

Design Thinking

Questions?

- Email – Please prefix all course email with “HCI426A: ”
- Class announcements will be sent through eTL
- Make sure your email address at eTL is valid
- Make sure your mobile phone number at eTL is valid

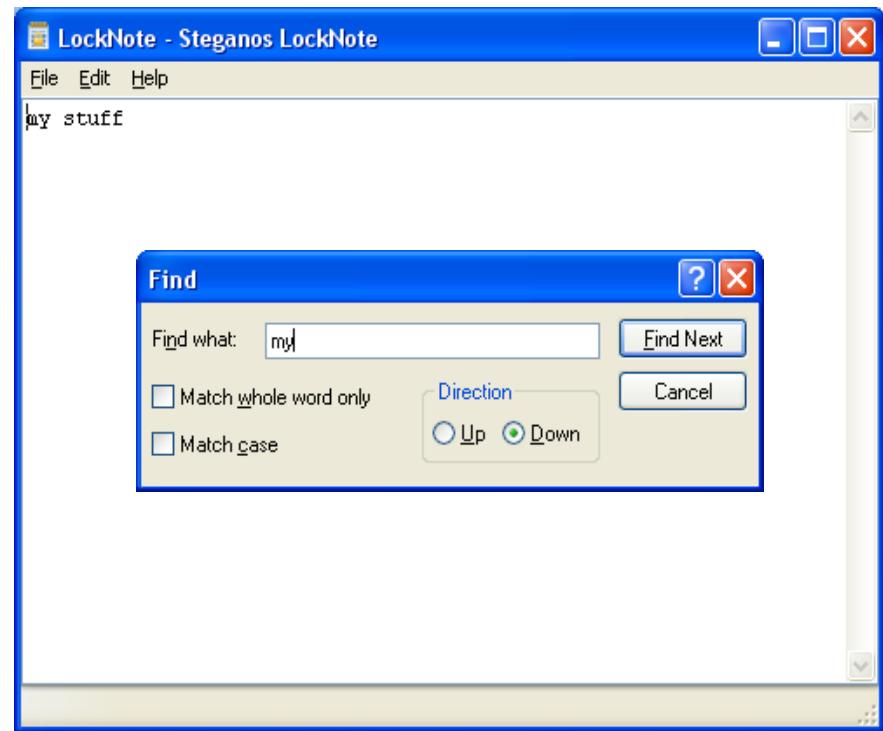
Hall of Fame/Shame

Good:

- Simple
- Effective
- keyboard shortcuts
Enter, Alt-F4, Tab

Bad:

- No incremental search



Tip

- Support advanced users

What is Interaction Design?

- Designing **interactive products** to support the way people **communicate** and **interact** in their everyday and working lives
 - *Sharp, Rogers and Preece (2011)*
- The design of **spaces** for human **communication** and **interaction**
 - *Winograd (1997)*
- **User Experience (UX)** is key to Interaction Design
 - how a system **feels** to users
 - how users **experience** it

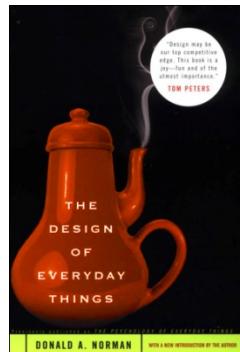
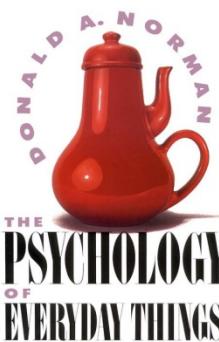
Design principles

- Generalizable abstractions for thinking about different aspects of design
- The do's and don'ts of interaction design
- What to provide and what not to provide at the interface
- Derived from a mix of theory-based knowledge, experience and common-sense

Today



- The Psychology of Everyday Things (POET)
- The Design of Everyday Things (DOET)
- Fundamental design principles
- Human-Centered Design or Cognitive Design
- Prof. Donald Norman
- “I've come to a disconcerting conclusion: design research is great when it comes to **improving existing product** categories but essentially useless when it comes to **new, innovative breakthroughs.**”
- “... grand conceptual inventions happen because technology has finally made them possible.”
- Use ethnographic observational studies to discover hidden, unmet needs → “**technology first, invention second, needs last**”



Psychopathology of everyday things

- Everyday frustrations
 - Blame it on the users?
 - *Need to read the manual?*
 - *They should learn?*



Psychopathology of everyday things

- Everyday frustrations
 - Blame it on the users?
 - *Need to read the manual?*
 - *They should learn?*
 - Blame it on poor design?
 - *Does not take into account basic human capabilities*
 - How humans perceive the world
 - How humans learn
 - How humans deal with error

Psychopathology of everyday things

- How many of you can program or use all aspects of your
 - Smart phone?
 - IPTV set-top box?
 - DVD player?
 - washer and dryer?
 - stereo system (especially car ones)
 - unfamiliar water faucets
- Conflicting demands
 - Demand for more features
 - Simplicity of uses



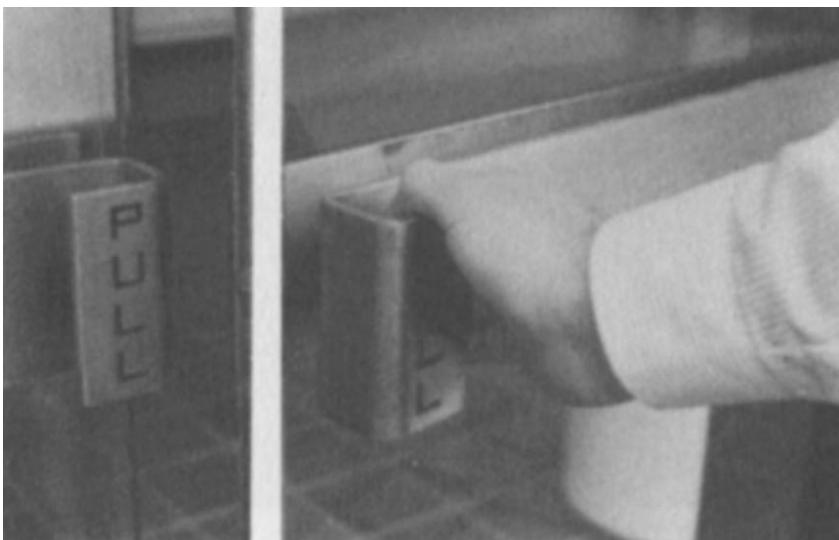
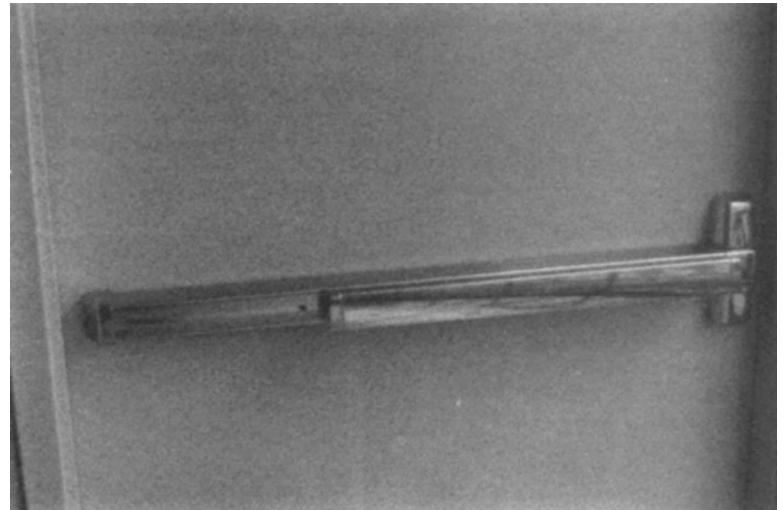
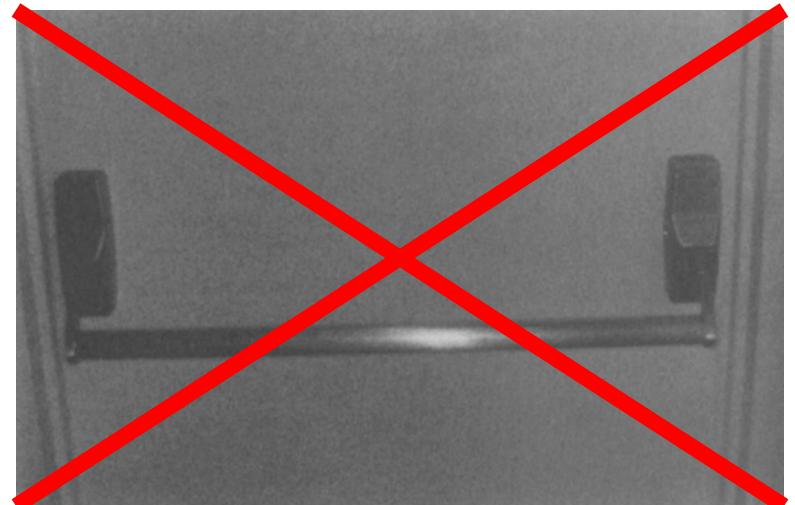
We're Not Designing For Ourselves



Darn these hooves! I hit the wrong switch again!
Who designs these instrument panels, raccoons?

Fundamental Design Goals

- Provide the right **affordances**



Affordances: “~ is for ~”

- **Perceived and actual properties**
- Provide strong clues to the operations of things
 - A chair affords sitting. = A chair is for sitting.
 - Buttons for pushing
 - Knobs for turning
- Simple things can be used without any need for words, symbols, trial and error

Different population, different affordances

- Kids
 - How to deal with small buttons?



- Elderly
 - Age Explorer suit (Meyer-Hentschel)
- Disabled users...
 - Limited vision, movements,...



Age Explorer suit (I.D. magazine)

Fundamental Design Goals

- Provide the right affordances
- Provide a good **mapping**
 - Mercedes seat adjustments



Natural Mapping

- Relationship between controls and actions should be apparent to users
- Minimize the need for **labels or legends**
- Work by “logical constraints”

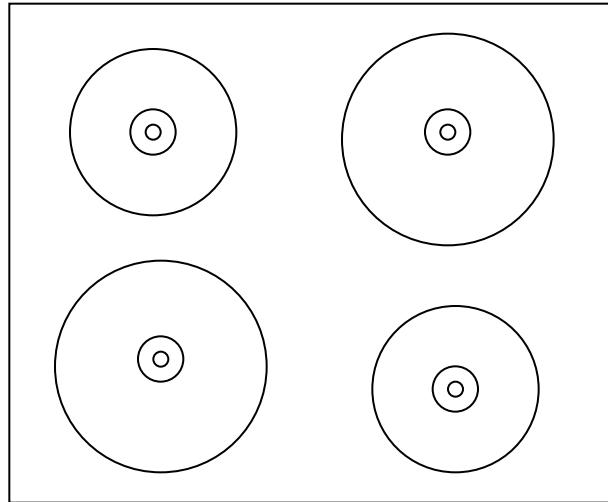
Design Principles

- Utilize narratives of space and time
 - Tell a story of position and chronology through visual elements

NEW YORK TO NEW HAVEN					
MONDAY TO FRIDAY, EXCEPT HOLIDAYS					
Leave	Arrive	Leave	Arrive	Leave	Arrive
New York	New Haven	New York	New Haven	New York	New Haven
AM 12:35 5:40 7:05 8:05 9:05 10:05 11:05 12:05 1:05 PM	AM 2:18 7:44 8:45 9:45 10:45 11:45 12:45 1:45 2:45 PM	PM 2:05 3:05 T 4:01 4:41 T 4:59 XT 5:02E XT 5:20 X 5:42 XT 6:07E PM	PM 3:45 4:45 5:45 6:25 6:53 6:33 7:08 7:26 7:46 PM	PM T 6:25 T 7:05 T 8:05 T 9:05 10:05 11:20 12:35 12:35 12:35 PM	PM 8:19 8:56 9:45 10:50 11:45 1:05 2:18 ----- ----- PM
SATURDAY, SUNDAY & HOLIDAYS					
AM 12:35 5:40 8:05 10:05 12:05 PM	AM 2:18 7:37 S 3:05 5:05 1:45 PM	PM 2:05 S 3:05 4:05 5:05 6:05 PM	PM 3:45 S 4:45 5:45 6:48 7:48 PM	PM 7:05 H 8:05 9:05 11:20 12:35 AM	PM 8:45 H 9:45 10:45 1:00 2:18 AM
The service shown herein is operated by Metro-North Commuter R.R.					
REFERENCE NOTES					
Economy off-peak tickets are not valid on trains in shaded areas. Check displays in G.C.T. for departure tracks. E-Express X-Does not stop at 125th Street. S-Saturdays and Washington's Birthday only. H-Sundays and Holidays only. T-Snack and Beverage Service. HOLIDAYS-New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas.					



Natural Mapping: Gas Stove



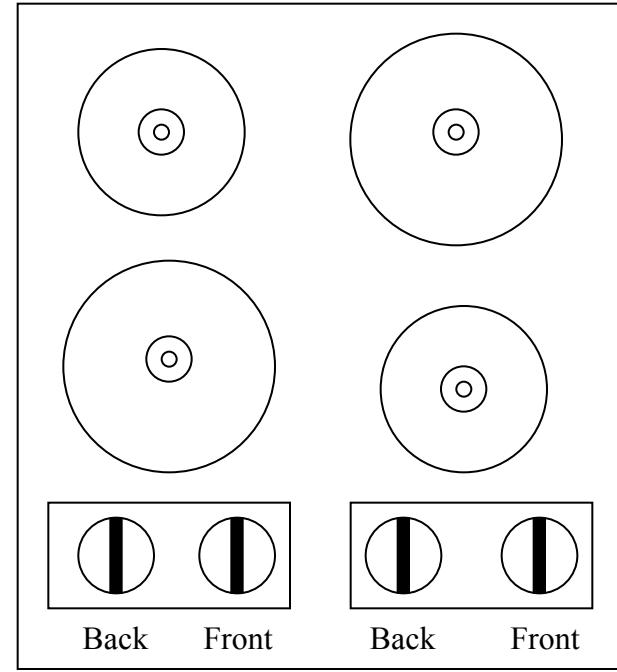
Back
Right

Front
Left

Back
Left

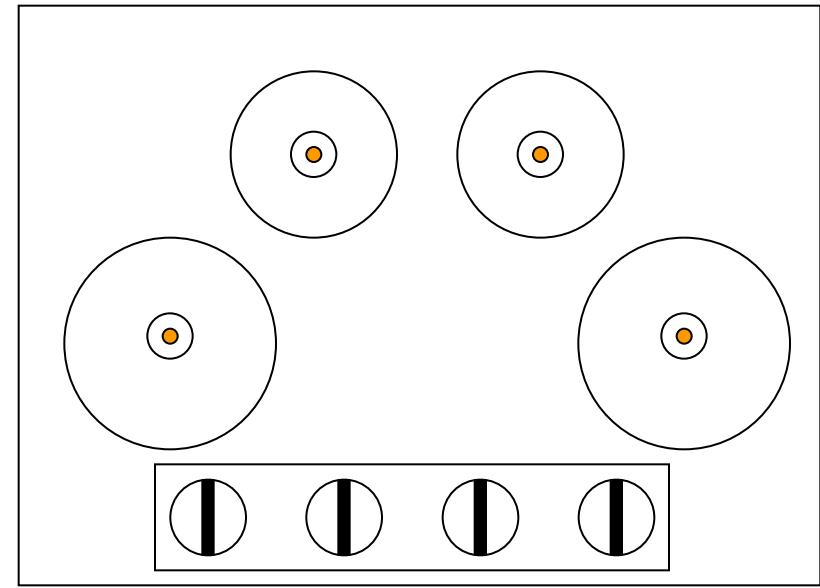
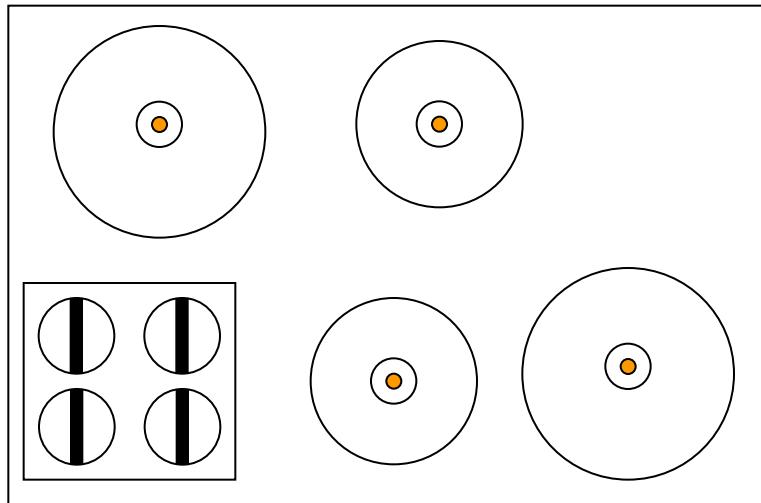
Front
Right

Arbitrary



Paired

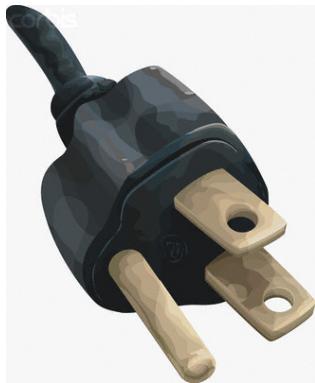
Natural Mapping: Gas Stove



- Full natural mapping between controls and burners
 - No labels!

Visible Constrains

- Limit the possible actions by appearance
- Prevent errors



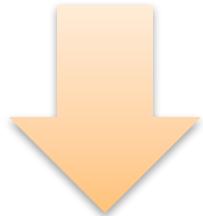
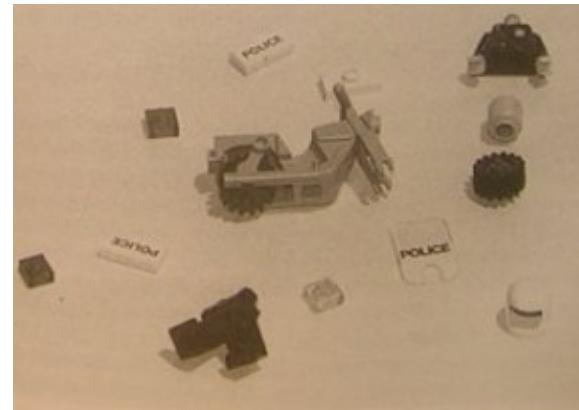
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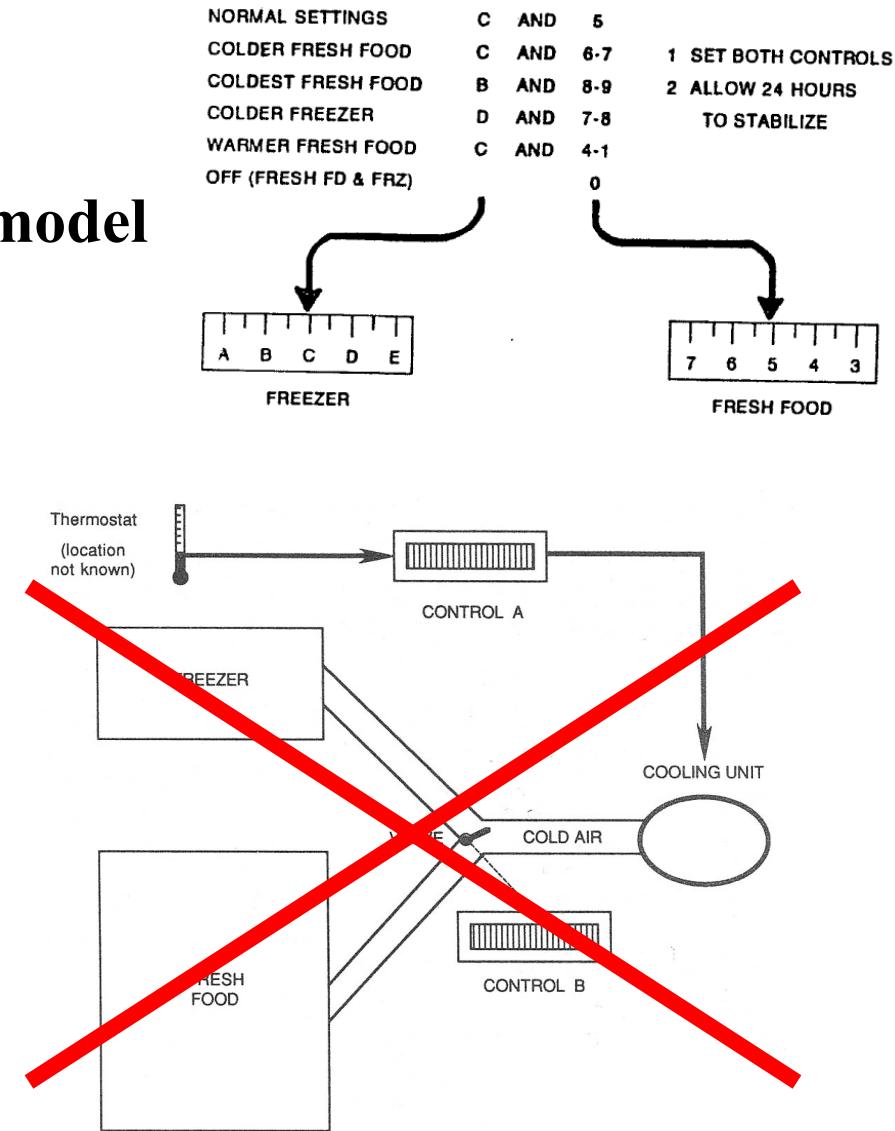
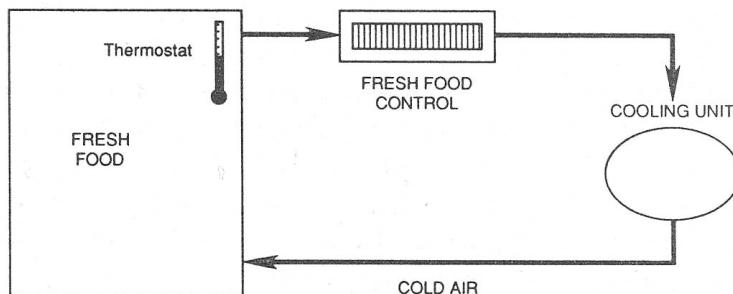
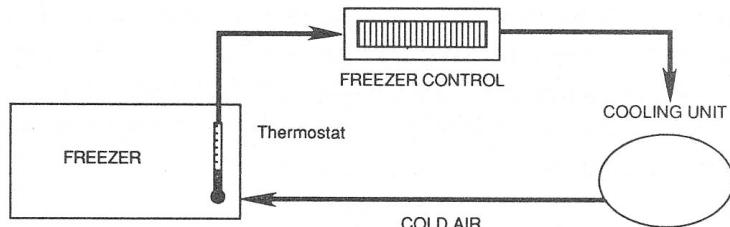
Classification of Constraints

- Physical Constraints
 - Physical limitations constrain possible operations
- Semantic Constraints
 - Depending on our meaning of situation
 - Where to put the rider?
- Cultural Constraints
 - Allowable actions for social situations
- Logical Constraints
 - only one piece left, only one possible place to go
 - spatial layout of components
 - “Natural mapping” work by this constraints



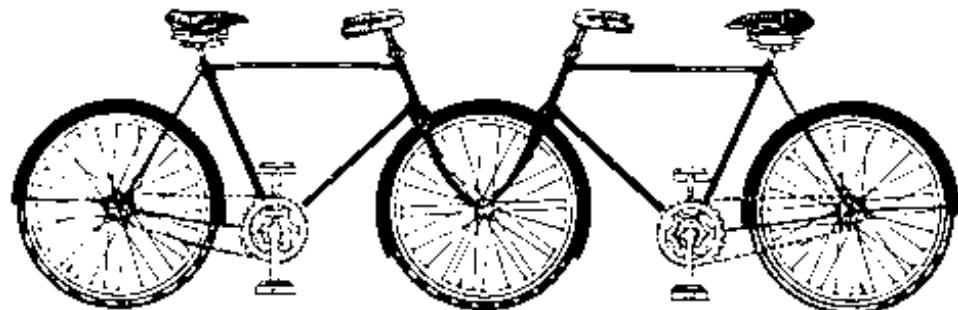
Fundamental Design Goals

- Provide the right affordances
- Provide a good mapping
- Provide the right **conceptual model**
 - Fridge control

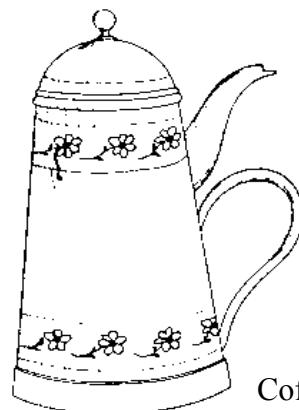


Conceptual Model

- Mental model of how things work
- Formed by
 - Affordances
 - Constraints
 - Mappings
 - Experience
 - Training
 - Instruction



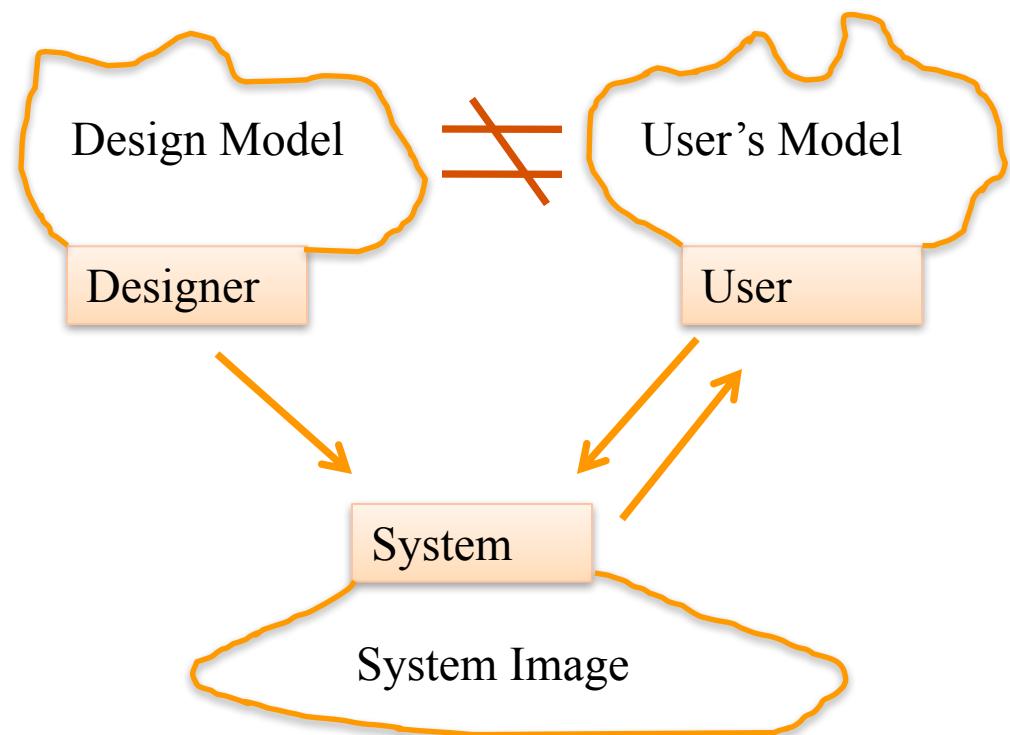
Convergent Bicycle, Jacques Carelman



Coffeepot for Masochists, Jacques Carelman

Three Conceptual Models

- Three aspects of mental models
 - Design model
 - User's model
 - System image



Conceptual Model: Scissors

- Affordances
 - All parts are visible → Holes for fingers to be inserted
- Mapping by Constraints
 - Fingers and holes (different size)
- Transfer Effect
 - Learnt constraints from adults

=> Good Conceptual Model

- Implication is clear



Wikipedia

Fundamental Design Goals

- Provide the right affordances
- Provide the right conceptual model
- Provide a good mapping
- Make things **visible**
 - A step backward: BMW iDrive?



Fundamental Design Goals

- Provide the right affordances
- Provide the right conceptual model
- Provide a good mapping
- Make things visible
- Provide **feedback**
 - Visual, tactile, auditory...



Fundamental Design Goals

- Provide the right affordances
- Provide the right conceptual model
- Provide a good mapping
- Make things visible
- Provide feedback
- Recognize **causality**
 - Be responsive



Causality

- Causality – interpretation of “feedback”
- People assume that the thing that happens right after an action be caused by that action
- False causality
 - incorrect effect
 - *causes “superstitious” behaviors*
 - invisible effect
 - *command with no apparent result often re-entered repeatedly*
 - *e.g., mouse click to raise menu on unresponsive system*

Fundamental Design Goals

- Provide the right **affordances**
- Provide a good mapping (by logical **constraints**)
→ Provide the right conceptual model

- Make things **visible**
- Provide **feedback**
→ Recognize causality

- Maintain **consistency**
 - similar elements for achieving similar tasks

Other Constraints to Consider

- Cost
 - But it costs more to manufacturer a good input device
- Space
 - But there isn't room to put one controller per function
- Discoverability
 - Given that we've hidden some controls, how do people find them?