CSE 165: 3D User Interaction

Lecture #15: Symbolic Input

Instructor:
Jurgen Schulze, Ph.D.

Announcements

- Homework Assignment #5
  - Discussion tomorrow at 4pm
  - Due Thursday March 19th at 3pm

- Unreal Engine 4 and Unity 5 are now free (for non-commercial use)

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
  - Example: mobile phones

Logitech Cordless Number Pad

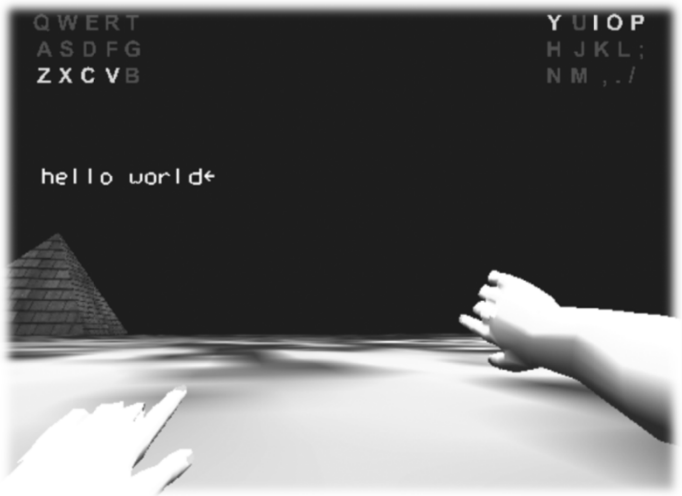
Chord Keyboards

- 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)

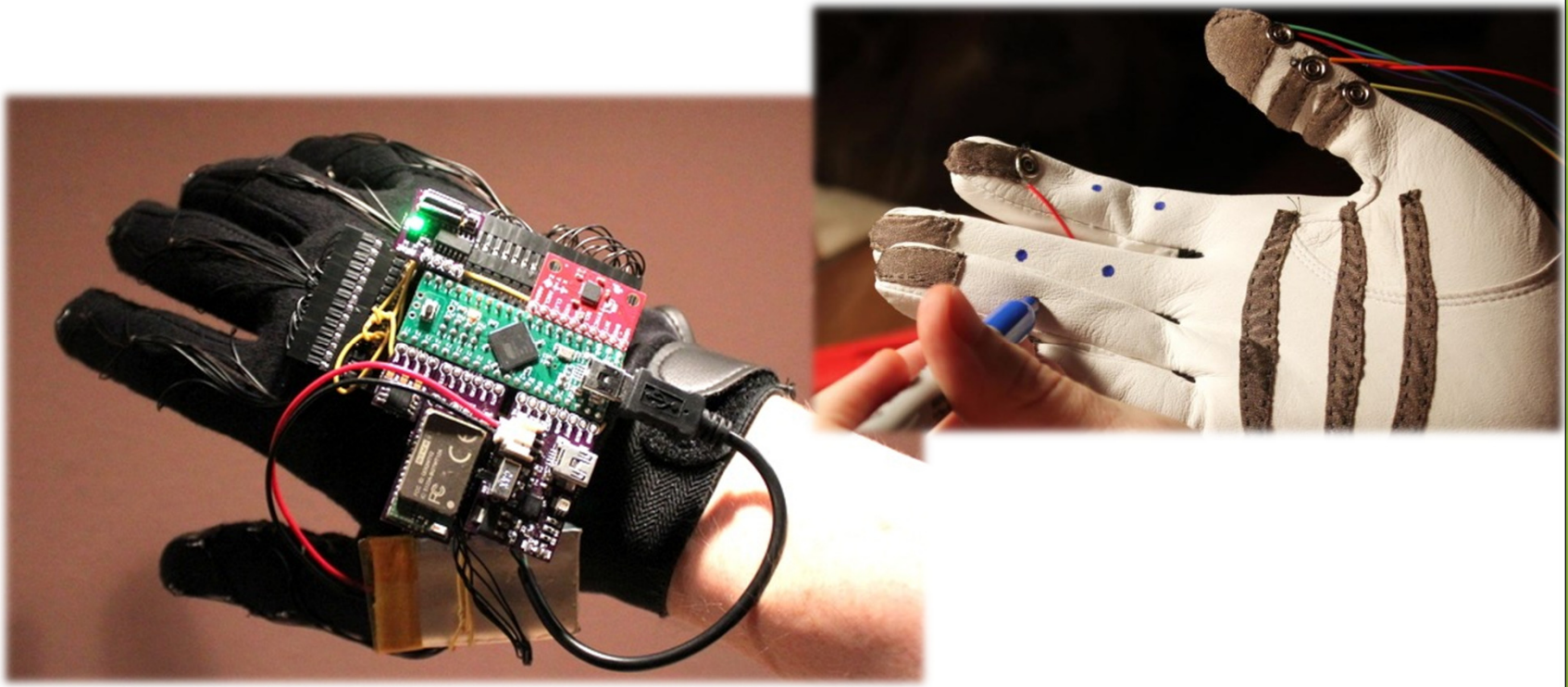
Pinch Keyboard

- Bowman et al. 2001
- 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



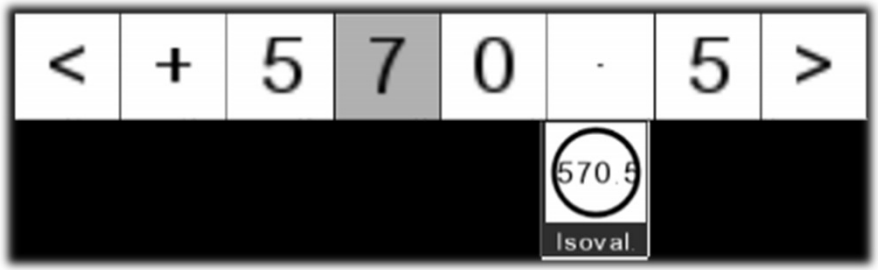
Keyglove

- Video at http://www.keyglove.net

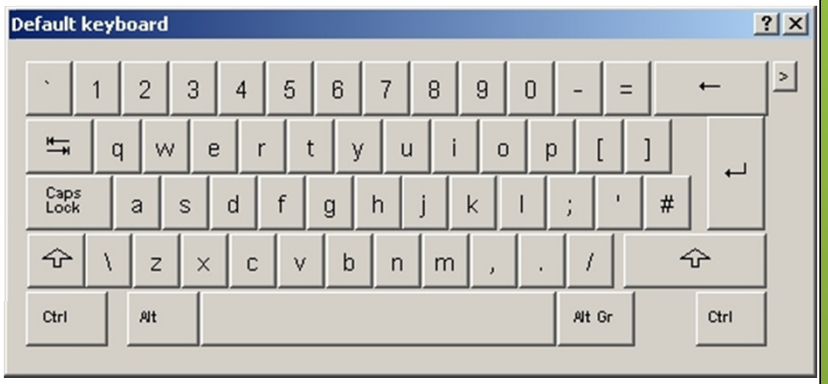


Soft Keyboard

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

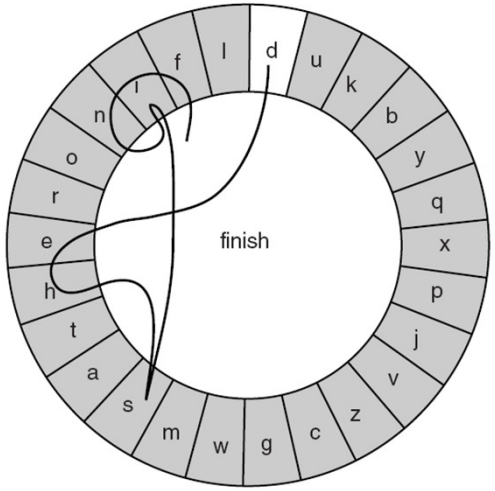


FloatOmeter (2005)

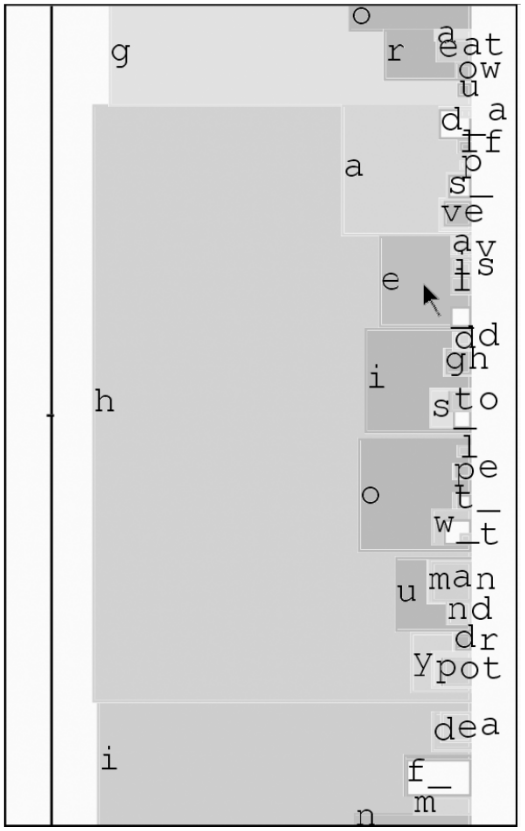


Pen-Based Keyboards

- Pen-stroke gesture recognition



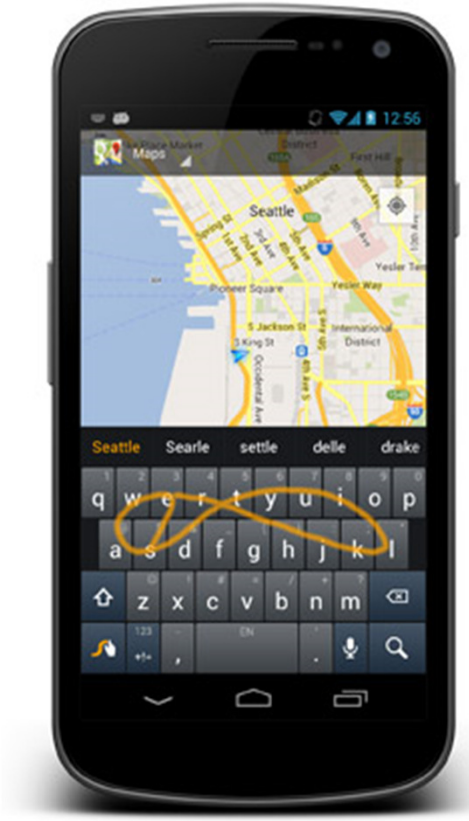
Cirrin soft keyboard (Mankoff and Abowd 1998)



Dasher (Ward et al., 2002)

Pen-Based Keyboards –Swype

- Typing by continuous finger or stylus motion across the screen keyboard



www.swype.com

Pen-Based Keyboards – Digital Ink

- Poupyrev et al., 1998
- Write with "digital ink"

Gesture-Based Techniques

- Sign language
  - Example: *American Sign Language Recognition using Kinect Skeleton features*
    - http://www.youtube.com/watch?v=qFH5rSzmgFE
- Numerical gestures
  - one finger raised = 1, etc.

Speech-Based Techniques

- Single character: words entered by spelling them out
- Whole word: unreliable without training
- Unrecognized speech input
  - e.g., annotations by audio recordings

User Performance

- Bowman et al. 2002