UCI University of California, Irvine

Informatics 134

Software User Interfaces
Winter 2022

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Agenda

1. Evaluating Widgets

2. A2: Five and Five

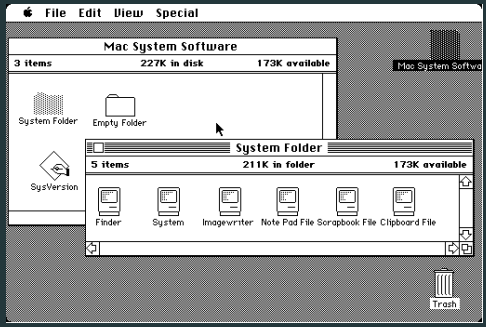
3. Next Week's Agenda

Evaluating Widgets

WIMP

Some History

- W Windows
- I Icons
- M Menus
- P Pointers



Macintosh System 1.0 [1]

Benefits of WIMP

Introduced core input and interaction methods that could be standardized across multiple systems.

This consistency opened a path to non-technical skill development, transferable across different computing environments.

Some History

Benefits of WIMP

Direct Manipulation

Obstacles of WIMP

Not accessible without additional architecture and semantic and lexical context.

Can lead to cluttered interfaces, affecting **task at hand**

WIMP's pervasiveness limits what is possible with technology today.

Some History

Post WIMP Interfaces

- Tangible User Interfaces
- Natural User Interfaces (*e.g.*, multi-touch, wearable, spatial)
- Voice User Interfaces
- Many more...

Evaluating WIMP and Post-WIMP Interfaces

$$MT = a + b \cdot \log_2 \left(\frac{D}{W} + 1 \right)$$

Fitts' Law

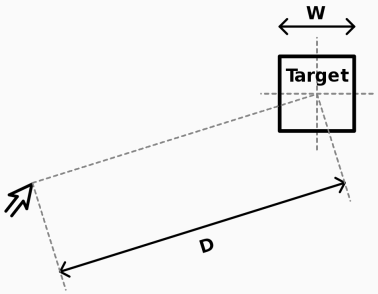
MT - The time it takes to move a pointer to a target

D - The distance of movement

W - The size of the target

a - Device specific coefficient (*e.g.*, time to move hand)

b - Movement coefficient (*e.g.*, sticky mouse, etc.)



$$MT = a + b \cdot \log_2\left(\frac{D}{W} + 1\right)$$

Implications for User Interface Design

Fitts' Law tells us:

- The larger the target (W), the easier it is to interact with it.
- The faster we move a pointer (MT), the time to interact is shortened.

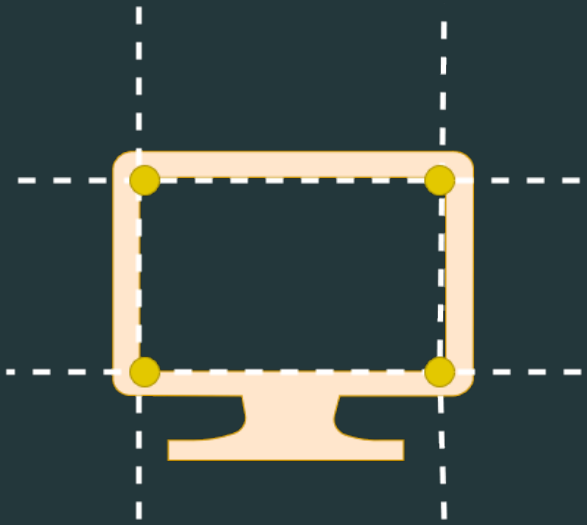
Implications for User Interface Design

So how do we take advantage of these principles in user interface design?

Implications for User Interface Design

So how do we take advantage of these principles in user interface design?

- Group related interactors (widgets), examples?
- Infinite Width (when constrained by screen), examples?



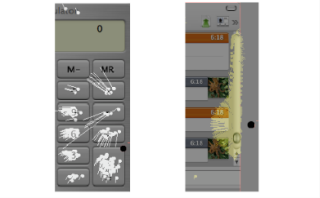
Infinite Edges [2]

Implications for User Interface Design

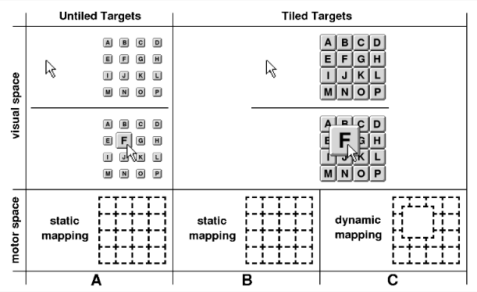
So how do we take advantage of these principles in user interface design?

- Group related interactors (widgets), examples?
- Infinite Width (when constrained by screen), examples?
- Snap to target
- Expanding targets [3]
- Magnetic field (click patina) [4]

Fitts' Law



Magnetic Dust or Click Patina [4]



Expanding Targets [3]

Implications for User Interface Design

The more difficult it is to move towards and interact with widgets in your interface, the greater the risk of user discomfort, frustration, and dissatisfaction.

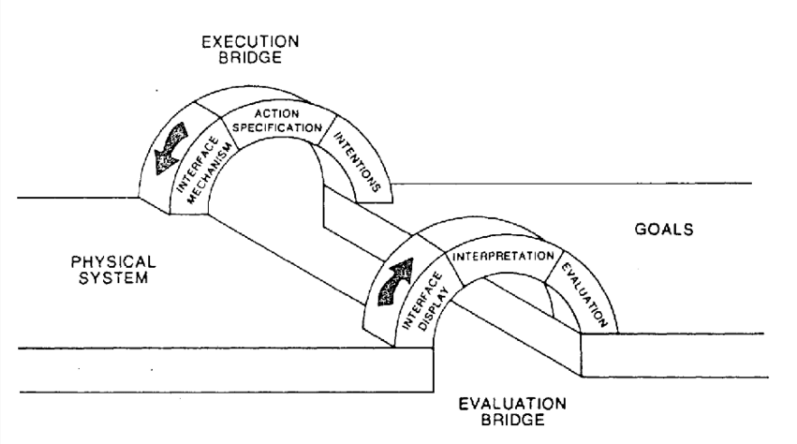
Fitts' Law

Implications for User Interface Design

"the greater the risk of user **discomfort**, **frustration**, and **dissatisfaction**."

Are these experiences universal?

The Gulf of Execution and The Gulf of Evaluation



The Gulfs

The Gulf of Execution

> The distance between what a user perceives and what a system supports.

The Gulfs

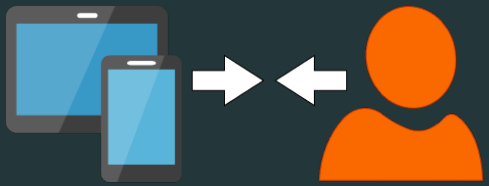
The Gulf of Evaluation

> The distance between how a user assesses system state and how well the system supports discovery and interpretation of that state.

The Gulfs

Stages of Execution

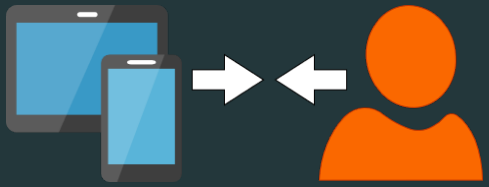
- Identify a goal
- Translate that goal to an intention to act
- Identify steps necessary to fulfill the intention



The Gulfs

Stages of Evaluation

- Identify user perception of the world
- Interpret perception to meet expectations
- Evaluate by comparing expectations to execution of intention



An Example

All the ingredients of a meal are properly measured and prepared for you, but you don't have the recipe to follow. Is the gulf of execution wide or narrow?

An Example

The meal is cooked, you need to determine if it tastes as expected. Is the gulf of evaluation wide or narrow?

The Gulfs

Using the gulfs to reason about widget and general user interface design

- **Visibility** of System Status: Can the intent of the object (state, actions) be determined by looking at it?
- **Mapping**: Can the user identify the relationship between action and outcome?
- **Consistency**: Is object behavior the same, regardless of changes to system state?
- **Feedback**: Does the object inform the user about its state after an action or outcome?

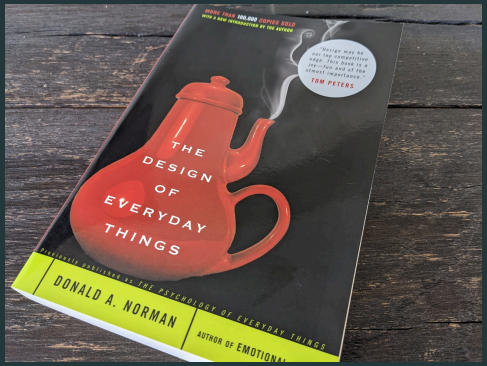
The Gulfs

The more difficult it is to move towards and interact with widgets in your interface, the greater the risk of user discomfort, frustration, and dissatisfaction.

Design Principles

On Execution and Evaluation

- Written by Don Norman (UCSD, nngroup.com)
- The hidden frustrations with everyday things
- Principles for design

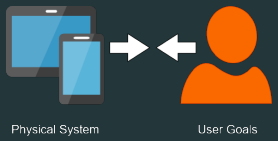


The Design of Everyday Things [5]

On Execution and Evaluation

> "The basic idea is simple. To get something done, you have to start with some notion of what is wanted—the goal that is to be achieved. Then, you have to do something to the world, that is, take action to move yourself or manipulate someone or something. Finally, you check to see that your goal was made. So there are four different things to consider: the goal, what is done to the world, the world itself, and the check of the world. The action itself has to major aspects: doing something and checking. Call these *execution* and *evaluation*."
>
> ——[5], p. 46

Design Principles



Stages of Execution

- Identify a goal
- Translate that goal to an intention to act
- Identify steps necessary to fulfill the intention

Stages of Evaluation

- Identify user perception of the world
- Interpret perception to meet expectations
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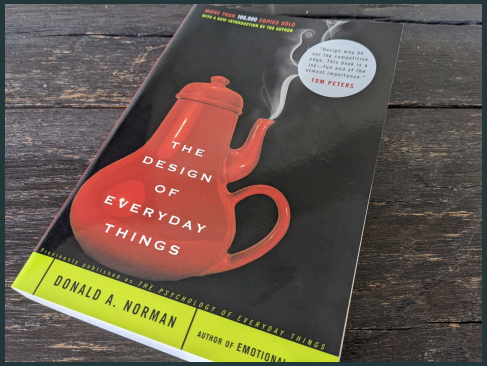
Design Principles

- Natural Mapping
- Visibility
- Feedback
- Affordance
- Constraints
- Mental/Conceptual Models



The Design of Everyday Things [5]

Natural Mapping

The relationship between two things.

The relationship between controls, their manipulations, and the results in the world.

Design Principles

Visibility

Make capabilities perceivable and interpretable.

Counteracting factors: features, aesthetics, and abstractions.

Visibility Examples

When the number of functions is greater than the number of controls, functionality is hidden.

When capabilities are visible, memory is not required to use (“recognition over recall”).

Feedback

Sending back to the user information about what action has actually been done and what result has been accomplished (*e.g.*, sounds, change in physical state)

Design Principles

Someone is Typing...

Affordance

Perceived and actual properties or clues about something that determine just how that thing could possibly be used.

Note:

Affordance != Features

Design Principles

Norman's pet peeve:

[6]

The point is...

Complex things *may* need explanation, but simple things *should* not.

If a simple thing requires instructions, it is likely a failed design.

On Affordances

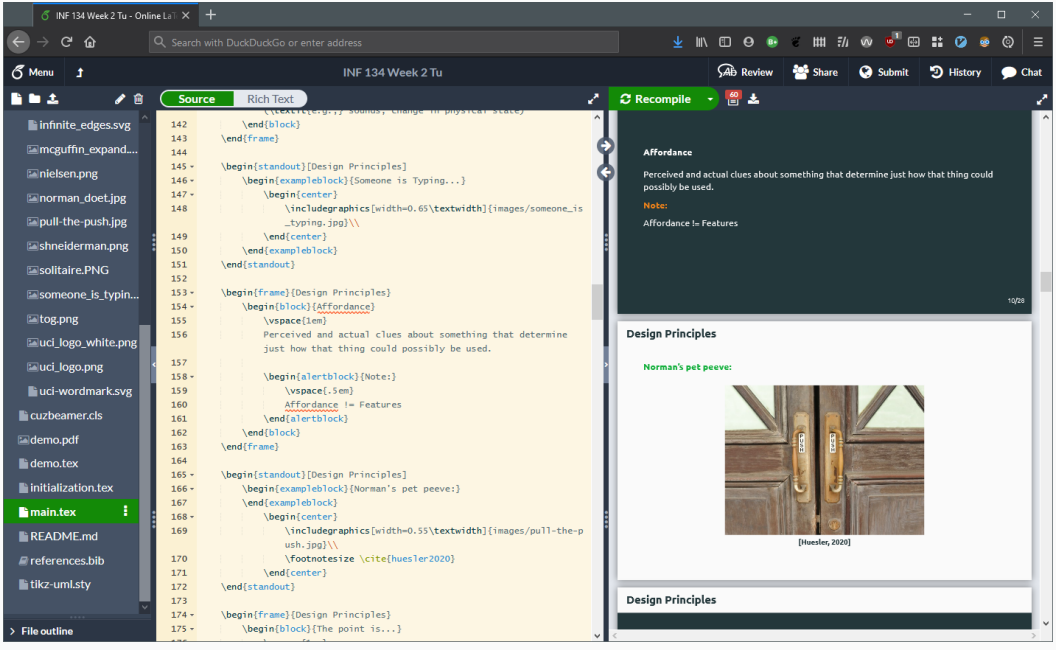
> “Affordances provide strong clues to the operations of things. Plates are for pushing. Knobs are for turning. Slots are for inserting things into. Balls are for throwing or bouncing. When affordances are taken advantage of, the user knows what to do just by looking: no picture, label, or instruction needed.”
>
> ——[5]

Affording Widgets...

Does it afford:

- “clicking”?
- “dragging”?
- “pulling”?
- “sliding”?
- “swiping”?
- “spinning”?

Design Principles

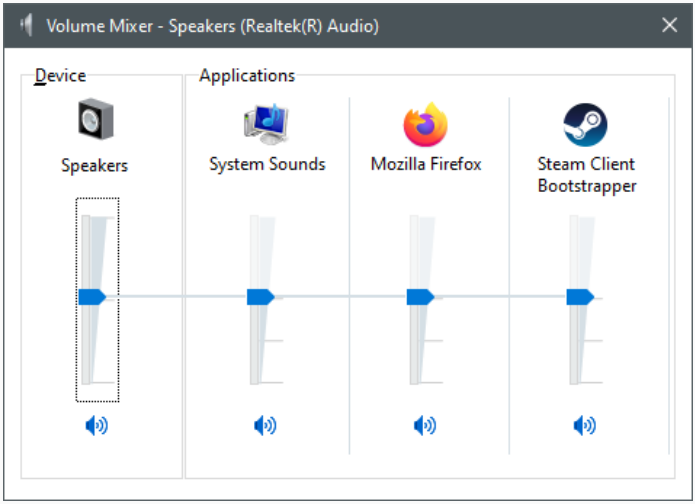


Constraints

“Physical” or psychological limitations that constrain possible actions.

Examples?

Design Principles



Conceptual Models

People build their own understanding of how things work by building a conceptual model around...

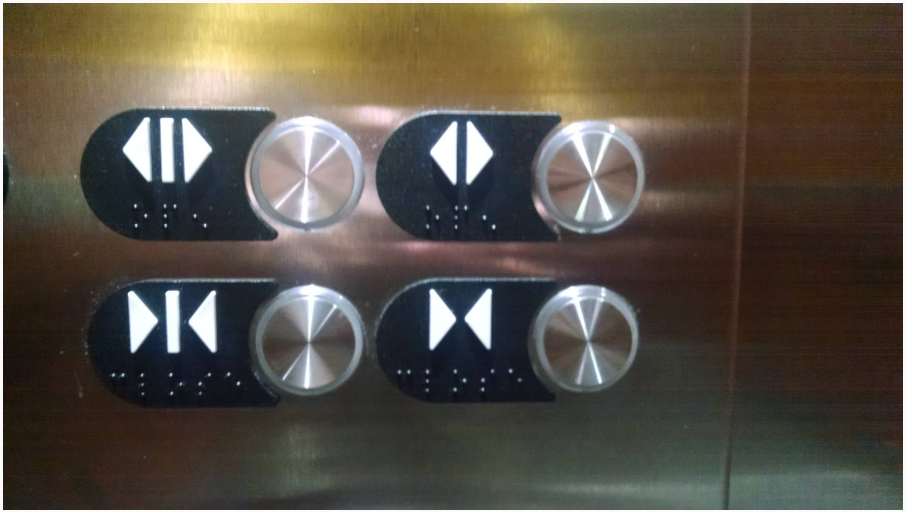
What?

Conceptual Models

People build their own understanding of how things work by building a conceptual model around...

- Mappings
- Visibility and Feedback
- Affordances
- Constraints

Design Principles



[7]

Conceptual Models

People are explanatory (usually)

- Sometimes they get things right...
- Sometimes they blame the wrong cause...
- Sometimes they blame themselves (learned helplessness)...

Designing Interfaces

Designers (and programmers!) should work to foster the appropriate conceptual model

1. How does something actually work?
2. How does the user think the thing works?
3. How should the user conceptualize about 1?

A2: Five and Five

Next Week’s Agenda

Next Week's Agenda

- Teams announced next Monday
- Team Assignment 1 will be launched on Monday
- Finish A1 (DUE TONIGHT)
- Get started on A2
- We'll talk more about design, then start getting more technical!

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