

System Control

1 1



Unless otherwise noted, images take from Chapter 9 of 3D UI text

System Control

- Menus, controls, widgets, settings. System and Symbolic input.
 - Talked a lot about this already; AI-A3 had you work with it
- Human and System Factors (9.2)
 - Perception, display and input factors, systems issues
- Classification (9.3)
- Physical Controllers (9.4)
- Graphical Menus (9.5)
- Voice Commands (9.6)
- Gestural Commands (9.7)
- Tools (9.8)
- Multimodal Techniques (9.9)

Classification of Techniques

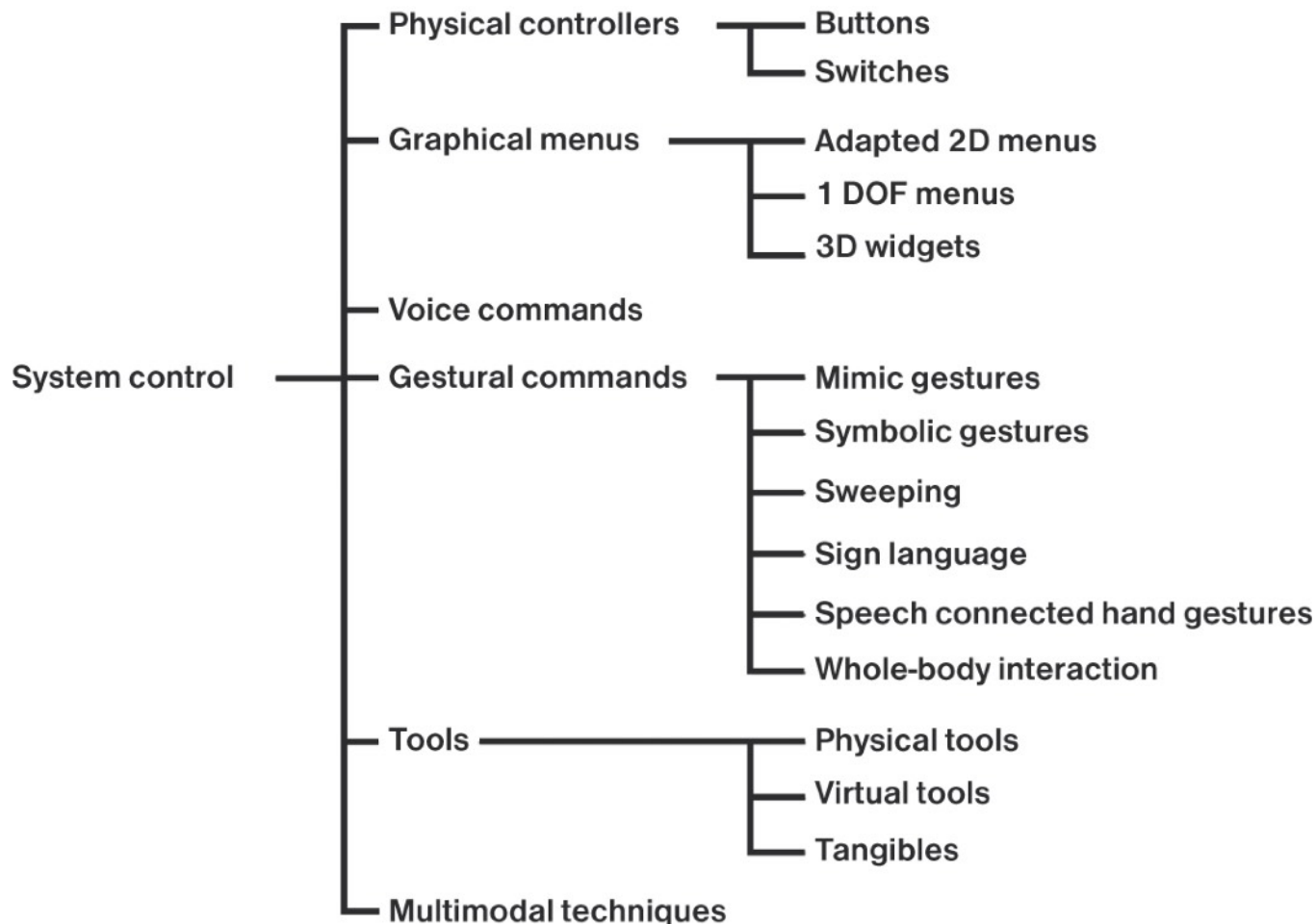


Figure 9.1 Classification of system control techniques.

Physical Controllers





Graphical Menus

- Adapted 2D, I-DOF, 3D widgets
 - Placement, how to interact



Voice

- Speech recognition engine
 - Apple, Google, Microsoft, Mozilla, ...
 - local vs streamed
 - activation words
 - time stamps
 - accuracy
 - vocabulary size
 - fixed
 - conversational

Gestural Commands

- Posture vs Gesture
- How to capture?
 - accuracy
 - speed
- How to specify
 - low level vs features
- Categories
 - Mimic gestures, symbolic gestures
 - Sweeping, sign language
 - Speech-connected hand gestures
 - Surface-based gestures
 - Whole-body interaction

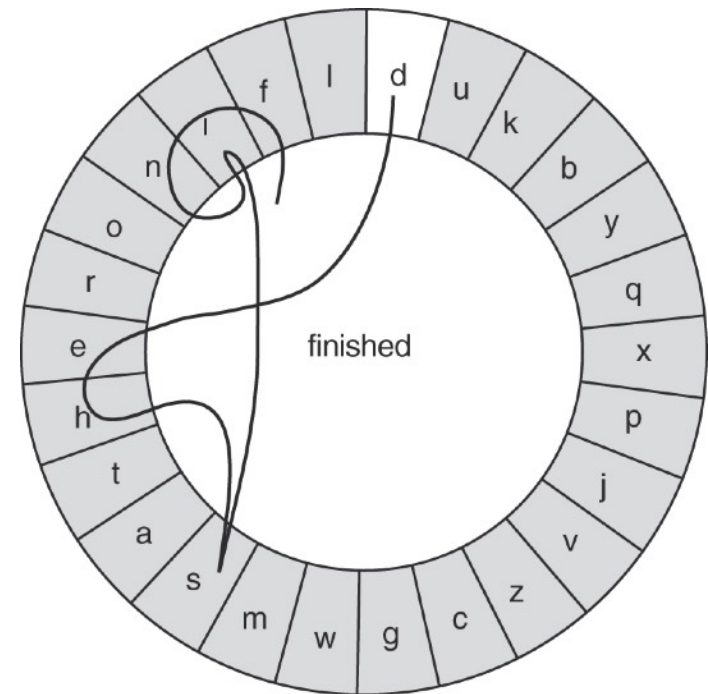


Figure 9.16 Layout of the Cirrin soft keyboard for pen-based input (Mankoff and Abowd 1998)

Tools

- Physical tools (props), tangibles (TUI), virtual tools

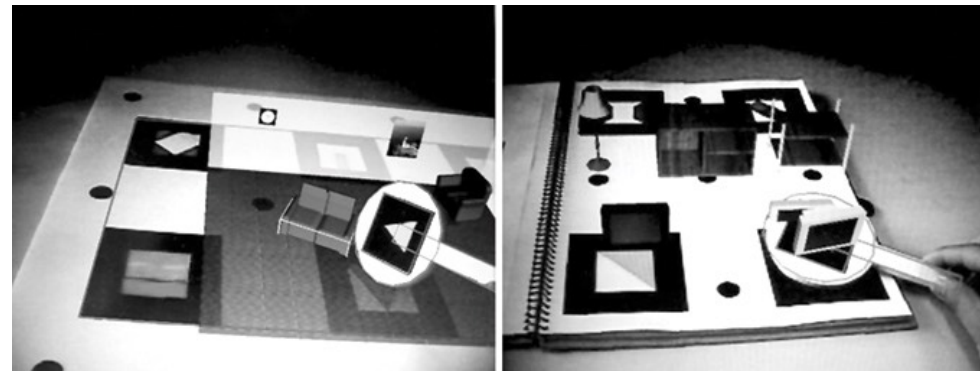


Figure 9.18 Using tools to manipulate objects in an AR scene. (Kato et al. 2000)

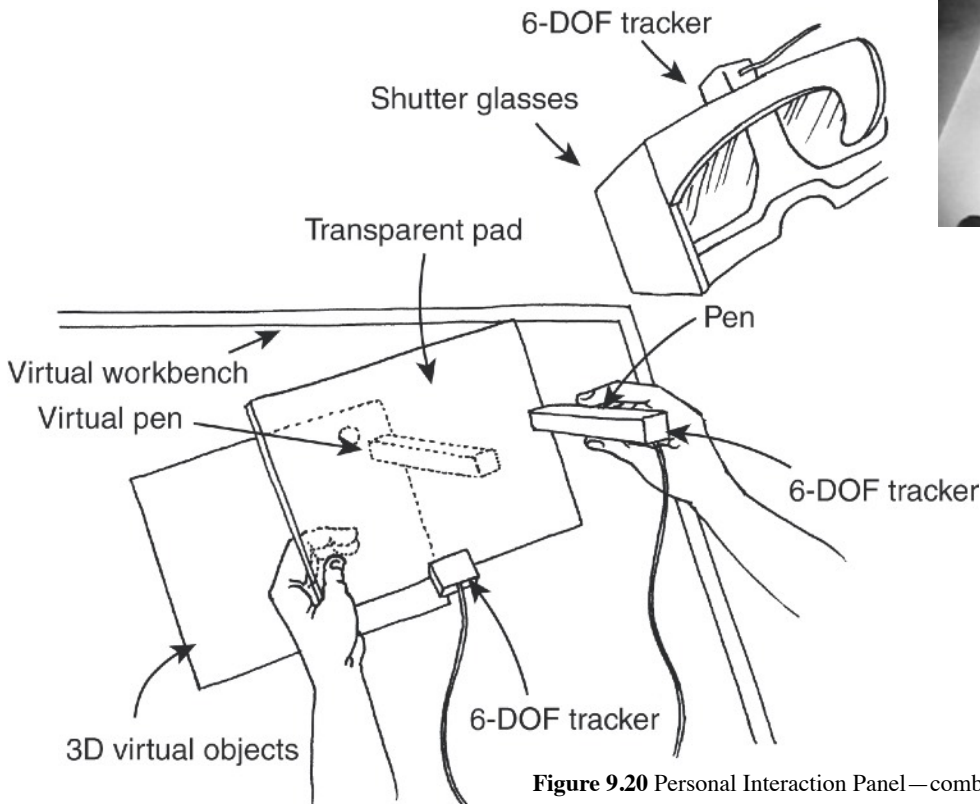


Figure 9.20 Personal Interaction Panel—combining virtual and augmented reality. (Adapted from Schmalstieg et al. 1999)

Multimodal Interfaces

9.9.1 Potential Advantages

Researchers have identified several advantages of using multimodal system control techniques (mostly in the domain of 2D GUIs) that can also apply to 3D UIs:

- **Decoupling:** Using an input channel that differs from the main input channel used for interaction with the environment can decrease user cognitive load. If users do not have to switch between manipulation and system control actions, they can keep their attention focused on their main activity.
- **Error reduction and correction:** The use of multiple input channels can be very effective when the input is ambiguous or noisy, especially with recognition-based input like speech or gestures. The combination of input from several channels can significantly increase recognition rates (Oviatt 1999; Oviatt and Cohen 2000) and disambiguation in 3D UIs (Kaiser et al. 2003).
- **Flexibility and complementary behavior:** Control is more flexible when users can use multiple input channels to perform the same task. In addition, different modalities can be used in a complementary way based on the perceptual structure of the task (Grasso et al. 1998; Jacob and Sibert 1992).
- **Control of mental resources:** Multimodal interaction can be used to reduce cognitive load (Rosenfeld et al. 2001); on the other hand, it may also lead to less effective interaction because multiple mental resources need to be accessed simultaneously. For example, as Shneiderman (2000) observes, the part of the human brain used for speaking and listening is also the part used for problem solving—speaking consumes precious cognitive resources.