Affordances

- A key element of effective interaction design, particularly with the direct manipulation interaction style, is *visibility* — user interface elements must be *seen* before they can be *used*
- With the noun-verb sequence for direct manipulation, visibility also includes the actions that can be performed on this element — the more intuitive, the better
- Don Norman's concept of an *affordance* is a "message" that an object conveys about its "possible uses, actions, and functions"

A Lego Motorcycle

- Affordances are essentially *constraints* imposed by an object — physical, semantic, cultural, and logical
- An ideal example of affordances can be found in Don Norman's Lego motorcycle experiment
- Without any instructions or *even seeing the completed motorcycle*, Norman found that many adults are able to reproduce it accurately; the combination of different types of constraints work together to "compel" a particular assembly of the Lego pieces

Physical Constraints

- Real-world objects provide natural constraints based on their shape and size — keys won't fit when inserted the wrong way, doors without handles can't be pulled
- Ideally, the nature of the physical constraint is *visible* before it is even tried — e.g., we know that a square peg won't fit into a round hole by just looking
- While user interface elements can't have "real" physical constraints, we can use the ideal of a *visible* physical constraint (shape, size) to communicate how they can be used, or how they fit somewhere

Semantic Constraints

- Our experience in the real world, plus the context of a particular situation, allows us to attach *meanings* to certain elements
- These meanings form *semantic constraints* — limitations that we impose on objects because their meanings dictate a particular choice
- For example, while a Lego person figure may be positioned facing forward or backward on the Lego motorcycle, we tend to place that figure facing forward, since that is the "meaningful" choice

Cultural Constraints

- Conventions or expectations on behavior form another category of constraints, labeled as "cultural" because, in many ways, that is what "culture" is: a communal set of conventions or expectations
- If asked to place the Lego motorcycle on a Lego street, Americans will most likely place it on the right side of that street; other nationalities may place it on the left
- Note how this constraint is driven by "what we're used to," which may vary — thus, internationalization is a crucial element in interaction design these days

Logical Constraints

- The final type of constraint is driven by *reasoning* — given a situation, a particular choice may "make the most sense" to us
- Given a set of Lego pieces and a request to build something out of it, we might conclude that we are expected to use *all* of the given pieces
- Logical constraints may also come into play through elimination: given a set of choices for how to handle a situation, physical/semantic/cultural constraints might eliminate all but one, leaving that as the "logical" choice

Natural Mappings

- *Natural mappings* are a special type of logical constraint — a design has a natural mapping when it holds all of the necessary information to make correct inferences about some aspect of a system
- This issue frequently comes up with device controls such as switches and knobs: is it possible to arrange switches and/or knobs such that users will not need explicit labels to tell what they control?
- Common layout, physical resemblance to the device, or other properties allow a design to "just make sense"

Case Studies: Doors and Switches

- Norman applies the affordance and mapping concepts to two everyday objects: doors and switches
- The overriding rule of thumb: "If a design depends upon labels, it may be faulty"
  - Proper use of affordances can produce doors that do not need a "Push" or "Pull" sign
  - Natural mapping of switches on a panel to the lights that they control obviates the need for labels
- And yet…many systems *still* require labels