Conceptual Models II

CS160: User Interfaces

Maneesh Agrawala

Slides based on those of Francois Guimbretiere, Marti Hearst and James Landay

Hard to distinguish cost vs. # gallons

- Bad labels
- Placed inconsistently
- Displays too similar

Review

Task Analysis

1. Who is going to use system?
2. What tasks do they now perform?
3. What tasks are desired?
4. How are the tasks learned?
5. Where are the tasks performed?
6. What's the relationship between user & data?
7. What other tools does the user have?
8. How do users communicate with each other?
9. How often are the tasks performed?
10. What are the time constraints on the tasks?
11. What happens when things go wrong?

Review

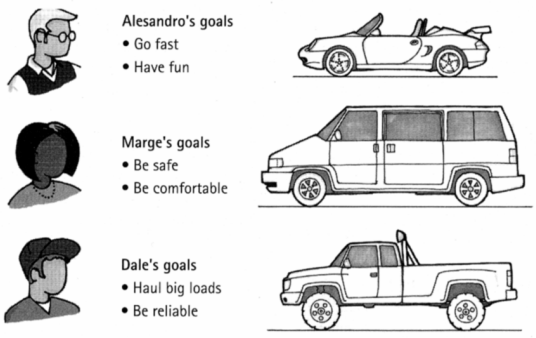
Contextual inquiry

- Helps answer the task analysis questions
- Hybrid between interview and observation
- Use master-apprentice model to get them to teach you

Review

Personas

- Specific archetype of user you will target your product to
- Build based on contextual inquiries/interviews



Assignment (due Sep 27)

Contextual Inquiry and Task Analysis
- A lot to do so get started ASAP
- Should be interviewing subjects (at least lining up subjects)

Individual Project Proposals (20 pts)
- Mean 18.25
- Stdev 1.65

Next Week

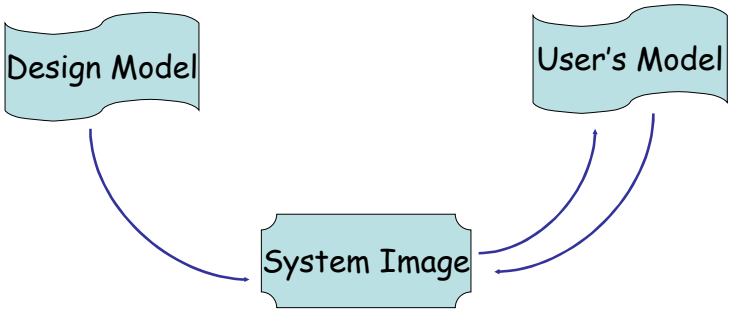
- Bring paper and pen/pencil to class for in-class exercises
- Sections
  - Hopefully we will start working with Anoto pens
  - David, Jerry and I are still working out the pen setup software

Topics

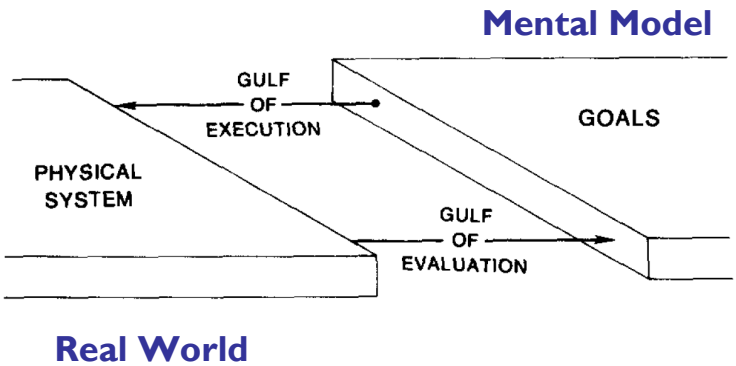
- The Action Cycle
- Metaphor in User Interfaces
- Cognition (Jef Raskin)
- Error Messages

The Action Cycle

Conceptual Models



Gulfs of Execution & Evaluation



Gulf of Evaluation

Gulf

Real world:

X	Y
0.67	0.79
0.32	0.63
0.39	0.72
0.27	0.85
0.71	0.43
0.63	0.09
0.03	0.03
0.20	0.54
0.51	0.38
0.11	0.33
0.46	0.46

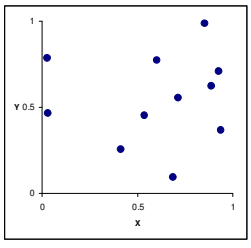
Mental model:
x,y correlated?

Evaluation

Gulf of Evaluation

Gulf

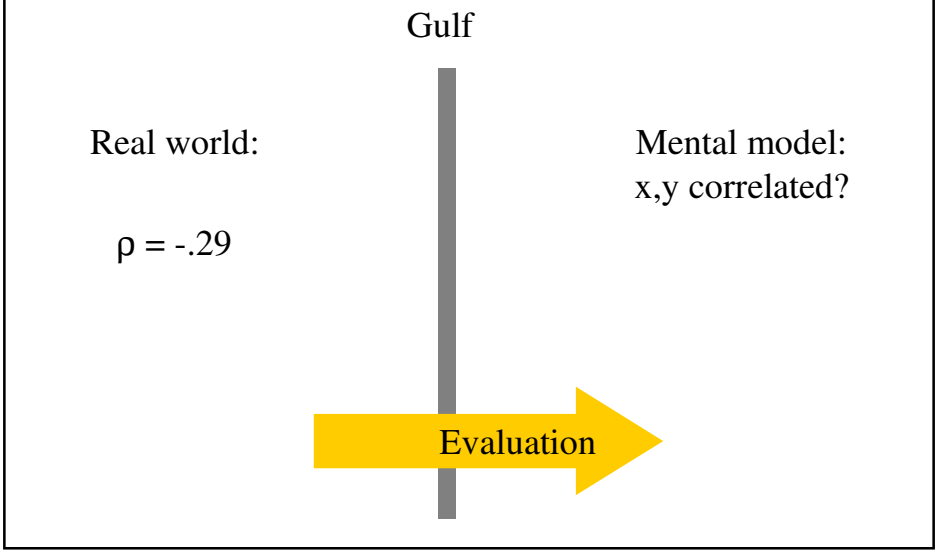
Real world:



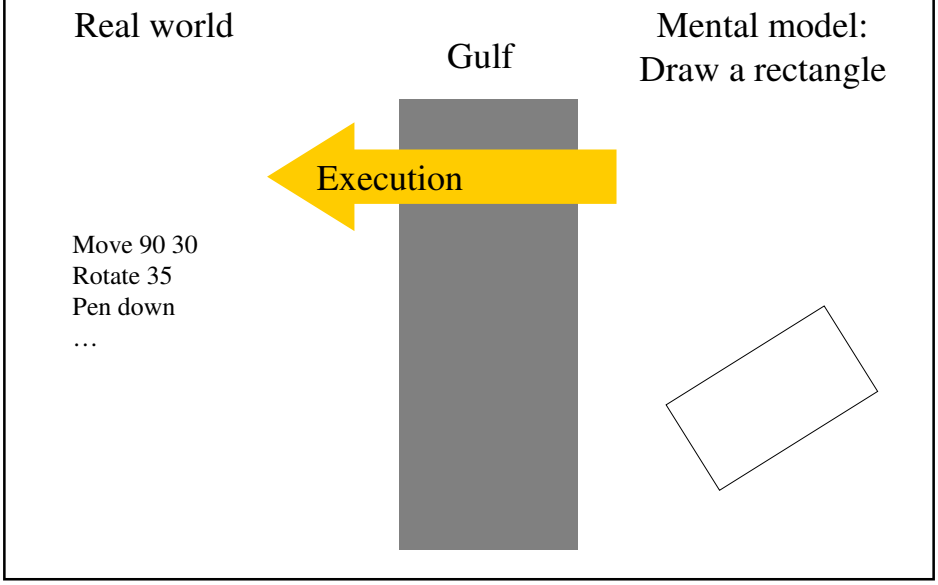
Mental model:
x,y correlated?

Evaluation

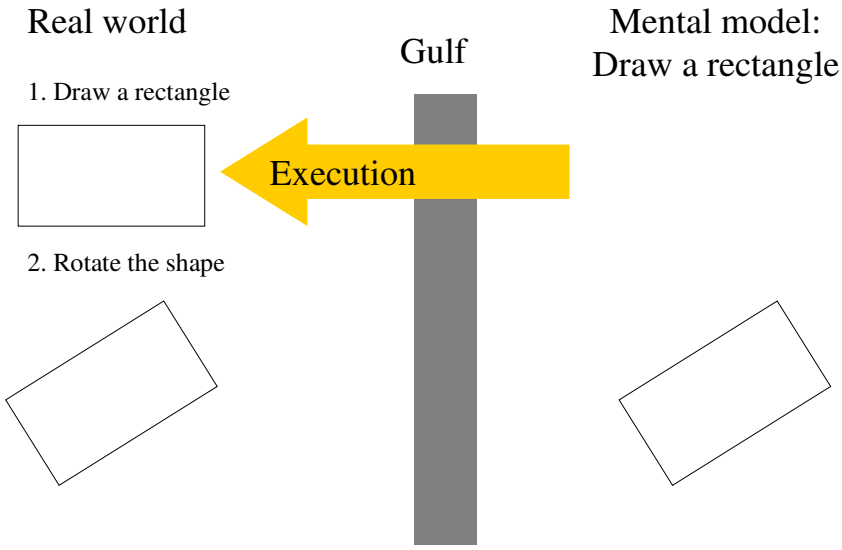
Gulf of Evaluation



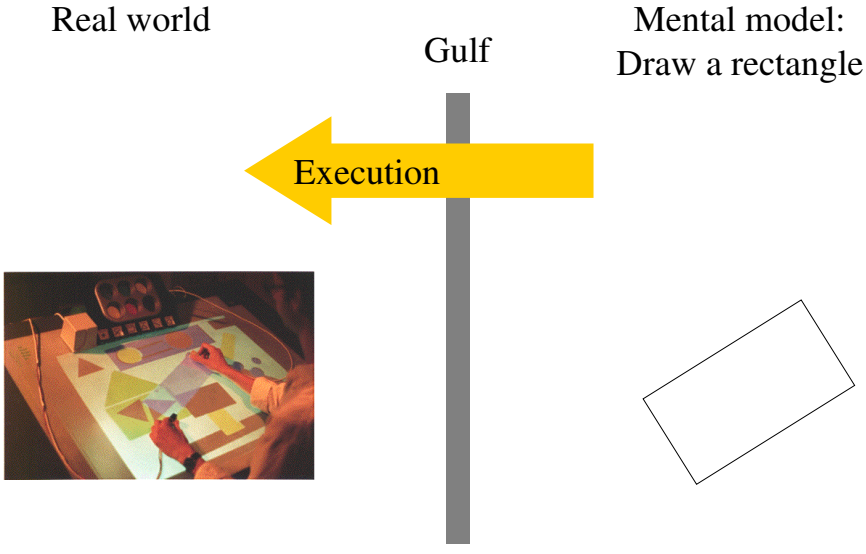
Gulf of Execution



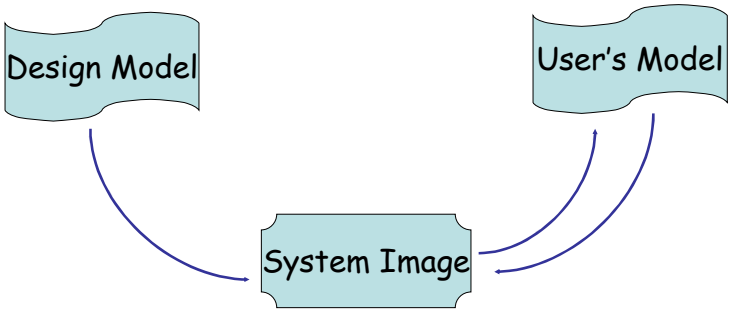
Gulf of Execution



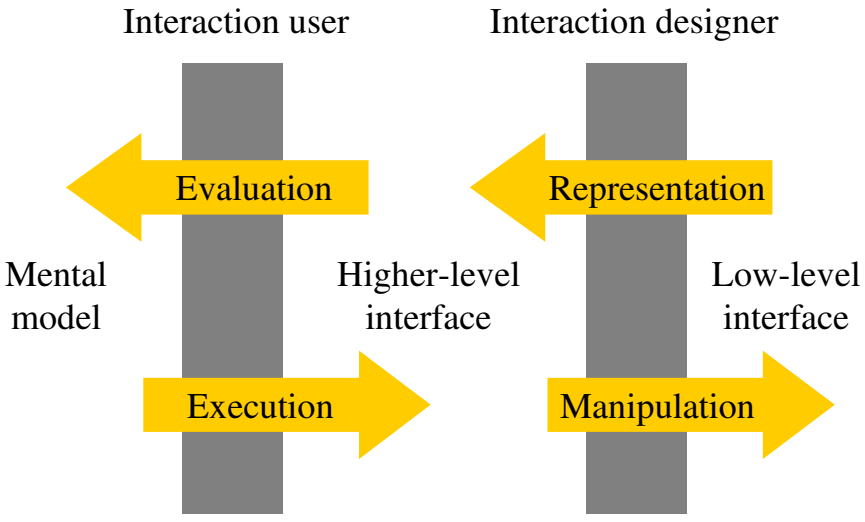
Gulf of Execution



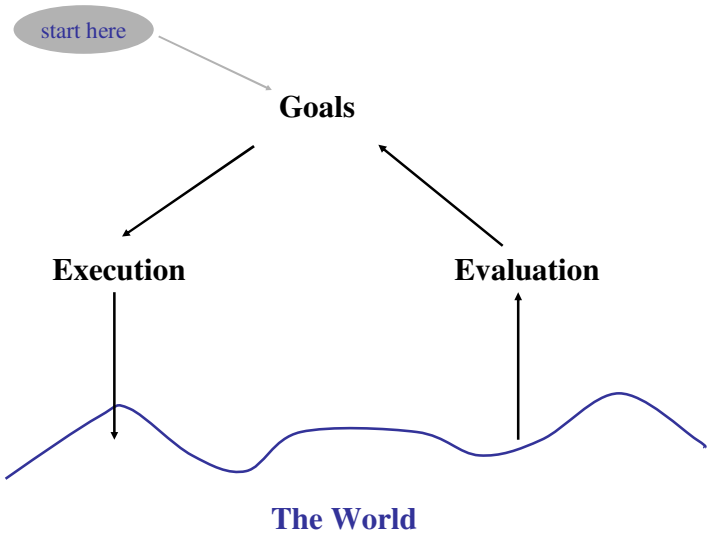
Conceptual Models



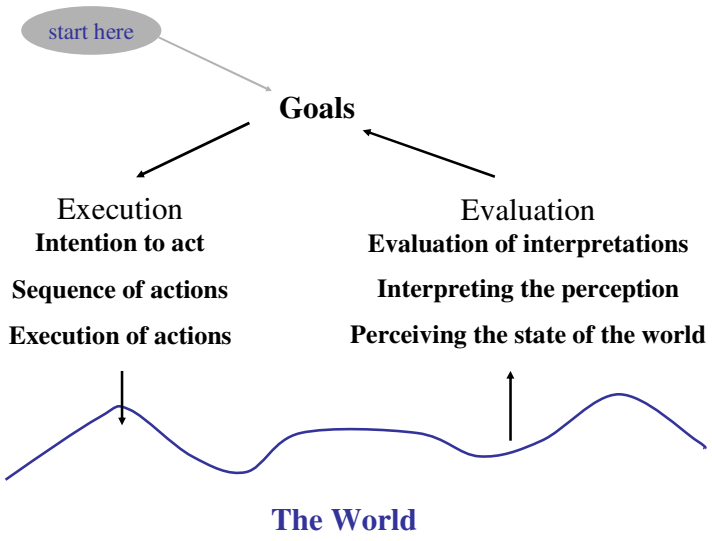
Interaction design: A double gulf?



Action Cycle



Action Cycle



Metaphor in User Interfaces

Metaphor

Definition

The transference of the relation between one set of objects to another set for the purpose of brief explanation

Lakoff & Johnson

- "...the way we think, what we experience, and what we do every day is very much a matter of metaphor."
- in our language & thinking - "argument is war"
  - …he attacked every weak point
    ... criticisms right on target
    ... if you use that strategy

Metaphors can highlight some features, suppress others

- There is some systematicity to the transference

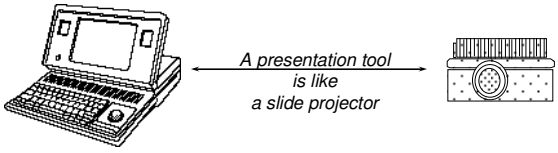
Interface Metaphors

Purpose

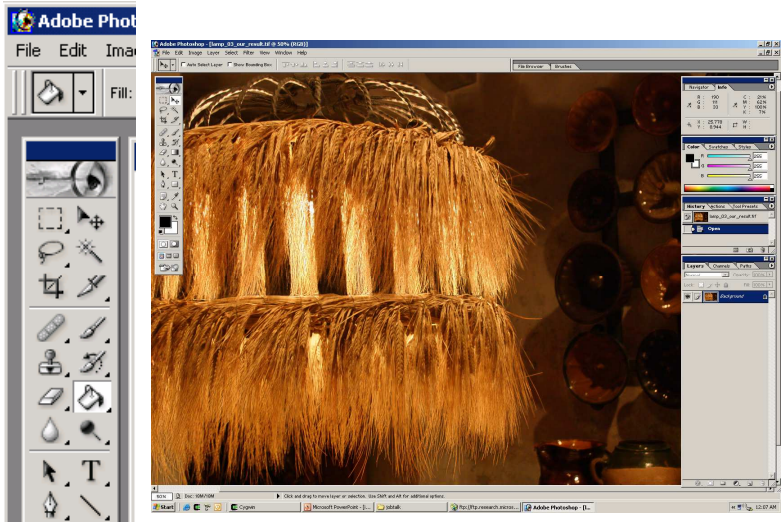
- Function as natural models
- Leverages knowledge of familiar, concrete objects/experiences
- Transfer this knowledge to abstract tasks and concepts

Problem

- Inaccurate or naive conceptual model of the system



The Painting Metaphor



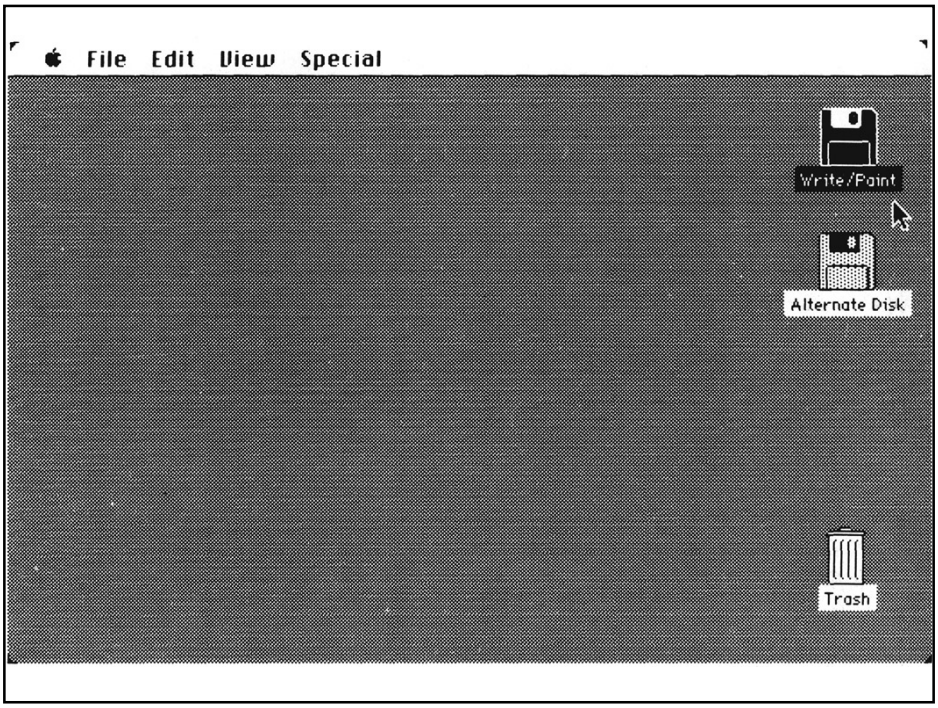
The Desktop Metaphor

Started at Xerox PARC

- Xerox Star
- Bitmapped screens made it possible

Not meant to be a real desktop

- Idea is to organize information in a way to allow people to use it in the way they user information on their desktops
- Allow windows to overlap – make the screen act as if there were objects on it



Microsoft Bob's Desktop Metaphor

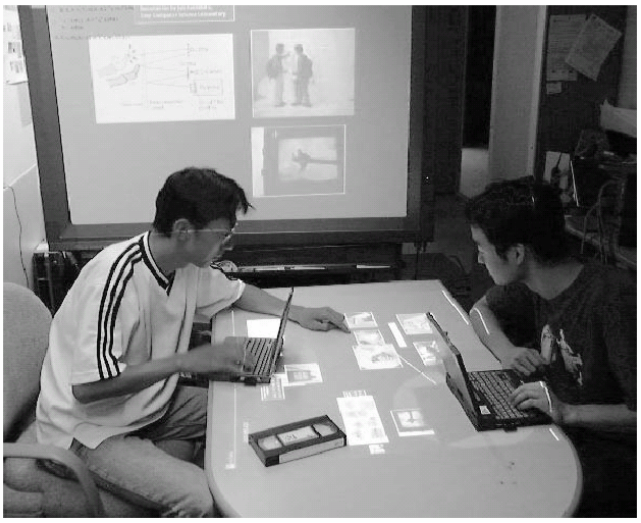
Bob's "Living Room" Metaphor

3D Desktops

[Robertson 2000]

Sun's Looking Glass

Going Further



[Rekimoto 2000]

Metaphor Caveats

Too limited
- The metaphor restricts interface possibility

Too powerful
- The metaphor implies the system can do things it can't

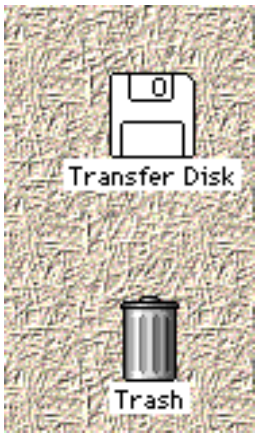
Too literal or cute
- Makes it difficult to understand abstract concept

Mismatched
- The metaphor conveys the wrong meaning

Mismatched Metaphors

The classic (from the mac desktop)

- To eject a disk you drag it to the trashcan



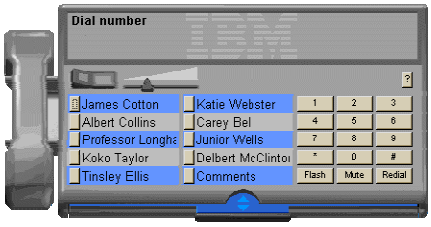
Mismatched Metaphors

What is being controlled here?

Misused Metaphors

Direct translations

- Software CD player that requires turning volume knob with mouse
- Software telephony solution that requires the user to dial a number by clicking on a simulated keypad
- Airline web site that simulates a ticket counter!



Southwest Airlines Home Gate
The Home of Southwest Airlines on the World Wide Web

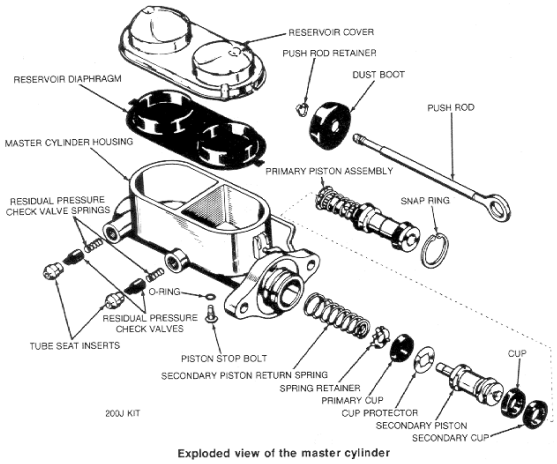
Guidelines for Design

Good Metaphors

- Capture essential elements of the event / world
- Deliberately leave out / mute the irrelevant
- Appropriate for user, task, and interpretation

Direct Manipulation

Manipulating Exploded Views



Exploded view of the master cylinder

Interactive Image-Based Exploded View Diagrams. Wilmot Li, Maneesh Agrawala and David Salesin. Graphics Interface 2004.

Viewing and Direct Manipulation

Definitions

Direct Engagement

- The feeling of working *directly* on the task

Direct Manipulation

- An interface that behaves as though the interaction was with a real-world object rather than with an abstract system

Central ideas

- Visibility of the objects of interest
- Rapid, reversible, incremental actions
- Manipulation by pointing and moving
- Immediate and continuous display of results

Almost always based on a metaphor

- Mapped onto some facet of the real world task semantics

The Metaphor

Computer objects as visible, moveable objects

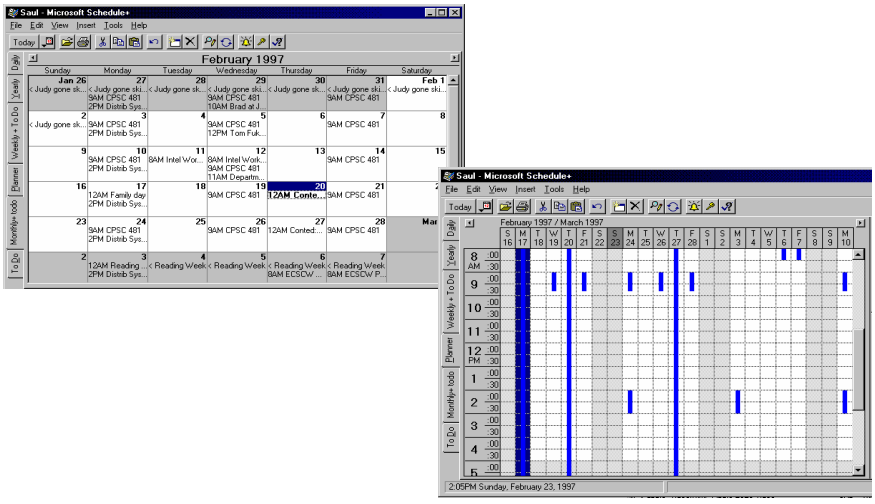
Consequences

- Items represented as icons
- Items can be “picked up” and “moved” on a surface
- Items can be “thrown out”
- Items can be “copied”
  - Do we really want to have to drag them to a photocopier?

How much is too much?

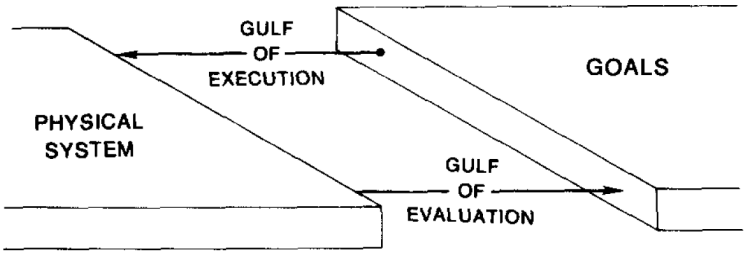
Visual Representation

To manipulate an object it must be visible



Reduce Distance

Decrease gulfs

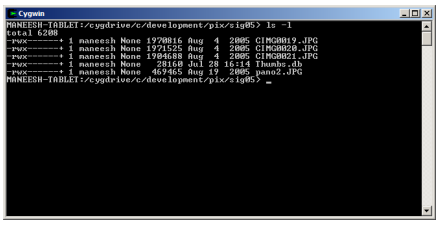


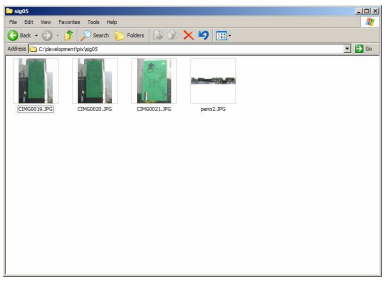
Increase Engagement

Conversation vs. Model world

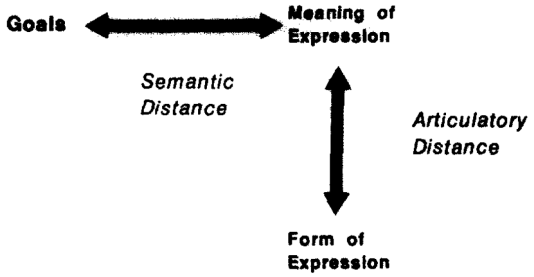
- Abstraction uses language vs. directly operating on objects
- Describe actions of interest vs. performing actions directly

Model world: Output can serve as input expression
Conversation: Cannot operate on what has been said





Semantic & Articulatory Distance



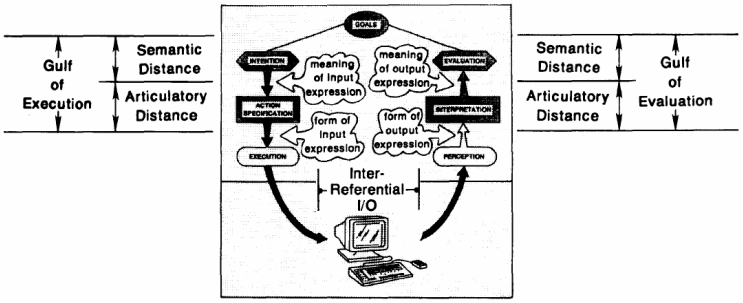
Semantic
- Is it possible to say what one wants to say
- Can it be said concisely

Articulatory
- Make form of expression similar to meaning of expression
- Onomatopoeia
  - "Boom" of explosion, "cock-a-doodle-doo" of roosters

The Gulfs & Semantic Distance

Gulf of Execution
- Match description level of interface language to level at which person thinks of the task (often interface is much lower)

Gulf of Evaluation
- Match terms of output to the form user requires for checking that goals have been met



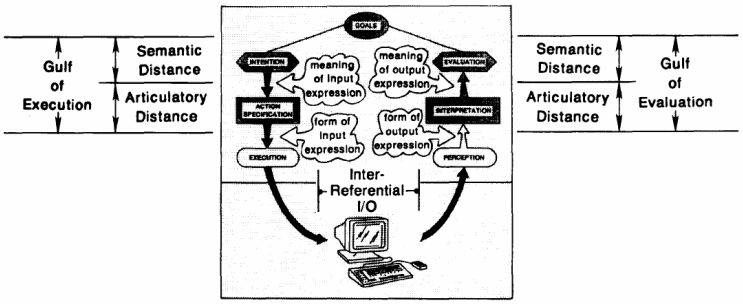
The Gulfs & Articulatory Distance

Gulf of Execution

- Permit specification of action by mimicking it (i.e. move pointer with mouse, pointing with finger, lightpen, …)

Gulf of Evaluation

- Depict output so that relationships between input action and output is obvious and easy to perceive (i.e. graphical chart vs. table of numbers)



Issues

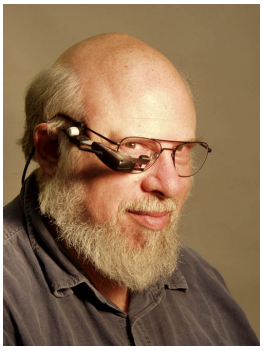
Some Disadvantages

- Ill-suited for abstract operations
  - Spell-checker?
  - Search database by scrolling or by query?

Solution: Combine direct manipulation & abstractions

- Word processor:
  - WYSIWYG document (direct manipulation)
  - Buttons, menus, dialog boxes (abstractions, but direct manipulation "in the small")

Cognition



Jef Raskin

Cognitive Engineering

Ergonomics:

- Accounts for statistical variation of human variability
  - Design a car seat that fits 95% of the population
- Says that designing products that interact with us physically is reasonable straightforward

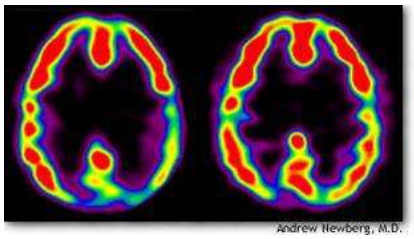
Cognetics: Ergonomics of the mind

- Study of the "engineering scope of our mental abilities"
- This is the applied side of cognitive science

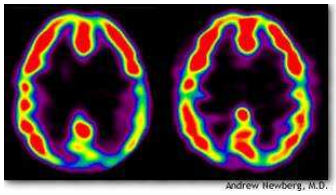
Cognitive Conscious / Unconscious

Examples?

- What is the last letter in your first name?
  - You know it but weren't consciously accessing this information a moment ago, but now you are.
- How do your shoes feel right now?
- How did "The Shining" make you feel?
- Having a name on the "tip of your tongue"



Locus of Attention



What is it?

- An idea/object/event about which you are intently and actively thinking
- The one entity on which you are currently concentrating
  - You see and hear much more
  - E.g., background noise

Why locus?

- Focus implies volition; locus not always consciously control
- Attention can be either active or "going with the flow"

Locus of Attention

Why is it important for HCI?

- Cannot be conscious of more than one task at a time
- Make the task the locus of attention
- Beware of the power of mental habits
  - Repetitive confirmations don't work
- Take advantage of it
  - Do pre-loading while user thinking about next step
  - Streamline resumption of interrupted tasks

Summary

Gulfs of Execution and Evaluation

- Action cycle involves bridging these two gulfs between user & system

Metaphor

- Leverages knowledge of familiar objects & experiences
- Transfer this knowledge to abstract tasks and concepts
- Easily mismatched or misused so be careful!

Direct Manipulation Interfaces

- Should reduce semantic and articulatory distances
- Increase engagement by operating on objects

Cognition (Jef Raskin)

- Locus of attention – where you consciously attend

Be careful when designing error messages

Next Time

More from Raskin

- Cognetics and the Locus of Attention. *The Humane Interface.* Chap 2. Raskin.
- Meanings, Modes, Monotony and Myths. *The Humane Interface.* Chap 3. Raskin.
- Readings are a bit long, but Raskin is a great writer worth reading
- Reading for next Wed will be short

Storyboards and Sketching

- Bring pen and paper for in-class exercise