Week 3-1
Design Principles: Part 2

SFWRENG 4HC3/6HC3 Human Computer Interfaces

** Slides adapted from previous instructors of COMPSCI/SFWRENG 4HC3/6HC3*

McMaster University

Week 2 Goals Overview

- **Monday**
  - **Design Principles: Part 2**
- Wednesday
  - Design Principles: Part 3
- Friday
  - Design Principles: Examples and Practices

Fundamental Design Principles

- **Discoverability**
- **Feedback**
- Conceptual Model
- Affordances
- Signifier
- Mappings
- Constraints

Seven Fundamental Design Principles *by Don Norman from "The Design of Everyday Things"*

Fundamental Design Principles

- ~~Discoverability~~
- **Feedback**
- Conceptual Model
- **Affordances (?)**
- Signifier
- **Mappings**
- **Constraints**

Seven Fundamental Design Principles *by Don Norman from "The Design of Everyday Things"*

Discoverability

Making system capabilities clearly apparent to users

Core Guidelines:

- **Make core functions clearly visible** (e.g., toolbars vs. hidden menus)
- **Hide secondary functions** to reduce cognitive load
- **Use visible properties to guide users** toward next actions
- **Structure enhances discoverability:** organize interface logically

Feedback

Continuously informing users about system status and how it's interpreting their input

Core Guidelines:

- **Be specific:** "Saving file heuristics.ppt in folder topics" vs. just "Saving..."
- **Use user's language:** "Username or password incorrect" vs. "Valid authentication credentials not provided"
- **Provide contextual feedback:** show feedback near the user's action area
- **Match feedback to delay length:** cursors for short tasks, progress bars with details for longer ones

Feedback: Long Delays

Interaction often relies on **“good”** connectivity

Not everybody has a fast or reliable connection

- E.g., rural communities, remote areas of the country, developing parts of the world
- Another instance of why it is important to “know thy user”

Types of delays:

- Accessing a backend database
- Downloading large amount of content (e.g., a long video)

Lengthy downloads **actually change** users’ perception of the quality of the content [Ramsay 1998, Jacko 2000]

Feedback: Long Delays

Strategies for dealing with Connectivity-Related Delays

- **Providing appropriate feedback**

  E.g., Where, what, quantity of data, estimated time remaining

- **Ensuring that the content that downloads first is meaningful**

  E.g., Descriptive tops of pages, informative ALT text labels for images, selective downloading, progressive images

  - Users may be able to get what they need without the large content

- **Enabling offline operations**

Practice: Design Audit (~7 mins)

1. **Choose one app you use daily** (Instagram, tiktok, snapchat, Netflix, spotify, google maps, Amazon, WhatsApp, Uber Eats, Avenue, etc.)
2. **Inspect Discoverability in the design**
   - What are the most obvious feature when you open the app?
   - What are some hidden features?
   - How would you rate its overall discoverability?
   - Should the hidden feature be more visible?
3. **Inspect Feedback in the design**
   - Is there any feedback in loading or while waiting?
   - Are error or warning messages friendly?
   - Any feedback for actions?
   - How are the feedback for status provided?

Design Principles: **Mappings**

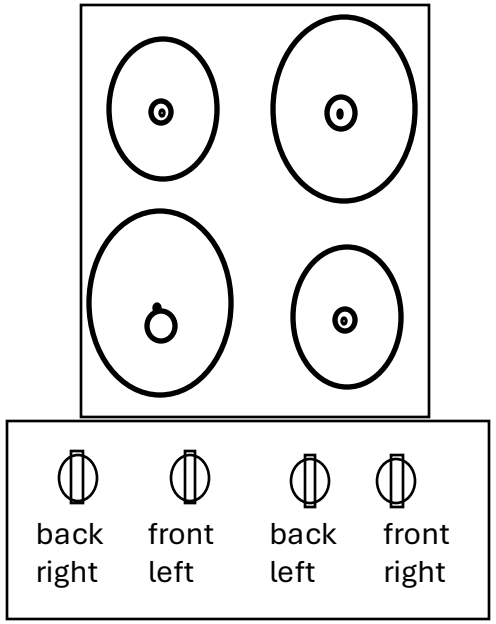
Relate controls to the **intuitive understanding** of **how they should be used**

- System should speak the **user's language**, with **words, phrases and concepts familiar to the user**, rather than system-oriented terms
- **Follow real-world conventions:**
  - Information should appear in **natural and logical order** based on user's expectations

Design Principles: **Mappings**

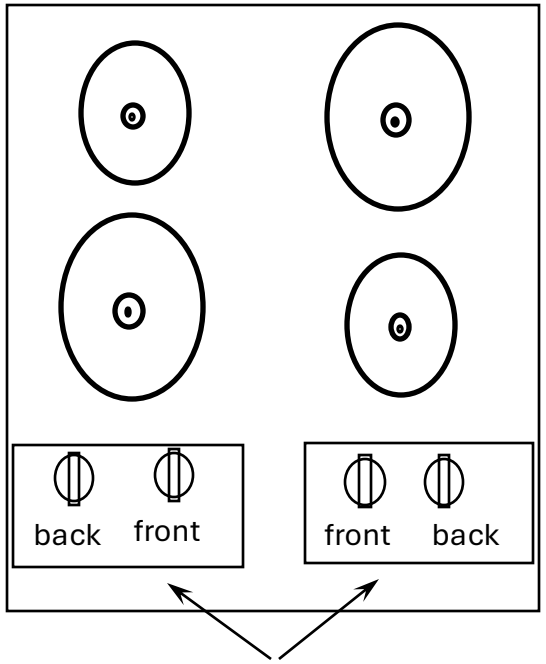
Design Principles: **Mappings**

Arbitrary



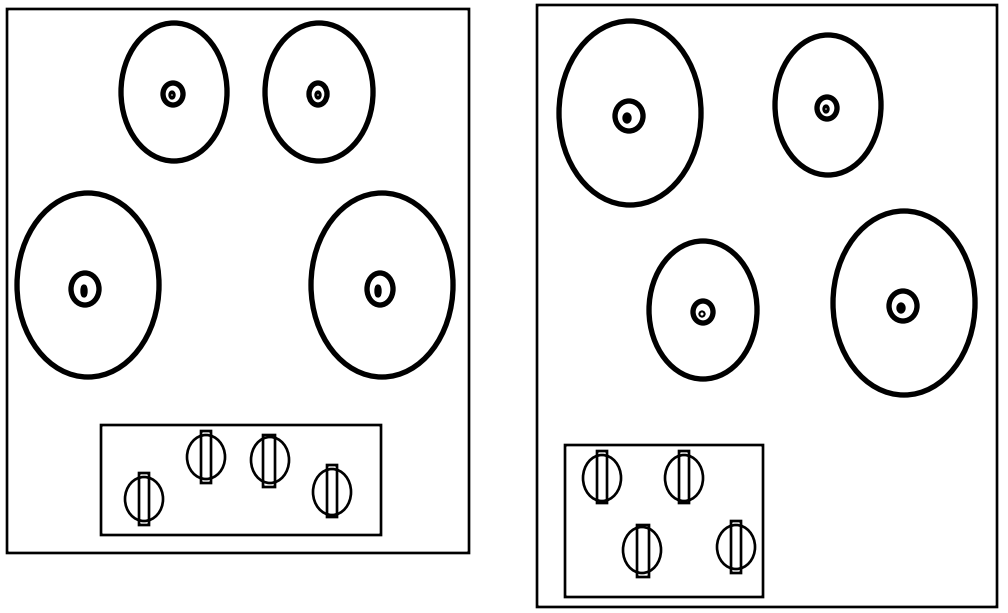
24 possibilities, requires:
-visible labels, memory

Paired



2 possibilities per side
=4 total possibilities

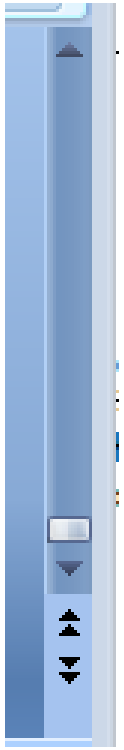
Full mapping



Mappings: Scrolling

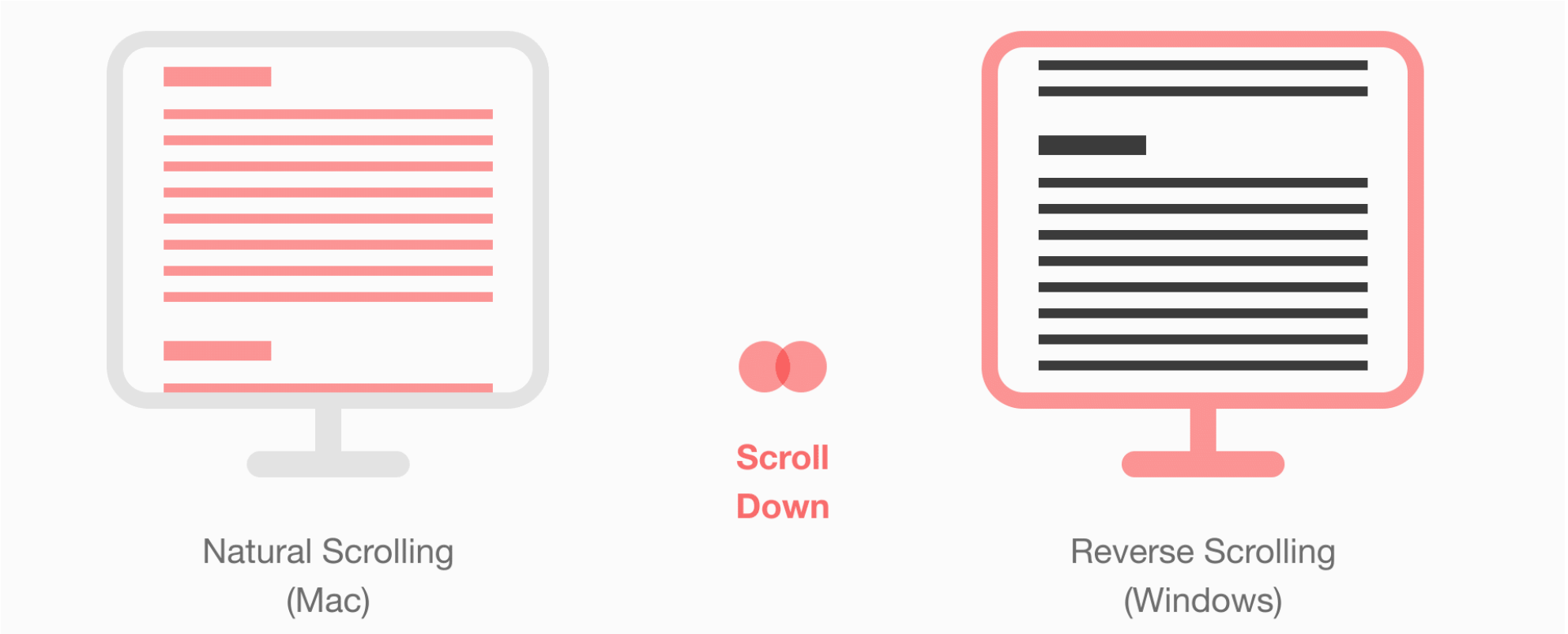
In terms of mapping, **how intuitive** is a scroll bar in **page scrolling**?

- Think about how you read **a long physical page**
- Think about scrolling on Windows/Mac computers with a mouse
  - How about scrolling on touch screens?
- **Feel free to try scrolling on your devices and observe**



Mappings: Scrolling

- Natural Scrolling vs. Reverse Scrolling



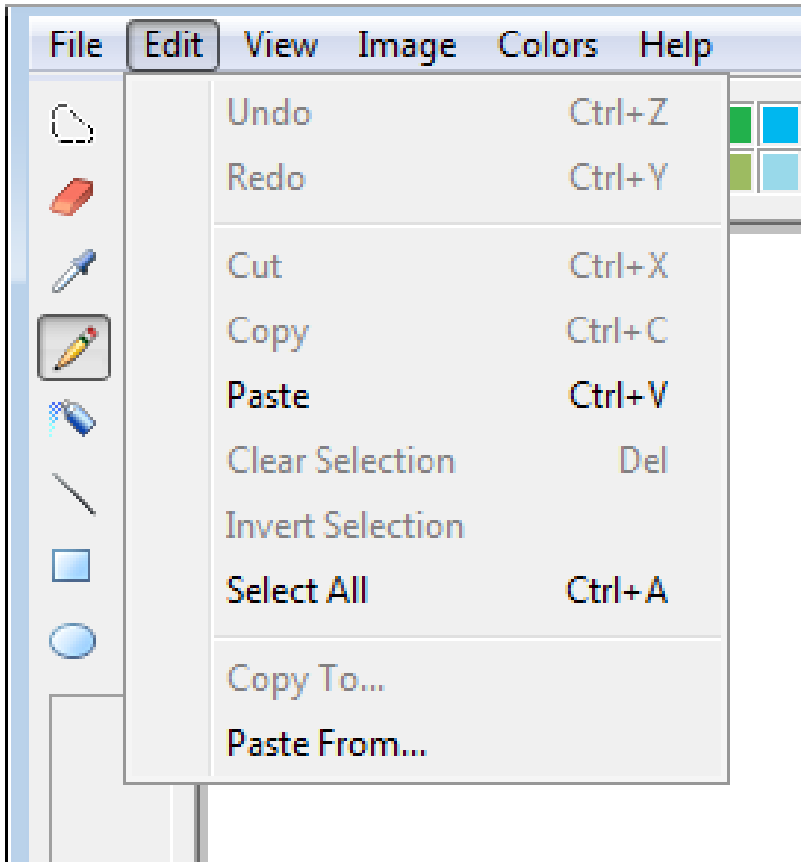
Animation by Kunal Rathore https://bootcamp.uxdesign.cc/natural-scrolling-mac-vs-reverse-scrolling-windows-e48656275081

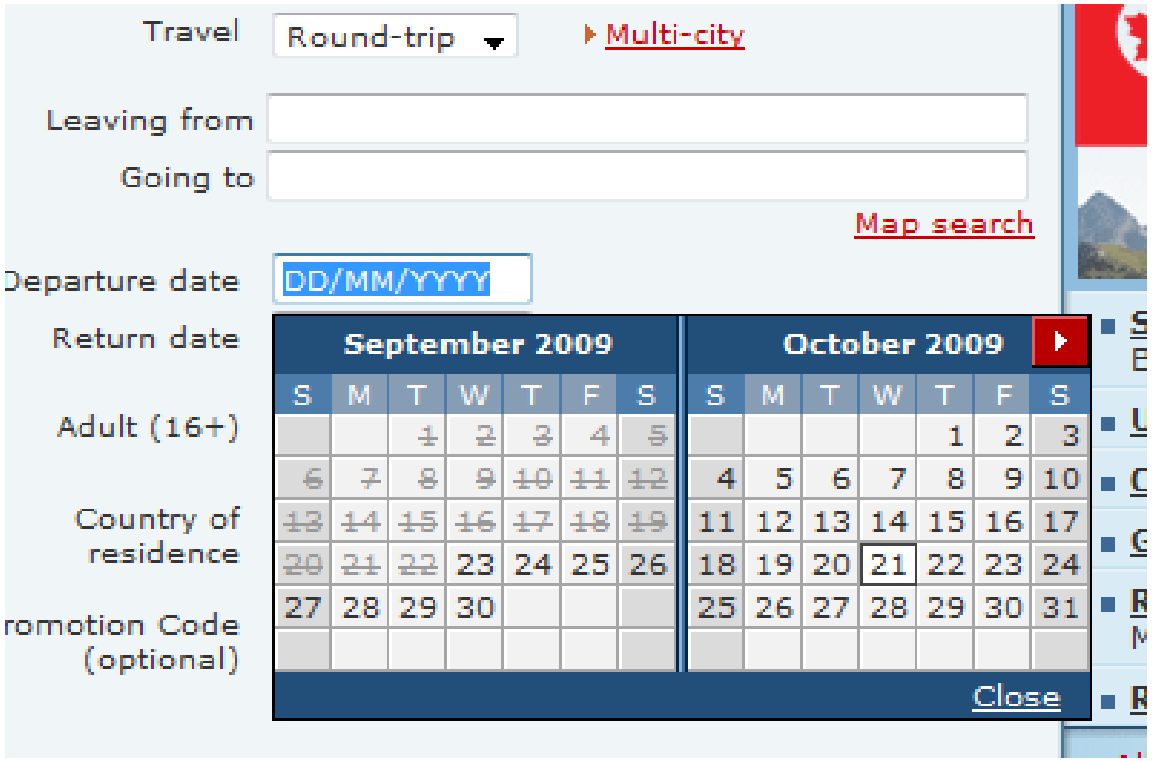
Design Principles: **Constraints**

Constrain what is possible

- **Restrict the kinds of user actions** that can take place for any given mode of interaction
- Provide people **with a range of usage possibilities**

Constraints: Example #1

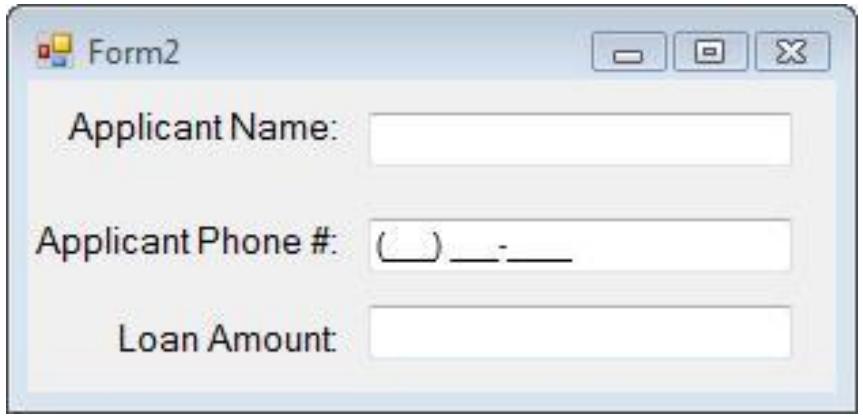


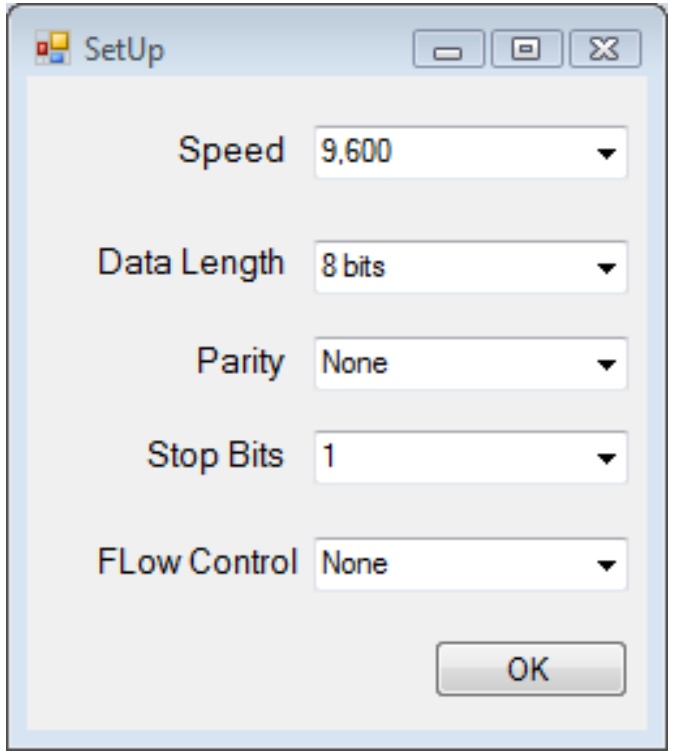


Constraints: Example #2

If hard constraints don't make sense, try to at least **guide user input**

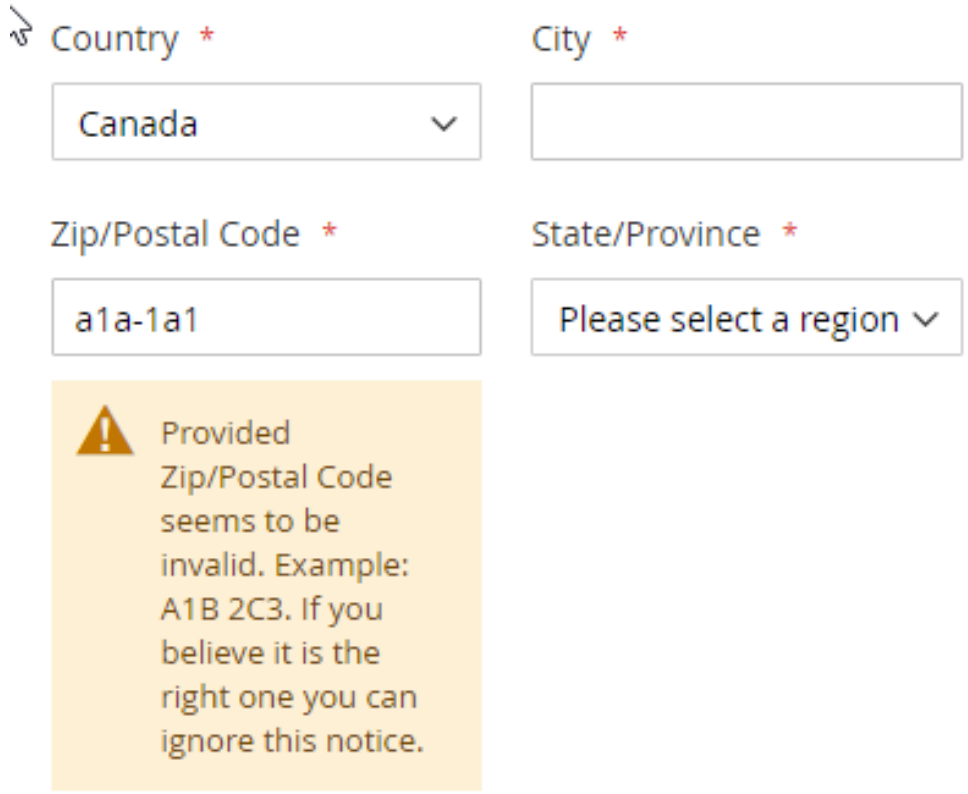
E.g., steering, input masks





Constraints: Example #3

This doesn't mean to be annoying with stuff computers can fix!



Design Principles: **Affordance**

- Defines the **possible interactions between an agent/user and object**
- The **relationship** between an object's properties and an agent/observer's capabilities that determines how the object might be used

- Jointly determined by agent abilities and object qualities
- Might be perceivable, but not always
- Anti-affordance can prevent interactions

Design Principles: **Affordance**

- **Appearance** indicates how the object should be used
  - Chair for sitting
  - Table for placing things on
  - Knobs for turning
  - Slots for inserting things into
  - Buttons for pushing
- Complex things may need explaining, **but simple things should not**
- Real affordances apply to physical objects (i.e., grasping), but interfaces exhibit **perceived affordances**

Affordance: **Example**

A door panel affords pushing

A door handle affords pulling

Design Principles: **Affordance**

Can use **metaphors** to suggest affordances

- Metaphor of desktop, files, folders, trash can, etc.

But remember affordances **may not** transfer from physical to digital world

- Don’t blindly mimic real-world controls

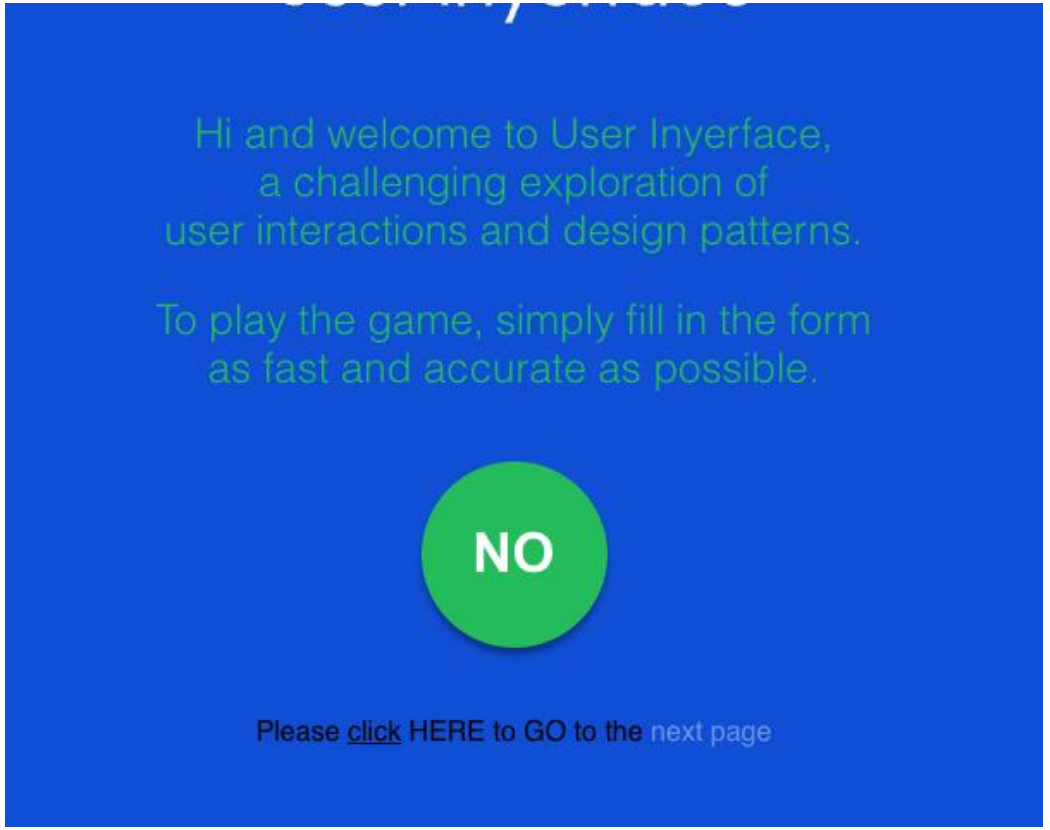
Affordance: Example

Why does a digital recreation of rotary knob fail to transfer affordances with current WIMP interfaces?

Affordance: Example

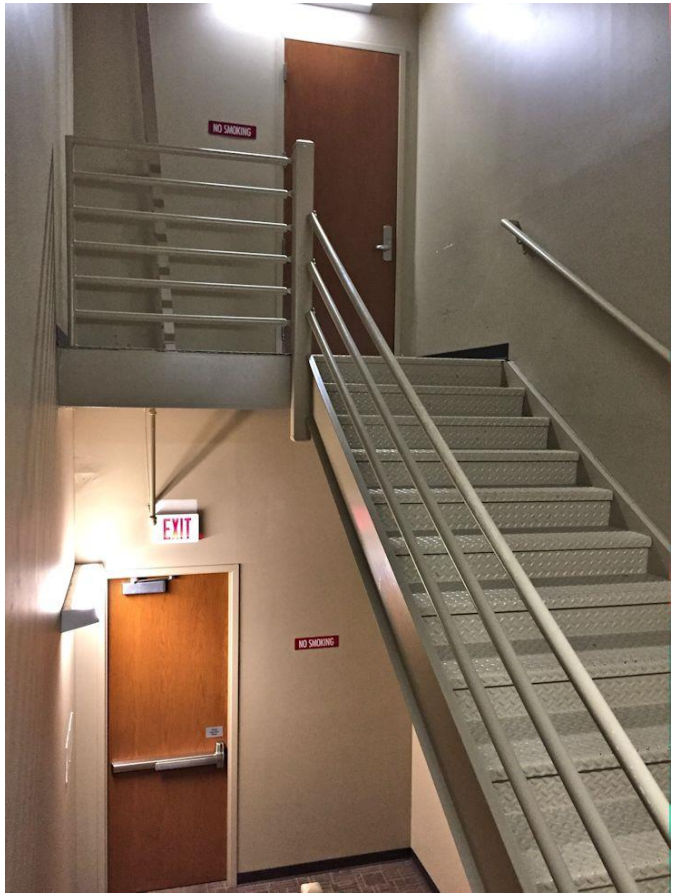
click is not a link

Or the next page
in a different color



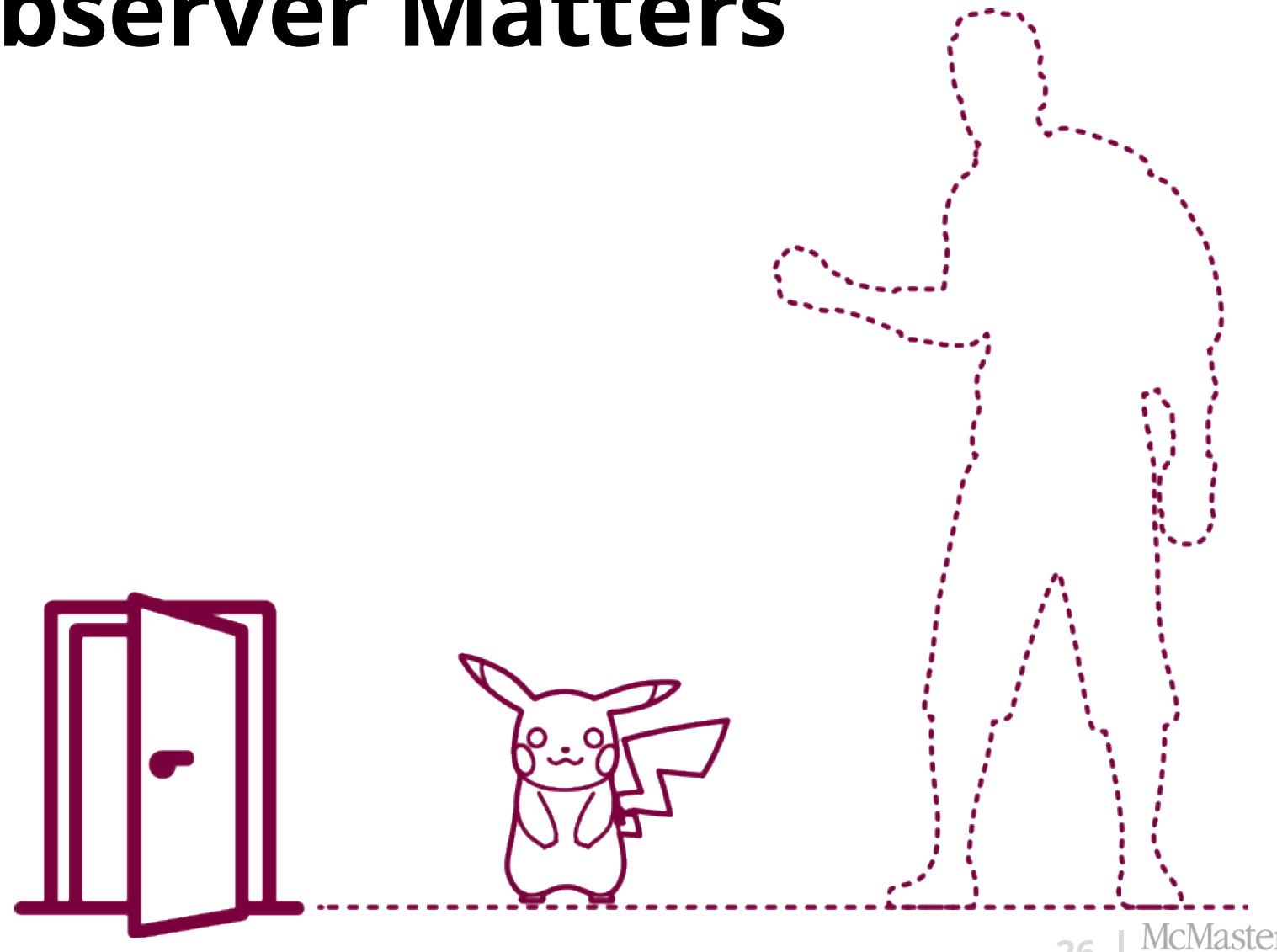
Affordance: **Anti-Affordance**

- Barriers prevent passage of solid objects
- People (among other things) have solid bodies
- Barriers prevent people from falling from the landing/sideways off the stairs



Affordance: **Observer Matters**

Does the door afford entering for all users?



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