Preliminaries

CS5540 HCI
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Affordances

- 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,
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 - 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

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

Control Structures

• Shallow structures
  - Ice cream store menu
• Narrow structures
• Cooking recipe
  - Small vocab
  - Many steps
Errors

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

Designing for Errors - 1

• 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 - 2

• 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 !)
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 *ON*
- 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 Functions: Advisories - 6

- "Shoplifters will be *prosecuted* to the fullest extent 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?

Forcing Function Approach - 8

- When does the user subscribe to the approach; when is it resented?
  - Gun control
  - Restricted (superuser) functions
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

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!

Visibility

- 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 proc
  - our world view was wrong

Effecting Actions

- Command mode
  - 3rd Person
  - Proxy
  - “fly by wire”
- Direct control
  - “hands on experience”
  - good haptic 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
End Lecture Set 3
D A Norman Notes

Bookmark
Pick up here...

End of Lecture Set 1
Preliminaries