Feedback and Learning for Gesture Recognition

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Presentation Overview

- Assistive Robots
- Gesture Recognition
- Feedback
- Learning
- My proposed implementation

Assistive Robots

iRobot RP-VITA Remote Presence Robot

Survivor Buddy, CRASAR


Tawabo, the robotic tour guide of Tokyo Tower

Assistive Robots

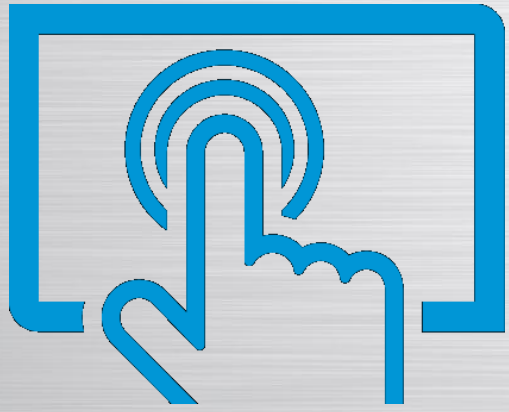
Designed to interact with people in a social manner.

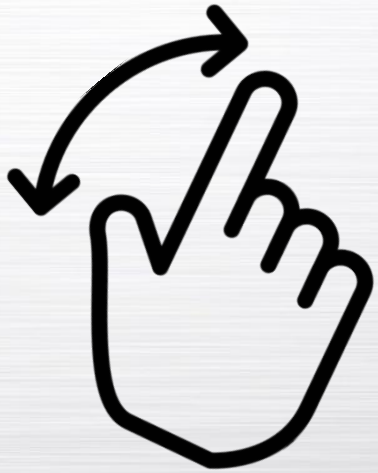
- Increased autonomy
  - Need to perceive the world
  - Understand what people are communicating
- Social interaction is key, so interfaces are very important

Assistive Robot Interfaces

Touchscreens, speech and gesture recognition

- “intuitive” means of interaction

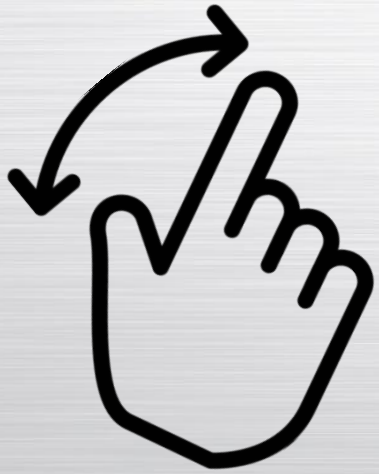




Assistive Robot Interfaces

Touchscreens, speech and **gesture recognition**

- Speech and touch are difficult to use in challenging environments:
  - Noise and language
  - Mobility, reachability, and injury

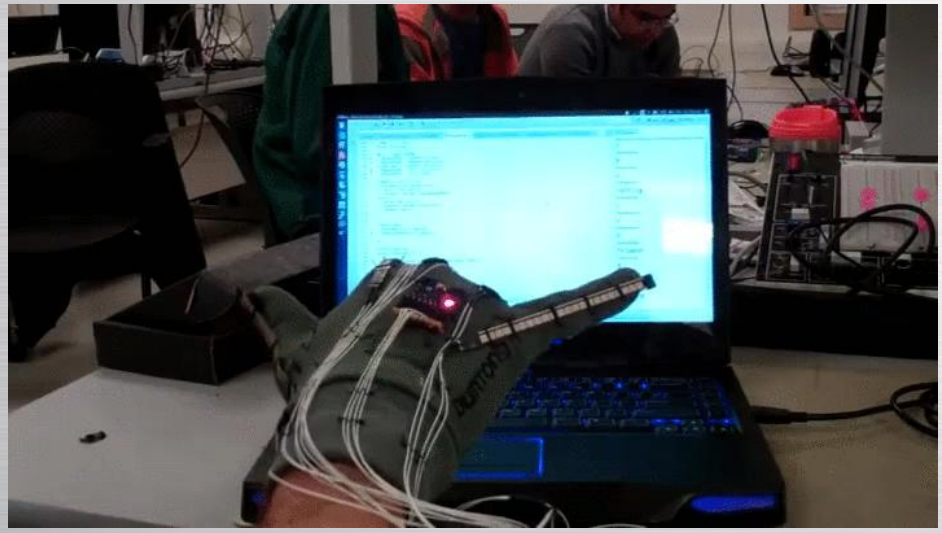


Gesture Recognition

- People gesture in several different ways (e.g. body language, pointing, gesticulating)
  - note: sign language is usually considered separately [McNiell, 1996]
- **Hand gestures** are often preferred for their explicitness
  - Distinction between static poses and dynamic gestures

Gesture Recognition

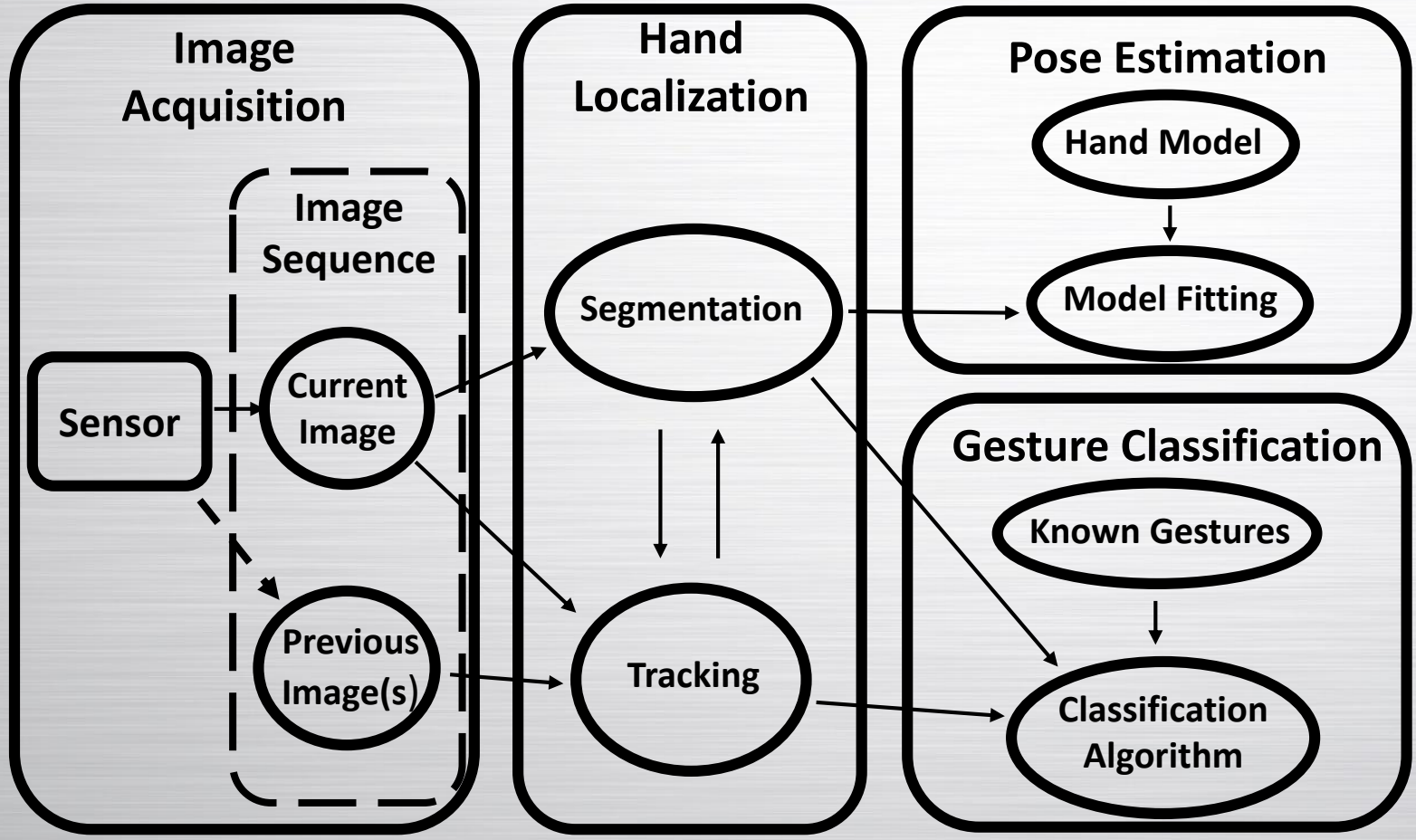
Two types: wearable and **visual**



Cornell ECE 4760 student project
(Monica Lin and Roberto Villalba)

Leap Motion Controller

Visual Gesture Recognition

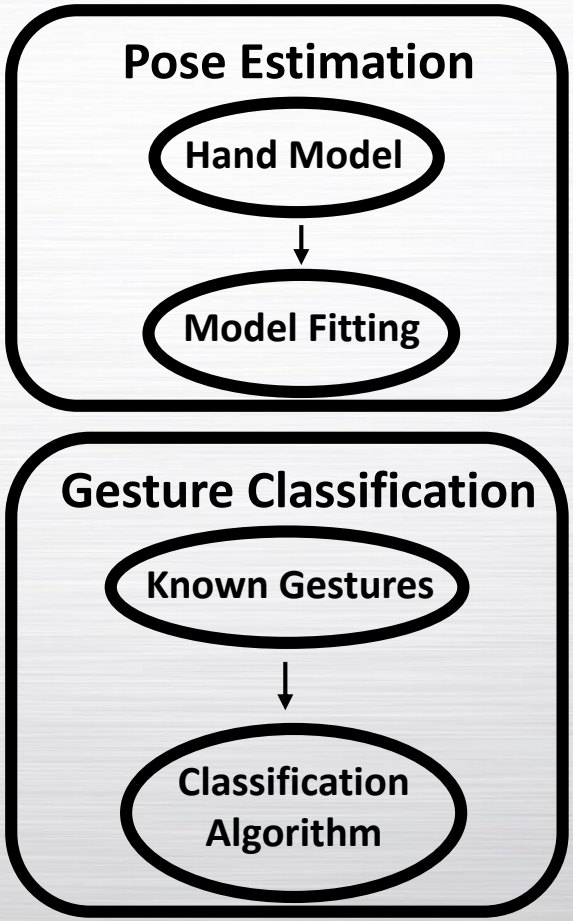


Feedback

- Unlike some interfaces (e.g. touch), Gesture recognition may fail, so status feedback is needed
  - Recognition errors
  - Hands not visible
- Need prior training to know accepted gestures
  - Not actually intuitive
  - A big problem for real novice users (e.g. rescue victims)

Learning

- Online learning is almost always absent from gesture recognition systems
- Different people gesture in different ways, and it is frustrating to have to adapt
  - System should do so instead



My Proposed system

Base is a visual gesture recognition system

- Depth sensor (PrimeSense)
- Novel hand-detection method (boosted cascades)
- Established tracking (Camshift) and classification algorithms (HMMs)

Developed for robustness to challenging light and noise conditions

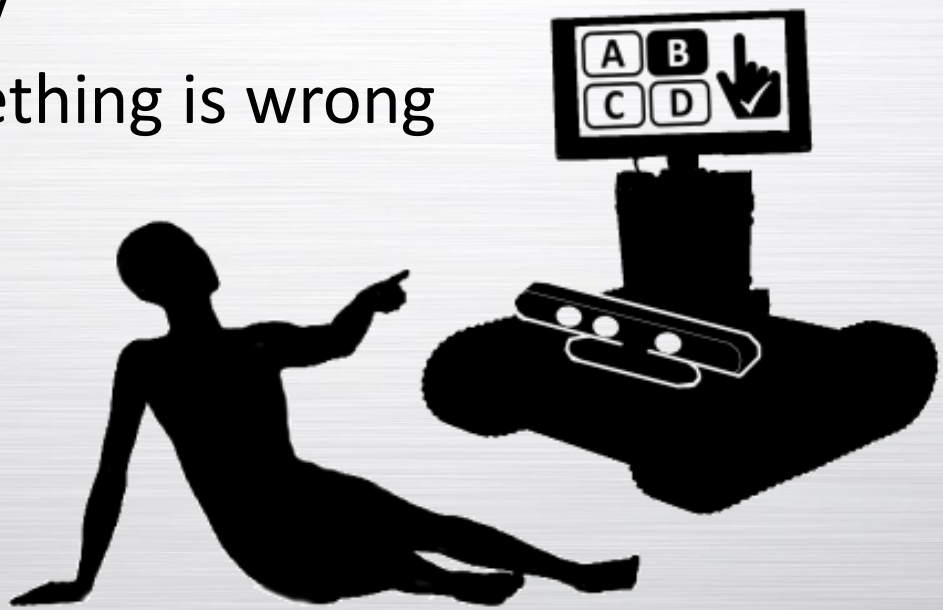
My Proposed system

Visual feedback

- Show the user how they can gesture
- Confirm gestures visually
- Inform them when something is wrong

Online learning

- Initial gesture set
  with online retraining



My Proposed System

User Study to evaluate system and interaction performance

What I hope to discover:

- Quantifiable impact of feedback and learning on gesture “performance” (as measured by established HRI metrics)
- Compare effect of different types of visual feedback

Questions

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