

# Preliminaries II



CS5540 *Human Computer Interfaces*

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Psychology/Design of  
Everyday Things

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Lecture Set 3

# Affordances

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- Affordances refers to the perceived and actual properties, esp wrt how it is used or applied
- Affordances provide “strong clues” to the operation of things

# Mappings

- Mappings refers to the relationship between two things
- Eg, control and movement
  - Steering wheel
  - Door handle

# Map's & Afford's: Ex's - 1

- Door Knobs v Levers



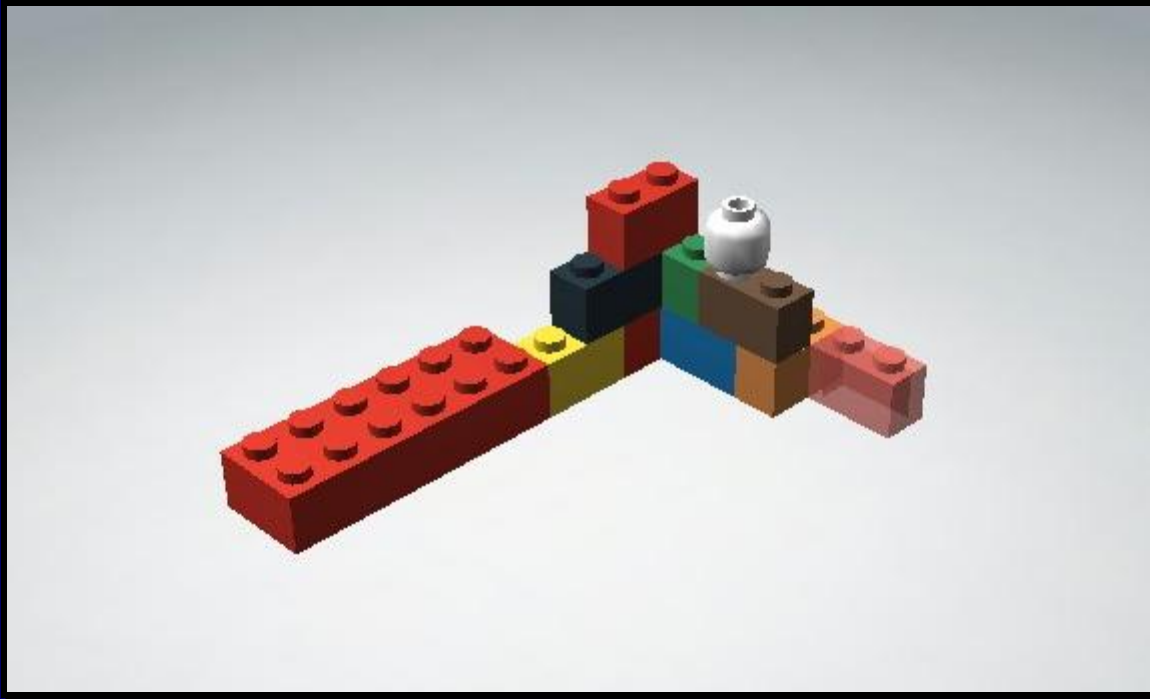
# Map's & Afford's: Ex's - 2

Doors open left or right?



# Map's & Afford's: Ex's - 3

Lego pieces



# Map's & Afford's: Ex's - 4

- Bicycle
  - Seat, position, handlebars, brakes



# Map's & Afford's: Ex's - 5

- Mercedes power seat adjustment



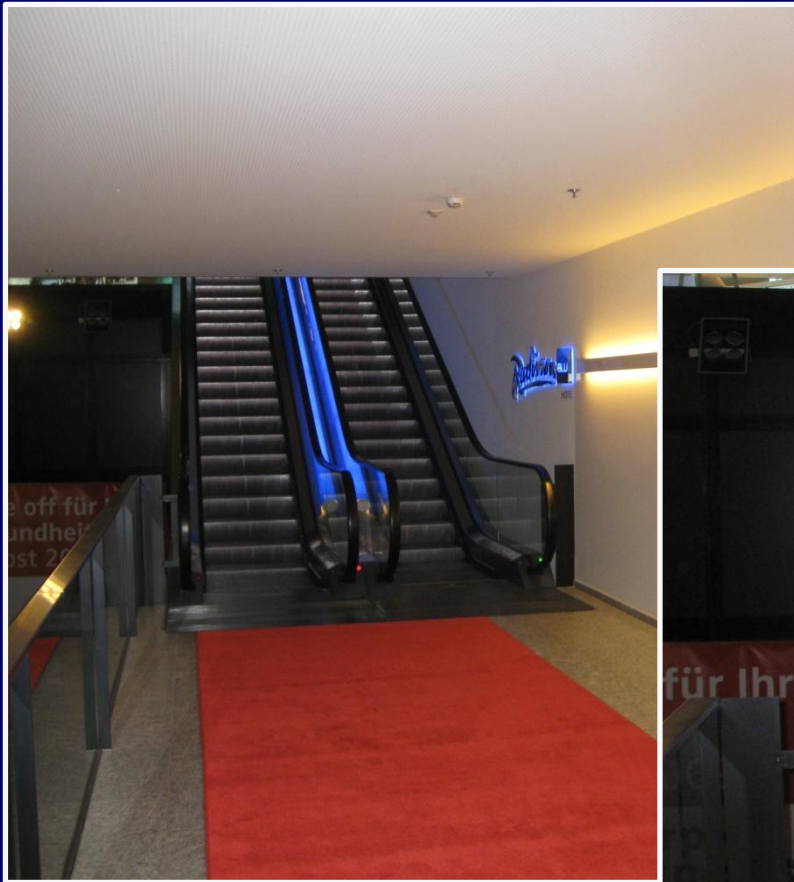
# Map's & Afford's: Ex's - 6

- Motorcycle
  - Clutch, shifting pattern
- Climate Control in (most) cars-
  - Want to set temperature
  - Really setting amount of hot water circulating through radiator

# Mappings & Affordances: Ex's -2

- Sound System Controls
  - Knobs v Sliders
- TV Controls
  - Menus
- Triggers
- Joystick controls

# Is this function obvious?



# Is this function obvious?



# Is this function obvious?



# Functionality v Interface/Mapping



# Huh? What's this?

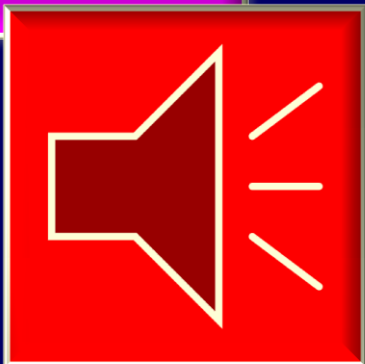
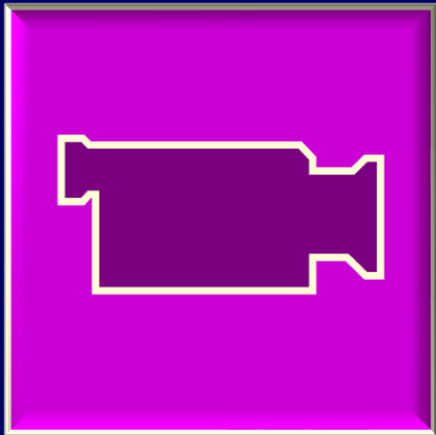
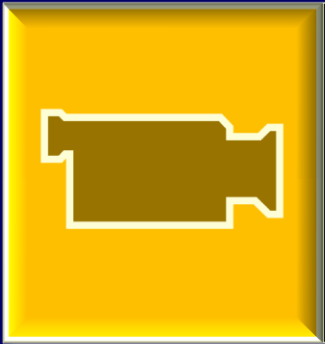
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## *Want to see the Wovel at work?*



# *Widgets*



# 7 Stages of Action - 1

1. Form Goal
2. Form Intent
3. Specify Action
4. Execute Action
5. Perceive State of World
6. Evaluate Outcome
7. Interpret State of World

# 7 Stages of Action - 1

## A. Abstraction

1. Form Goal

## B. Execution Phase

2. Form Intent
3. Specify Action
4. Execute Action

## C. Evaluation Phase

5. Perceive State of World
6. Evaluate Outcome
7. Interpret State of World

# 7 Stages of Action - 2

## 1. Form Goal

Get more light to read

# 7 Stages of Action - 2

## 2. Form Intent

Flip on a wall switch

## 3. Specify Action (Instantiate Plan)

Get out of chair, walk to switch ...

## 4. Execute Action

Carry out plan

# 7 Stages of Action - 4

## 5. Perceive State of World

Collect external data

## 6. Evaluate Outcome

## 7. Interpret State of World

# Issues

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- Gulf of Execution
  - Wrong thing happened
  - Unexpected response
- Gulf of Evaluation
  - What is going on?
  - Where am I?

# Control Structures

- Shallow structures
  - ice cream store menu
- Narrow structures
- Cooking recipe
  - small vocab
  - many steps

# Designing for Errors - 1

- Design for errors
- Making mistakes is normal
- Implement fault tolerant designs
  - redundancy

# Designing for Errors - 2

- Understand the cause, and minimize
- Implement UNDO
- Make errors easy to
  - detect
  - Correct
- Think of user as
  - engaged in approximate behavior
  - don't think of it as wrong behavior

# Designing for Errors - 3

- Example: Locking keys in car
  - various alerts and inhibitions
  - don't want a voice telling you that you just locked your keys in car!

# Forcing Functions - 1

- Forcing Functions are a form of physical constraint
  - Make this hard to turn, hard to open
  - Barriers
  - Loud fire alarms (120 db !)
  - Inadequate password rejection

# Forcing Functions: Examples - 2

- Child-proof medicine containers
- Engaging reverse in a car
- Inhibit *start* w transmission
- Critical military decisions
  - Requires two authorized people
- Fire extinguisher

# Forcing Functions - 3

- Recessed *reset button* on equipment
- Turnstiles and automatic gates
- Speed *governors* on fleet cars
- Function car locks
  - Child locks on rear doors
  - Automatic locking when in *Drive*
  - Locked steering wheel w/o key

# Forcing Functions - 4

- Automatic seatbelts restraints
- Open microwave door inhibits *POWER*
- Self-cleaning oven – door stays locked
- Firearm safety settings
- Double instead of single mouse click
- Elevator – door must be closed

# Forcing Functions - 5

- Legal and psychological
  - Policeman at intersection
  - Police car at roadside
- Security
  - Security guard
  - Surveillance camera
  - Surveillance *sign* (not for sale, officially)
  - Guard dog – or any dog

# Forcing Function: Advisories - 6

- “Shoplifters will be *prosecuted* to the fullest extend of law”
- “Speed enforced by radar”
- Radio alert provided by police
  - Radar in operation in following areas
- Reminder of consequences
  - Punishable by fine, jail, suspension, removal, etc.

# Forcing Function Approach- 7

- Drastic, imposing, assertive, militant, authoritative, officious, *Big Brother*, risky
- When to use?
  - This is a choice of the *stick* over carrot
  - Often has a goodwill cost
    - Motorcycle helmets
    - Seatbelts
    - Child restraining seats

# Forcing Function Approach- 8

- What circumstances justify this approach?
  - Safety?
  - Potential for major damage?
  - Harm to others/society?

# Forcing Function Approach- 8

- When does the user subscribe to the approach; when is it resented?
  - Gun control
  - Restricted (superuser) functions
  - Speed limits on German autobahn
  - Dress/behavior codes

# Forcing Function Approach- 8

- When does the user subscribe to the approach; when is it resented?
  - Drug control
    - Need a prescription
    - Only dispensed for 1 month supply; cannot renew
    - Cannot call-in to pharmacy
    - ID required
    - Not honored from out-of-state prescription

# Forcing Function Approach- 8



# Fault “Intolerance”

- Design so that only correct actions can be taken
- Nuclear power plants
- Cockpits: Flaps down
- Shifting into reverse
- Assemble only one way: right way!

# Can Force Function of Machine

**StopSaw**

# Visibility

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- Allow the user to be informed
- Show him the state
  - Where is the elevator?
  - Can I see the elevator in its shaft?
- Is the tape in correctly? Is it engaged?

# Interpreting Data

- Swiss Air flight
  - low oil pressure, level on Eng 1
    - turn off Eng 1
  - ditto on Eng 2 & 3
    - impossible, not reasonable!

# Interpreting Data

- This happened!
  - New procedure
  - Same mistake on all engines
  - Oil ran out because of maintenance error on new procedure
  - *World view* was wrong

# Effecting Actions

- Command mode
  - 3rd Person
  - Proxy
  - “fly by wire”
- Direct control
  - “hands on experience”
  - good feedback

# Make Complicated Simpler - 1

- Use both world and user knowledge
  - Can lead to difficult choices
- Simplify structure of tasks
- Make things visible
  - Bridging execution and evaluation

# Make Complicated Simpler - 2

- Get mappings right
  - test and validate
- Exploit constraints
- Design for error
- Standardize
- Weigh cost/benefit of choices

End

*D A Norman Notes*

