Requires Dexterity

What about disabled users with hand tremors?
Muscular dystrophy
Cerebral palsy
Parkinson’s
Spinal cord injuries

EdgeWrite [Wobbrock 2003]
Individual Programming Assignment 3 (due Feb 17)

Individual Competitive Analysis (due Feb 17)

Compile a list of at least 10 related applications
- Be thorough
- Check other sources like Android Marketplace

Analysis
- Briefly review each application
  - target users,
  - functionality
  - usability

Summary
- What is unique about your application?

Contextual Inquiry and Task Analysis

Due Feb 17
- Find and interview 3 target users (not from class)
- Analyze their tasks
- Explain how your application addresses their needs
- See wiki for details

Start now!
- Finding participants will take time
- We will not accept late group project assignments

Contextual Inquiry and Task Analysis

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Contextual Inquiry and Task Analysis

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Start now!
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Review Conceptual Models

Designers model may not match user's model
Users get model from experience & usage
Users only work with system image, not with designer

What if the two models don't match?

Review: Design Principles

1. Make controls visible

2. Make sure mapping is clear

Mercedes S500 Car Seat Controller
Review: Design Principles

3. Provide feedback

Topics

Direct Manipulation
Metaphor in User Interfaces
Cognition (Jef Raskin)
Modes

The Action Cycle

- **Goals**
  - Intention to act
  - Sequence of actions
  - Execution of actions

- **Evaluation**
  - Evaluation of interpretations
  - Interpreting the perception
  - Perceiving the state of the world

The World

Direct Manipulation

- **Direct Manipulation**
  - An interface that behaves as though the interaction was with a real-world object rather than 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
Reduce Distance

Decrease guls

Semantic & Articulatory Distance

Semantic Distance reflects the relationship between the user’s intentions and the meaning of expressions in the interface languages.

Articulatory Distance reflects the relationship between the physical form of an expression in the interaction language and its meaning.

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 output to the user’s mental model to enable checking that goals have been met

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 & 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)

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**Calculator Example**

**User intention**
What is 5 + 5?

**Semantic distance vs. articulatory distance?**

Infix Calculator
Press '5', '+', '5', '='

Post-fix Calculator
Press '5', '5', '+', '='

Which gulf are we talking about?

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**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**
Leverages knowledge of familiar, concrete objects/experiences
Transfer this knowledge to abstract tasks and concepts

**Problem**
Inaccurate or naive conceptual model of the system

![A presentation tool is like an overhead projector](image)

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The Desktop Metaphor

**Started at Xerox PARC**
Xerox Star
Bitmapped screens made it possible

**Not meant to be a real desktop**
Organize information the way people use information on desktop
Allow windows to overlap – make screen act as if objects are on it

![Xerox Star interface](image)
Microsoft Bob's Desktop Metaphor

Bob's "Living Room" Metaphor

3D Desktops

[Robertson 2000]

Sun's Looking Glass
Metaphor Caveats

Too limited
The metaphor restricts interface possibilities

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

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!

Guidelines for Design

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

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”

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

Modes
What are they?
The same user actions have different effects in different situations.

Examples?
Keycaps lock
Using Modes in Interfaces

When are they useful?
- Temporarily restrict users’ actions
- When logical and clearly visible and easily switchable
- Autocorrect (if easy to switch the mode)

Why can they be problematic?
- Big memory burden
- Source of many serious errors

How can these problems be fixed?
- Don’t use modes – redesign system to be modeless
- Redundantly visible

Redesigning to Avoid Modes

Setting the time on a clock
Redesigning to Avoid Modes

Setting the time on a clock

![Modeless clock](image1)

Modes are Sometimes Good

Fill and empty syringe

![Modeless syringe](image2)

If task requires modes, interface may also contain modes

**Fill Syringe**
- Current Vol: 25ml
- Max Vol: 200ml

**Deliver Solution**
- Current Vol: 25ml

**Quasimodes**
- Set and hold a mode via conscious, continuous action
  - Shift key to capitalize (vs. Caps Lock)
  - Foot pedal that must remain pressed
  - Pull down menus
  - Muscle tension reminds users they are holding a mode

Also known as "spring-loaded modes"
### Noun-Verb VS Verb-Noun

**Noun-Verb:** Select object, then do action

Emphasizes ‘nouns’ (visible objects) rather than ‘verbs’ (actions)

**Advantages**
- Closer to real world
- Modeless interaction
- Actions always within context of object
- Inappropriate ones can be hidden
- Generic commands
  - The same type of action can be performed on the object
  - E.g. drag ‘n’ drop

**Summary**

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

**Cognition (Jef Raskin)**
Locus of attention – where you consciously attend

**Modes**
Can create memory issues and cause serious errors
Avoid modes in your designs!

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### Next Time

2/15: No class due to President’s Day

2/17: Input Devices, Mobile vs. Desktop Applications
Reading to be posted soon

2/17: Assignments due
Individual Programming Assignment 3
Individual Competitive Analysis

2/22: Assignments due
Contextual Inquiry and Task Analysis