DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF TORONTO

CSC318S

THE DESIGN OF INTERACTIVE COMPUTATIONAL MEDIA

Lecture 3 — 19 January 1998

LEARNING FROM DESIGN

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3.1 Design, interfaces, and everyday things

Interfaces are everywhere
- All “everyday things” (all 20,000 of them) have interfaces
- See Norman's *The Design of Everyday Things*

We can learn by observing and reflecting on these interfaces
- We can become more sensitive and insightful observers
- This will help us become better designers

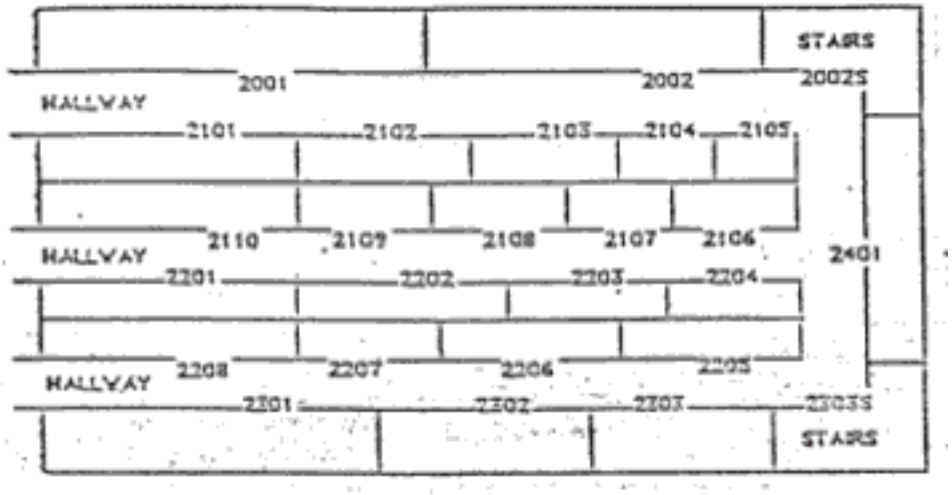
3.2 Problems with the interfaces to everyday things

SST Death Flight (Airplane Disaster Film)
- Sabotage, detergent in hydraulic fluid -->
  - Can't steer or change altitude
- Shimmering pressure gauge, visual, not auditory -->
  - Delayed discovery of problem
- Identical sabotage to backup system -->
  - Inadequate security, robustness
- Electrical bypass procedure, but cable brushes a connection, causing short and explosion -->
  - Poor juxtaposition of controls, insufficient system simulation
- Happy ending: temporary substitution of gallery water for hydraulic fluid -->
  - Some robustness

Pilot error on airplanes (New York Time Magazine, 27/3/88)
- 65% of all jet transport accidents between 1959 and 1969 attributed to errors by flight crews
- Automatic pilots may exacerbate the problem

Navigation through Sandford Fleming Bldg. (Fig. 3.1)
- Conceptual model underlying numbering scheme
- Conceptual model underlying lettering scheme
- Need for maps and other navigational aids
- Where am I, where have I been, where am I going?

Figure 3.1 A floor plan of the Sandford Fleming Building

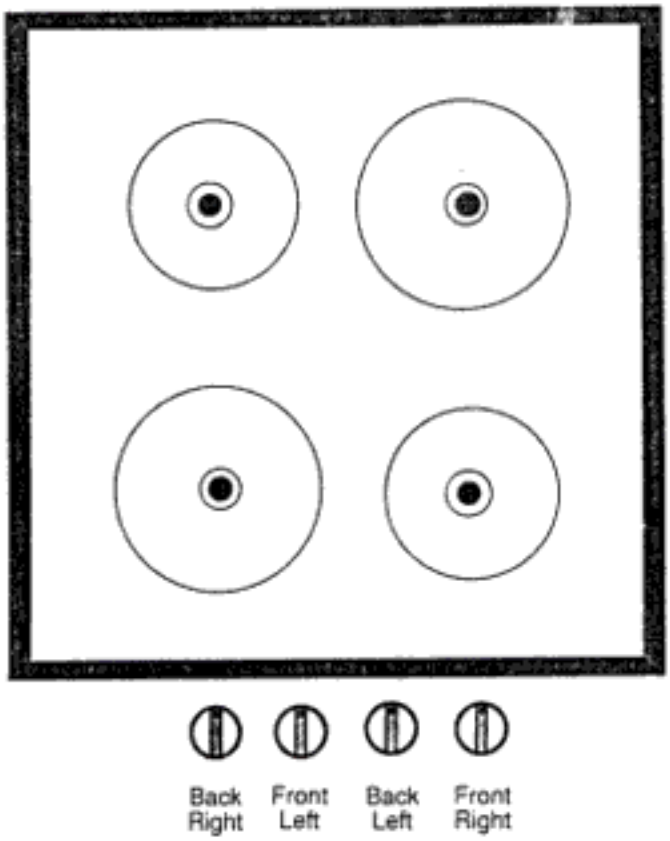


Doors
- Do you pull or do you push?
- Need for affordances for choosing pull or push and doing so at the proper place
- Constraints to prevent errors

Faucets
- Usually controls over hot and cold water flow
- But the need is to vary overall flow and temperature
- Need for mappings from given control(s) to these variables
- The need for visibility
- The need for rapid feedback

Stoves
- Four burners, four controls (Figs. 3.2–3.3, Norman)
- The mapping problem: Relationship of the geometry of the controls to the geometry of the burners

Figure 3.2 Problems with stove controls (Norman, p. 76)



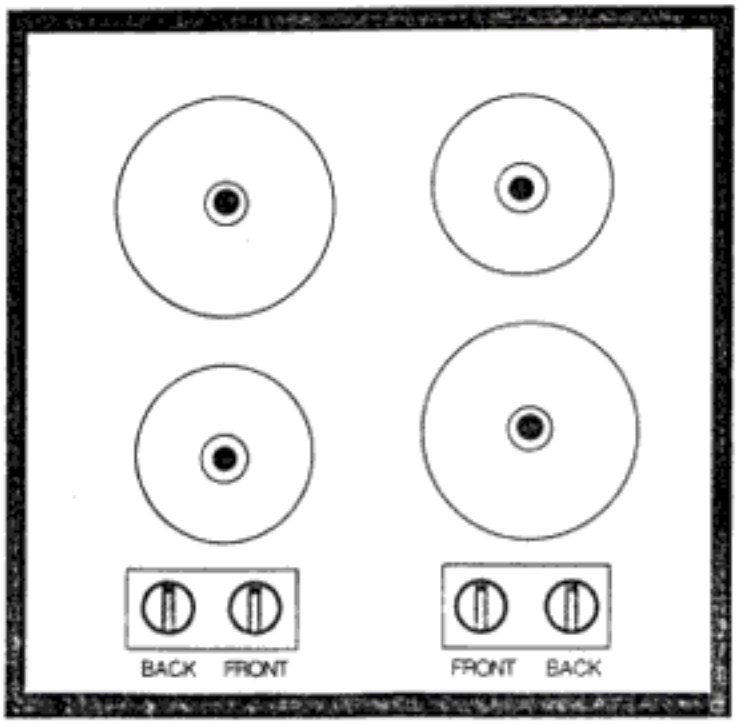


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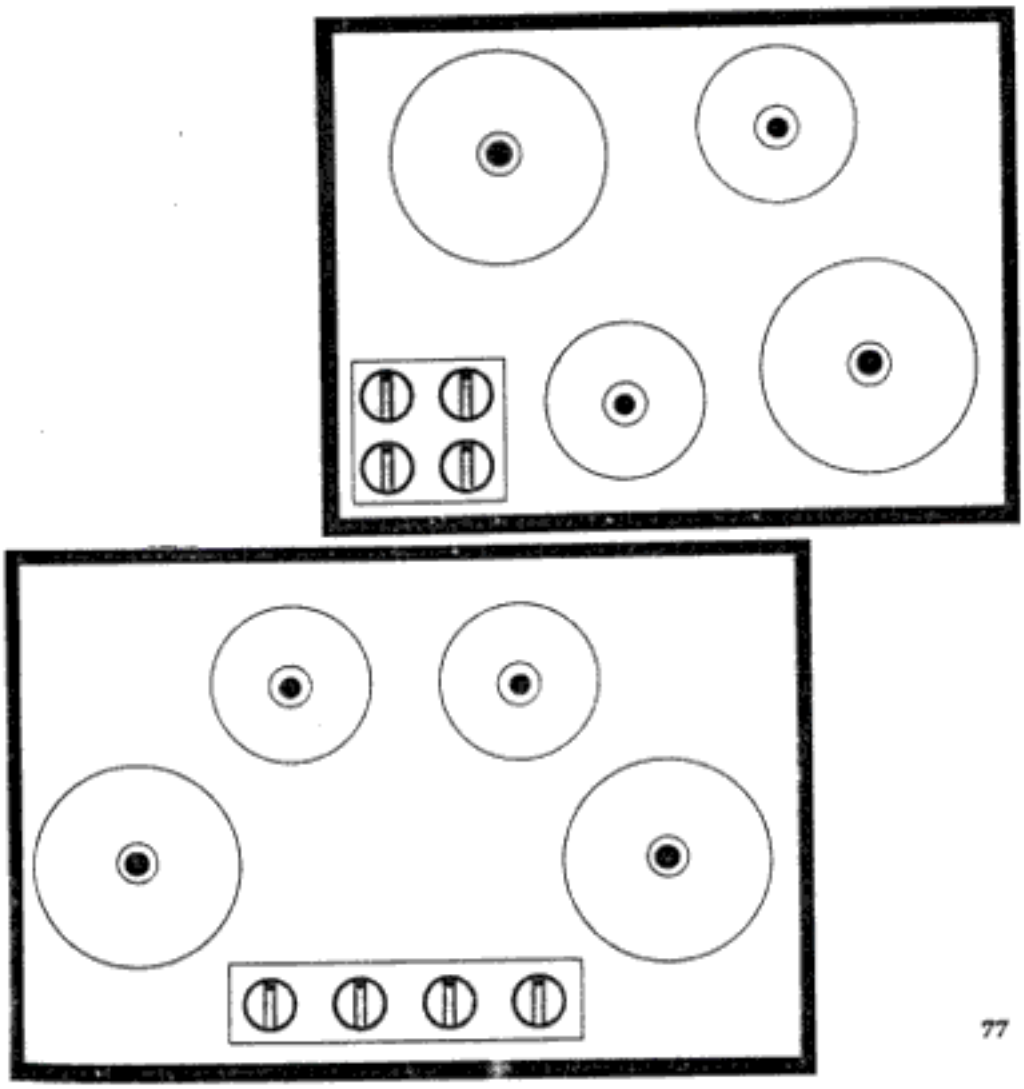
Figure 3.3 Solutions to the problems with stove controls (Norman, p. 77)



The stateroom of a ship (slides)
- Marvelous design under severe space limitations

A tale of two cookbooks
- Affordances for holding the book up and open
- Affordances for keeping the pages clean
- Affordances for adjusting the contents
- Interfaces are vital, but functionality is even more vital

3.3 Key concepts (see Norman)

Affordance
- "The perceived and actual properties of a thing, primarily those fundamental properties that determine just how the thing could possibly be used"
- Properties need to be visible
- Method of usage needs to be "natural"
- E.g., buttons are for pushing, menus are for choosing

Constraints
- Physical, semantic, cultural, and logical factors that limit the set of all possible actions
- I.e., encourage proper actions, prevent errors
- E.g., training wheels interface

Mappings
- For example, the relationships between controls and their effects on a system
- E.g., stove problem is a mapping problem
- E.g., if input goes "up," output should go "up", as in control for side view mirrors of car

Conceptual models
- Mental models of a system which allow a user to understand the system, to predict the effects of their actions, and to interpret the results
- E.g., tree structure of menus, state diagram of commands

Visibility
- Including “the conceptual model of the system, the alternative actions, and the results of actions”
- E.g., lack of visibility in digital phone system
- E.g., lack of visibility, and partial solutions, in VCR and television controls

Feedback
- “Sending back to the user information about what action has actually been done and what result has been accomplished”
- E.g., control panel of digital thermostat
- E.g., some feedback with VCR programming

3.4 Computers (embedded) as everyday things

Examples

Thermostats	VCRs
Microwaves	Watches
Notebook computers	Cruise controls

Home multi-media entertainment consoles
etc. etc. etc.

Ubiquitous computers, invisible computers!!!
- Will be in canes, hearing aids, memory prostheses, pill dispensers, etc. etc. etc.

3.5 The bottom line

Look, observe, and think!!!

Observe interfaces in all everyday things
- Cars
- Administrative procedures
- Instruction manuals
- etc. etc. etc.

Quote from Don Norman's book, pp. 216-217 (Fig. 3.4)

Figure 3.4 Don Norman's Closing Words

"Now you are on your own. If you are a designer, help fight the battle for usability. If you are a user, then join your voice with those who cry for usable products. Write to manufacturers. Boycott unusable designs. Support good designs by purchasing them, even if it means going out of your way, even if it means spending a bit more. And voice your concerns to the stores that carry the products; manufacturers listen to their customers.

When you visit museums of science and technology, ask questions if you have trouble understanding. Provide feedback about the exhibits and whether they work well or poorly. Encourage museums to move toward better usability and understandability.

And enjoy yourself. Walk around the world examining the details of design. Take pride in the little things that help; think kindly of the person who so thoughtfully put them in. Realize that even details matter, that the designers may have had to fight to include something helpful. Give mental prizes to those who practice good design: send flowers. Jeer those who don't: send weeds."