Computer/Human Interaction
Lecture 26

Overview:
- Gulf of Execution: Refining Action Plans
- Gulf of Execution: Executing Action Sequences

Gulf of Execution
- How to get from user task goal to the physical movements to accomplish the task.
- System goal – software-oriented goal to accomplish task
- Action plan – steps for accomplishing goal
- Execution – physical actions that implement action sequence

Multi-tasking
- Note that humans are good at multi-tasking; consider its effect on interaction
- Users must have flexibility and control over multiple interactions, must be able to stop and start “in the middle”
- Example: multiple windows
  - Easy to have multiple tasks going
  - Increases plan complexity; i.e., how to find things
  - Overlapping windows vs. Tiled windows

Modal Interaction
- Example: modal interaction
  - Modes generally are to be avoided, since usually they require that task be completed before starting another, but sometimes are necessary
  - Example: Vi vs. emacs
  - Message dialog boxes especially annoying, compromise by allowing user to cancel

Executing Action Sequence
- Physical implementation of plan steps
- Articulatory directness is mapping of physical movement with a device to task input requirement
  - Direct – twist a knob
  - Indirect – type in a number

Input Devices
- Different input devices have different affordances. What are the input characteristics and sample applications the following are used for?
  - Buttons?
  - Keyboard?
  - Mouse?
  - Joystick?
  - Trackball?
### Speech Interface
- Star Trek future – talk to computer
- What are the input characteristics of a speech interface?
- What types of applications should a speech interface be good for?
- What are the current limitations of technology?

### Pragmatics
- Pragmatics are physical behaviors required by a user interface
- They should have underlying structure matching the conceptual task being implemented, i.e., match the chunks
- Example: selecting text chunk – press down on mouse button to specify start of selection, hold down while dragging, release mouse button to specify end point

### Anticipate Errors
- Carefully analyze physically challenging actions. Fitts’ Law: time to select a target is a function of distance and size of target. Of course not all targets can be large...
- Overlearned procedures (e.g. from other systems) lead to intrusions (slips, not mistakes). E.g. Ctrl-N in emacs vs. in MS Word

### Support Error Correction
- Forward/backward delete, click to de-select
  - Often not a design decision, since built into the UI platform directly
  - But what does “Back” do?
- Providing “undo” is a design problem
  - Hard to predict/support the right level of reversibility
  - Issue with logical vs. physical. Example: MS Word AutoFormat quotes

### Optimization of Sequence
- Long or clumsy sequences lead to more errors, longer to type in, frustration for users
- Tradeoff of expressive power and ease of use. Example: typed command language is much faster physically than point/click GUI.
- Compromise by mixing: keyboard shortcuts, default actions for frequent choices. But be careful not to violate overall consistency or favor one task over other common/important tasks.

### Customization
- Allow users to write macros to define their own sequences.
- Especially good for special needs cases
- Special needs accessibility is an on-going area of research in HCI