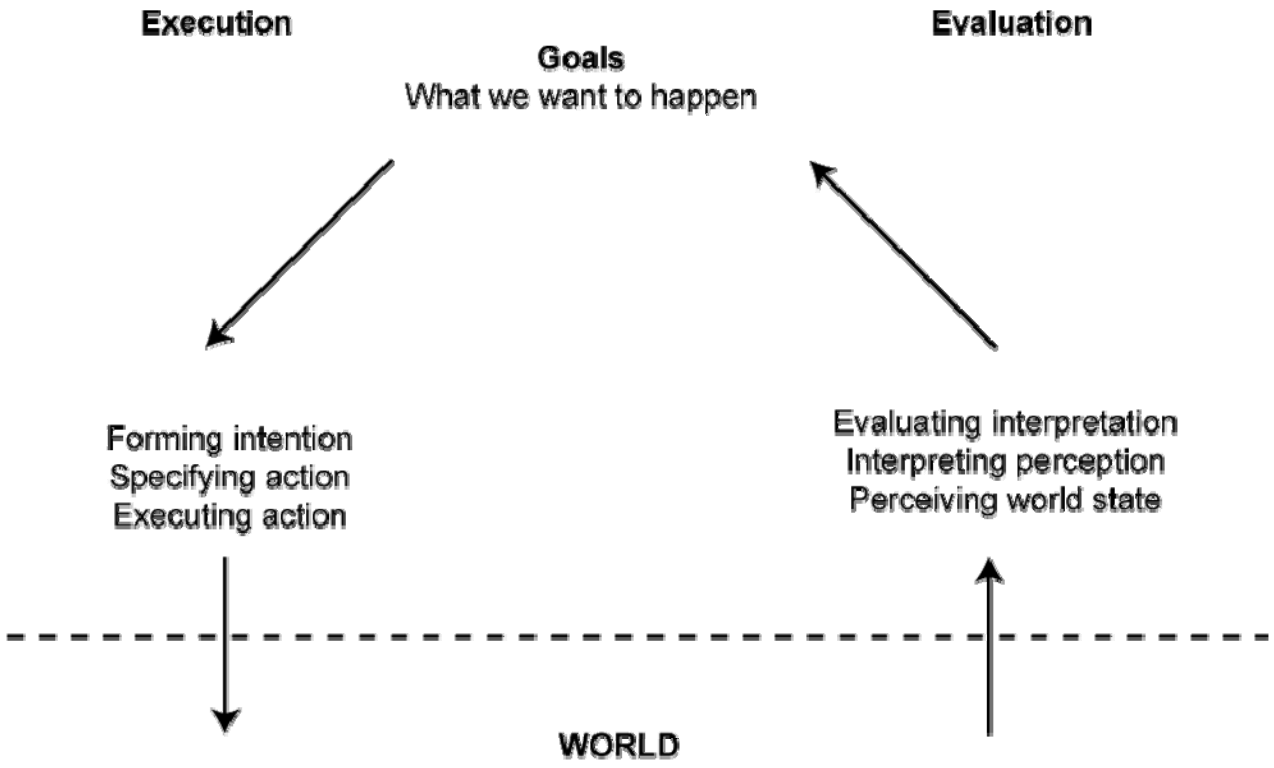
Execution/Evaluation Action Cycle (EEC)

- Evaluate Results
  - Perceive new state
  - Interpret what we perceive
  - Evaluate new state with goal (compare results with the goal)

Perceive > Interpret > Evaluate

Execution/Evaluation Action Cycle (EEC)

- Seven Stages of Action



Execution/Evaluation Action Cycle (EEC)

- The seven stages form a cycle
- The cycle can be initiated at any point
  - Some goals are data-driven - initiated when an environmental event is perceived (formulated ad hoc as opportunity arises)
  - Others are goal-driven - initiated when the person conceives of a new goal (thought out in advance)

Gulf of Execution

- **User's formulation of actions ≠ actions allowed by the system**

- Does the interface allows us to carry out the actions required by the intention?

  Goal = save a file
  Intention = use the file menu
  Action = click the save option

- Is there a save option in the file menu?

Gulf of Evaluation

- **User's expectation of changed system state ≠ actual presentation of this state**

- Given a particular interface design, how easily can you:

  - Determine the function of the device?
  - Determine what actions are possible?
  - Determine mapping from intention to physical movement?
  - Perform the action?
  - Determine whether the system is in the desired state?
  - Determine the mapping from system state to interpretation?
  - Determine what state the system is in?

(Norman, 1990)

Semantic and Articulatory Distance

- **Semantic Distance**
  - The distance between what people want to do and the meaning of an interface element.

- **Articulatory Distance**
  - The distance between the physical appearance of an interface element and what it actually means.

Human error - slips and mistakes

The model affects user errors

- slip
  -  understand system and goal
  -  correct formulation of action
  -  incorrect action

- mistake
  -  may not even have right goal!

Fixing things?

slip – better interface design

mistake – better understanding of system

Summary

- Many interaction paradigms and many more to come in the future....
- When designing we need to consider
    - Which paradigm best suit the needs of our intended user
    - Analyse using 5W + H
    - Avoid Gulf of Evaluation, Gulf of Execution, if possible.