CSE 165: 3D User Interaction

Lecture #12: Symbolic Input

Announcements

- Today's office hour ends at 4pm
- Today math class in lab 4:30-6:30
- Midterm: Thursday Feb 28 in class
  - Closed book
  - No cheat sheets
  - Bring student ID, show when handing in exam
  - Permitted: pen, pencil, ruler, eraser, scratch paper
- Final Project
  - To go on-line Friday March 1 by EOB

Universal 3D Interaction Tasks

- Navigation
- Selection
- Manipulation
- System control
- Symbolic input

Symbolic Input

- Entering text, numbers, math, symbols, etc...
- Difficult in 3DUIs
  - Rarely present in immersive systems
    - Keyboards not usually part of VR systems

Usage Scenarios

- Filename entry
- Labeling, annotation, markup
- Precise object manipulation
- Design annotation (e.g., architecture)
- Setting parameters numerically
- Communication via text messages (collaborative applications)

Boundary Conditions of Symbolic Input in 3DUIs

- Users often standing
- Users may physically move around
- No surface to place keyboard
- VR often low-light: hard to see keys
- Different hardware configurations compound problem
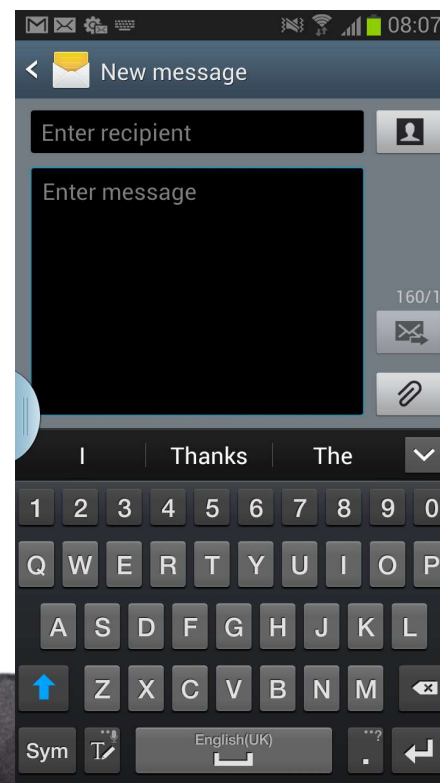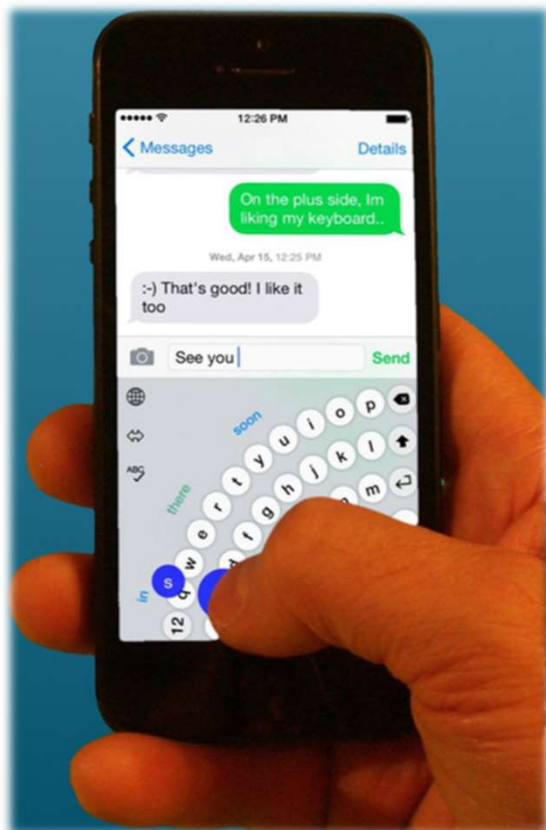
Symbolic Input Tasks

- Alphanumeric input
- Editing entered alphanumeric symbols
- Markup entered text: highlighting, font specification, text color, etc.

Symbolic Input Techniques

- Keyboard-based techniques
- Pen-based techniques
- Gesture-based techniques
- Speech-based techniques

Miniature Keyboards

Low Key Count Keyboards

- Reduced number of physical keys
  - T9 on early cell phones
  - Wireless number pad

Logitech Cordless Number Pad

Chord Keyboards

- Keyboard with functionality of a full-sized keyboard, but using many fewer keys
- Often requires pressing multiple keys at the same time (chord)
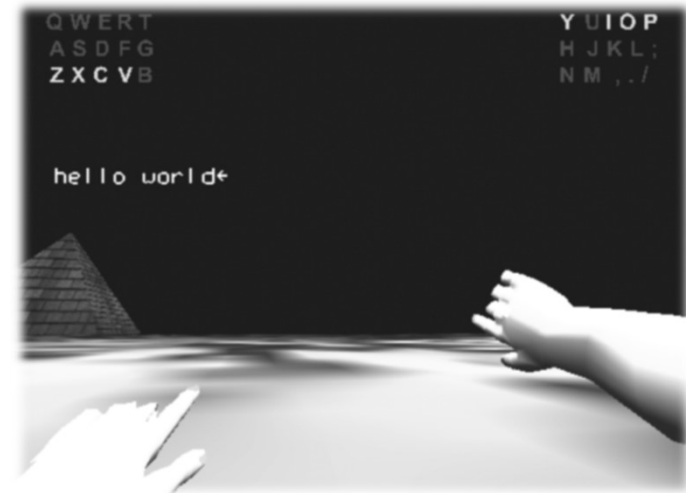

Spaceman Spiff's Chording Keyboard Experiment (SpiffChorder)
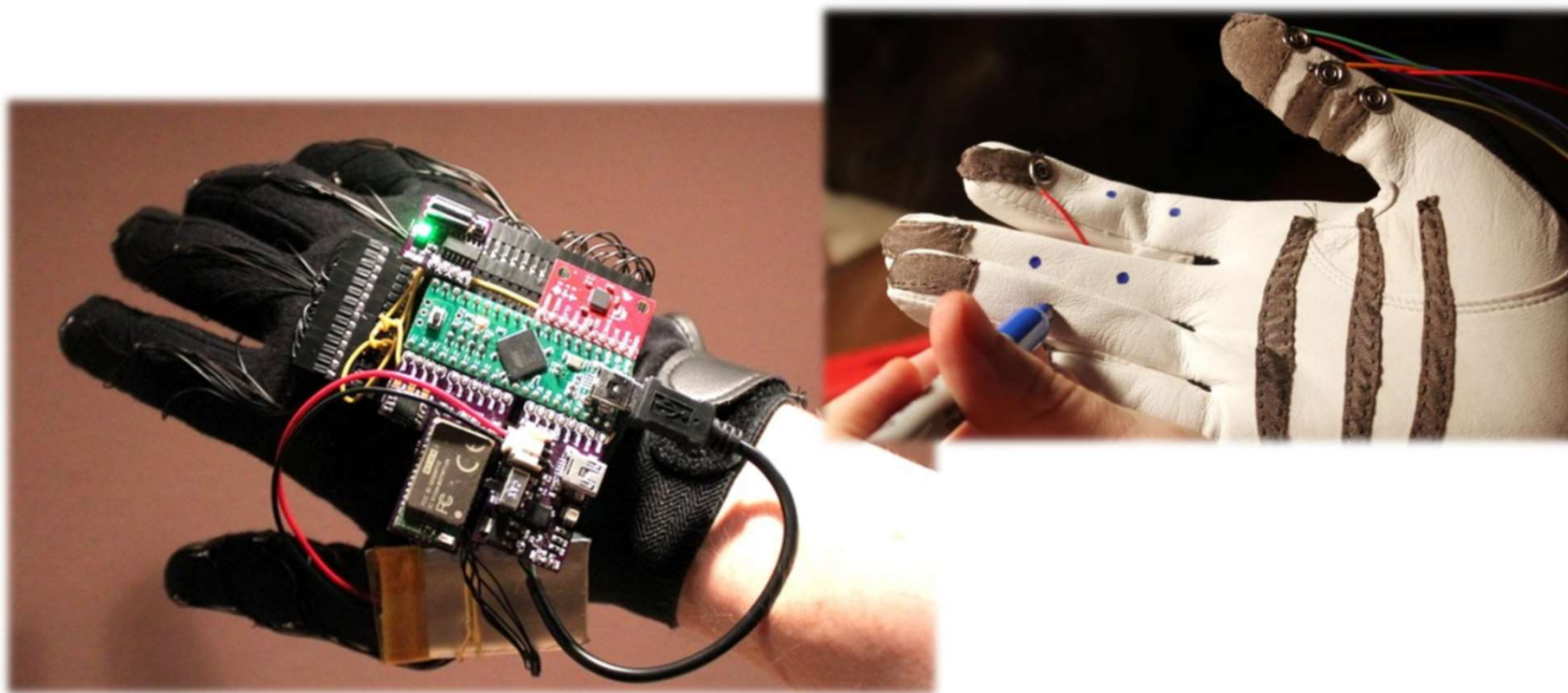
Pinch Keyboard

- Bowman et al. 2001
- Maps a real keyboard to the hand
- Pinch with a finger and the thumb represents a key press by same finger
- Uses rotation of hand to reach "inner keys"
- Uses hand distance from body to distinguish keyboard rows

Keyglove

- https://vimeo.com/59319446

Soft Keyboard

- Keyboard implemented in software: virtual keys
- Does not use physical keys

Cube - Bluetooth Laser Projected Keyboard

Windows 10 On Screen Keyboard