Text Entry in Augmented and Virtual Environments

CS5760 Presentation

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Outline

- Virtual Reality and Augmented Reality
- Common interactions
- Other Interaction interfaces

- Design and Methods
- Conclusion and Limitations
- References

Virtual Reality

Virtual reality (VR): an artificial **environment** that is experienced through sensory stimuli (as sights and sounds) **provided by a computer** and in which one's actions partially determine what happens in the environment

VR headset: mainly comprise of a stereoscopic **head-mounted display** (providing separate images for each eye) and head motion tracking sensors

Virtual Reality - Headset

https://store.steampowered.com/valveindex

Virtual Reality - Controllers

VIVE

oculus

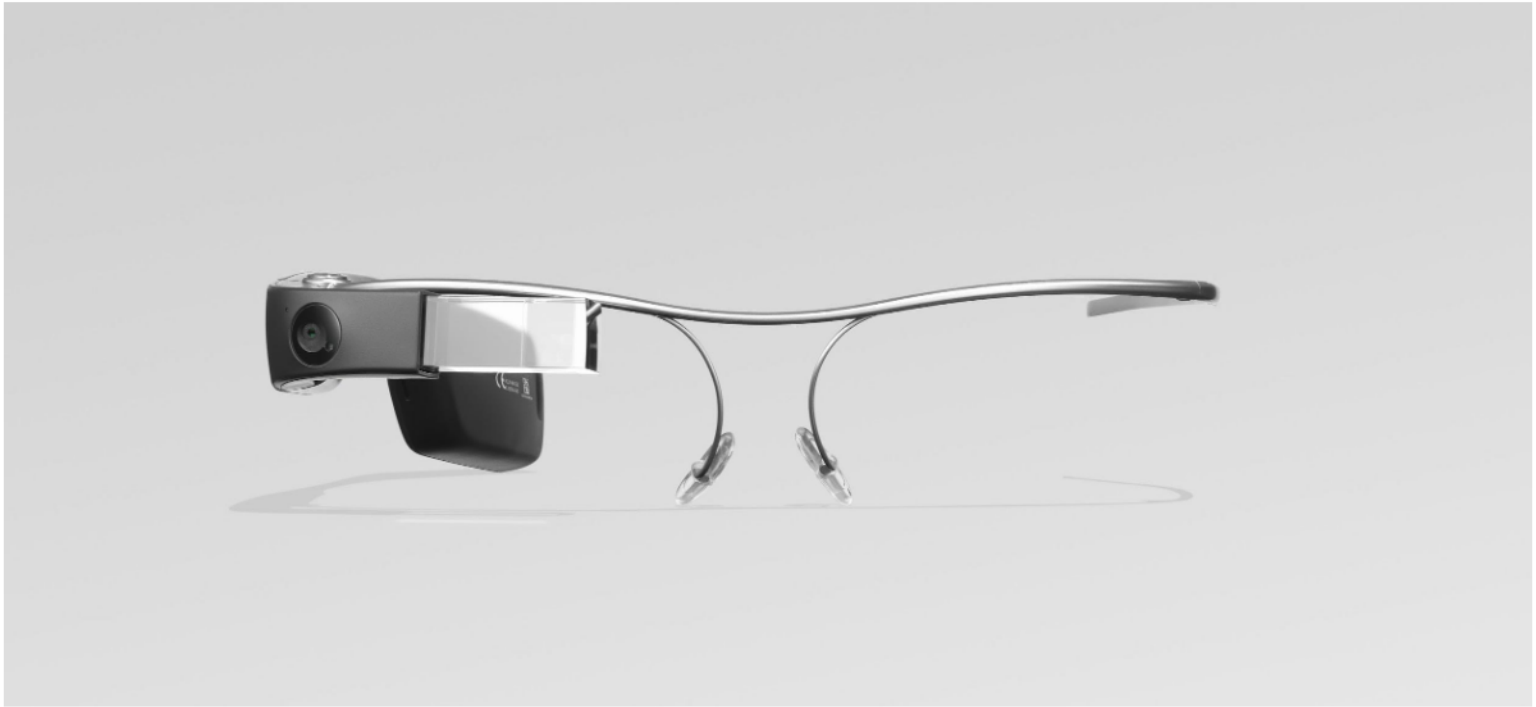
https://www.oculus.com/
https://www.vive.com/us/

Augmented Reality

Augmented reality (VR): a system in which the user has a **direct view** of their environment and where a specially constructed device allows **additional information** or graphical elements to be blended with the real environment in the form of an **overlay**

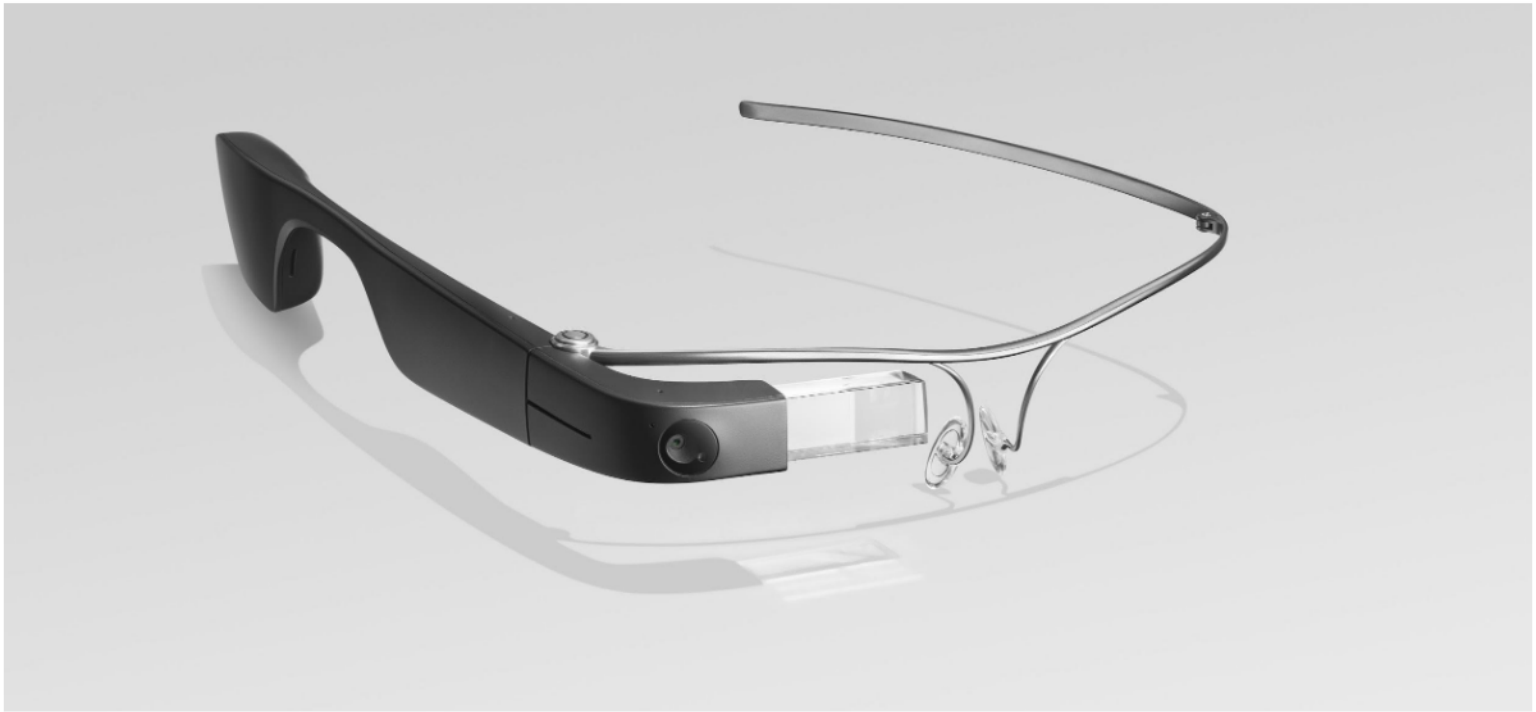
AR smart glasses: wearable computer glasses that add information alongside or to what the wearer sees

Augmented Reality - Smart Glasses



https://www.google.com/glass/tech-specs/

Augmented Reality - Smart Glasses



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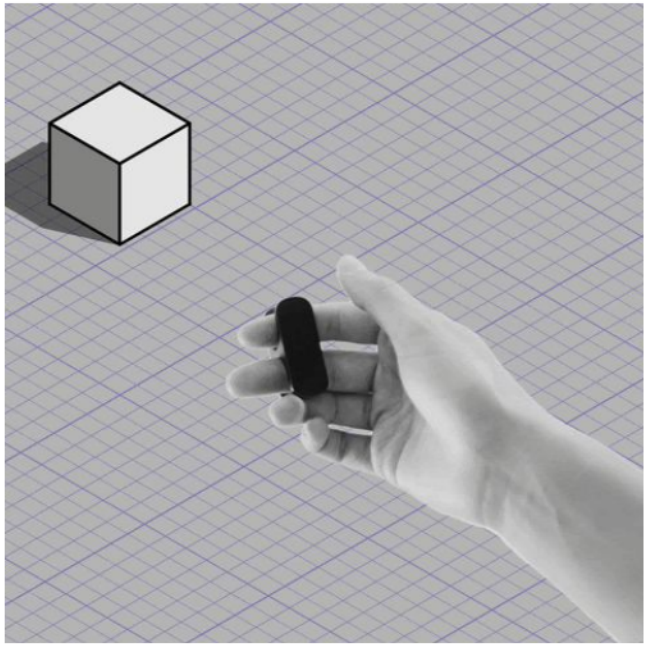
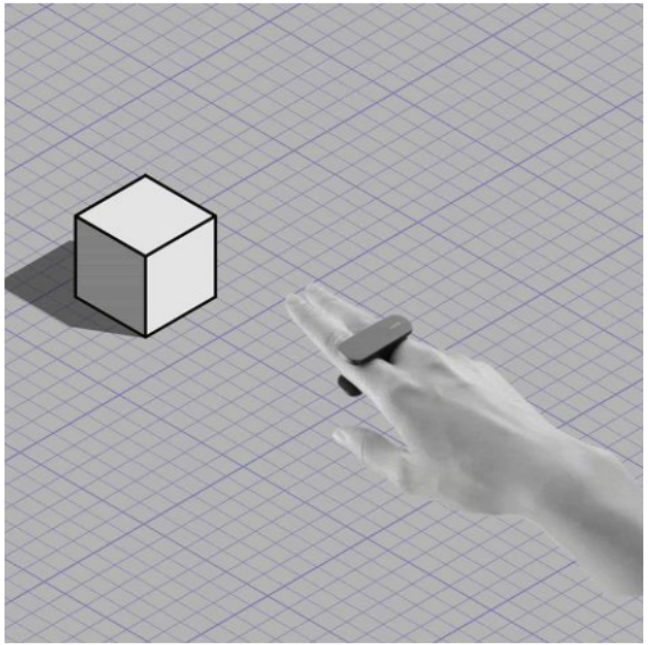
Augmented Reality - Controller





https://www.litho.cc/

Problems with common interactions

- Efficiency
- Precision
- Security
- Natural input
- Feedback

Interaction interfaces

- Acoustic
- Optics
- On-body
- Gesture
- ...

Interaction interfaces - Acoustic

- Speech/Pattern Recognition
- Sound Localization

Interaction interfaces - Acoustic

Speech/Pattern Recognition

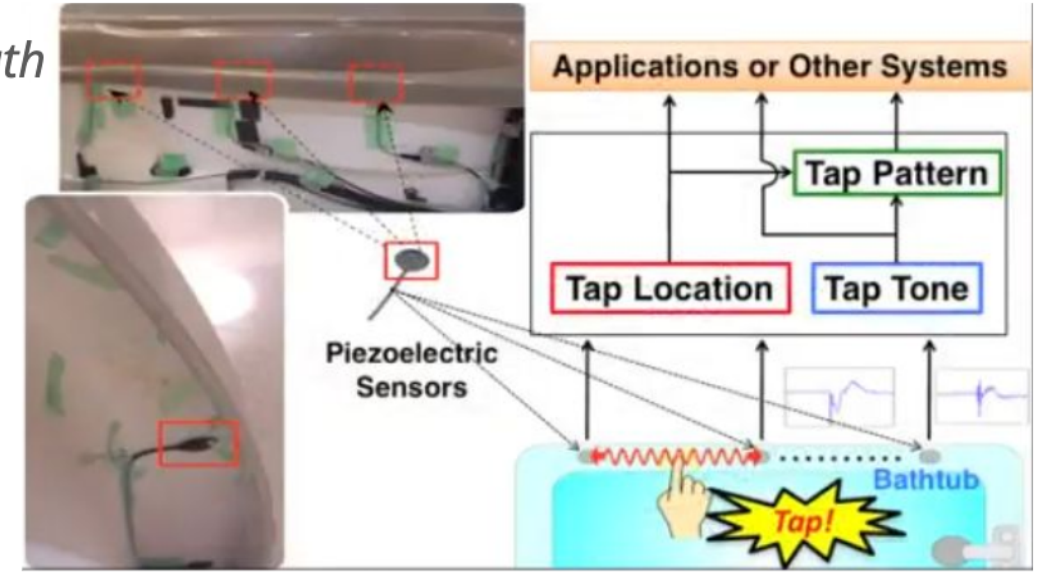
- *Whoosh*

Whoosh: non-voice acoustics for low-cost, hands-free, and rapid input on smartwatches.

Interaction interfaces - Acoustic

Sound Localization

- *Raptapbath*



Raptapbath: User interface system by tapping on a bathtub edge utilizing embedded acoustic sensors.

Interaction interfaces - Acoustic

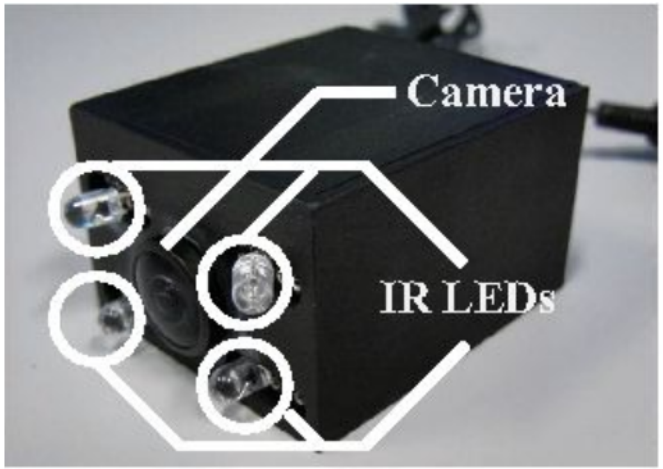
Raptapbath: User interface system by tapping on a bathtub edge utilizing embedded acoustic sensors.

Interaction interfaces - Acoustic

- Pros
  - Low cost
  - Easy to deploy
  - Fast to process
- Cons
  - Limited precision

Interaction interfaces - Optics

- *Anywhere surface touch*

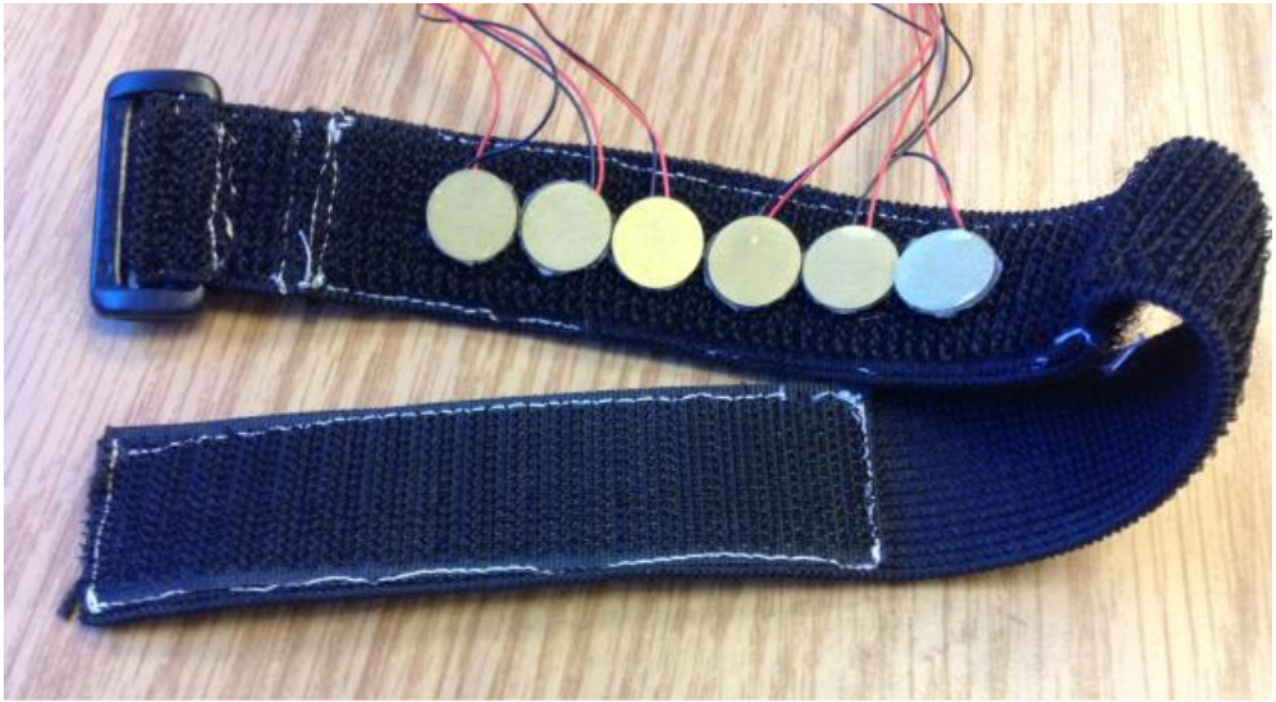


Anywhere surface touch: utilizing any surface as an input area

Interaction interfaces - Optics

- Pros
  - High precision
- Cons
  - Requires more processing power
  - Potentially more noise

Interaction interfaces - On-body



Validation of a piezoelectric sensor array for a wrist-worn muscle-computer interface

Interaction interfaces - On-body

- Pros
  - Mobile
- Cons
  - Limited interaction area
  - Not comfortable

Interaction interfaces - Gesture

- WiGest

Wigest: A ubiquitous wifi-based gesture recognition system.

Interaction interfaces - Gesture

- Pros
  - Natural express
  - High accuracy
- Cons
  - Limited information
  - High latency
  - Little real-time feedback

Design idea and Methods

Required attributes for text entry

- Efficiency
- Low latency
- High accuracy
- Real-time feedback

Design idea and Methods

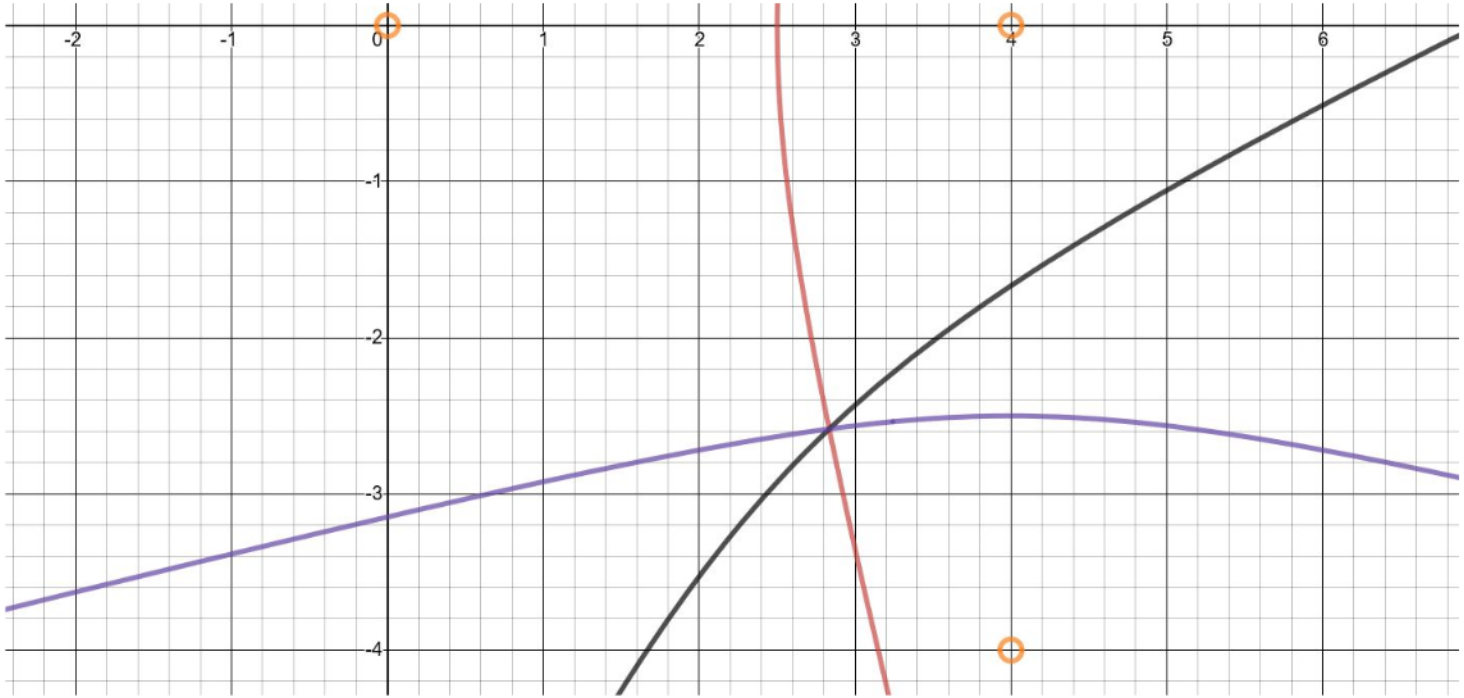
- Acoustic sensors
- Mapping flat surfaces to QWERTY keyboards
- Sound Localization
    - TDOA

Design and Methods - TDOA

- Time Difference Of Arrival (TDOA)

  Locating a source based on **intersections of hyperbolic curves** defined by the **time differences** of arrival of a signal received at a number of sensors is proposed.

Design and Methods - TDOA



Limitations

1. System not mobile
2. Requires calibration
3. Requires VR rendering

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