

## 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 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