Red Light, Green Light

Human Robot Interaction Final Project Presentation

—— Comparing robot expressive behavior in game setting including sound, gesture, lightring in terms of efficiency and user preference

Presentation Breakdown

- Overview of the project
- Technical approach
- Methodology
- Results
- Video Presentation
- Discussion / Future Work
- Q & A

Overview of The Project

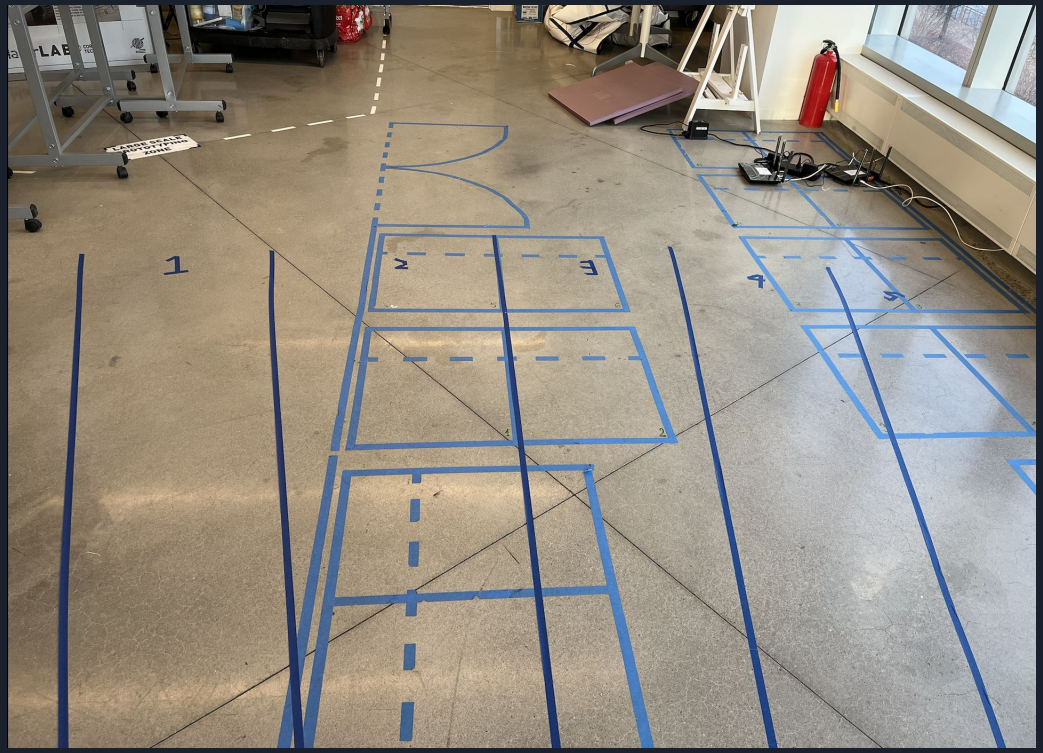
- In our project, I am trying to let the robot play the game “red light, green light” with participants.
- The robot will first get its back to the participants, and they can move towards the robot.
- When robot turn around, participants cannot move, otherwise they fail. The robot will detect movements of participants and use different expressive behavior to inform participants they lose the game.

Overview of The Project

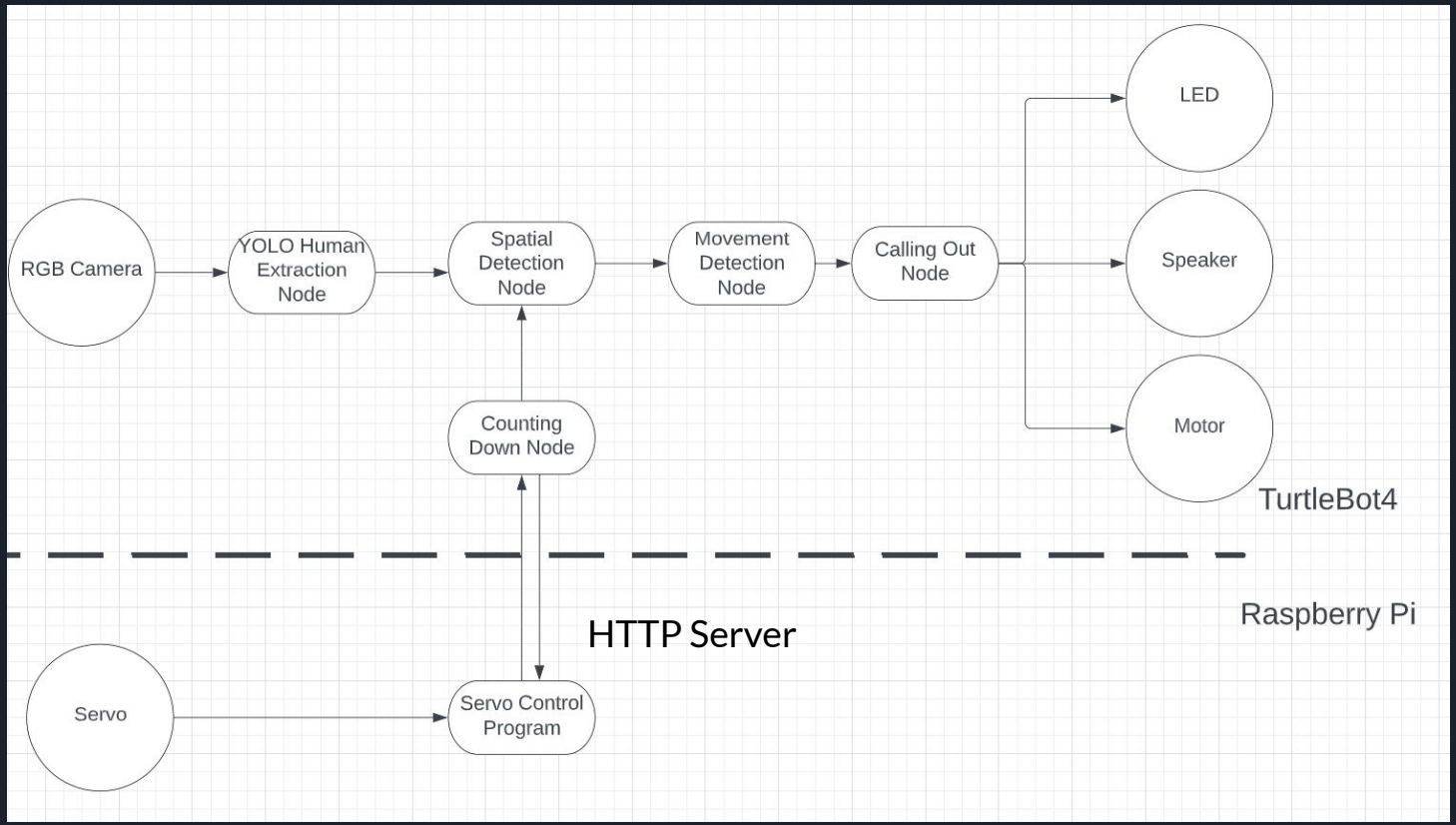
- The different expressive behavior will includes:
  - Lightring
  - Sounds
  - Movement
- Goal is to compare expressive behavior of robot in game setting in terms of efficiency, accuracy and user preference
- I choose this topic because I wanted to explore how robot can better communicate with users in game setting, which will strongly impact users' experience

Appearance

Game Experimentation Set Up



Technical Approach



Technical Approach

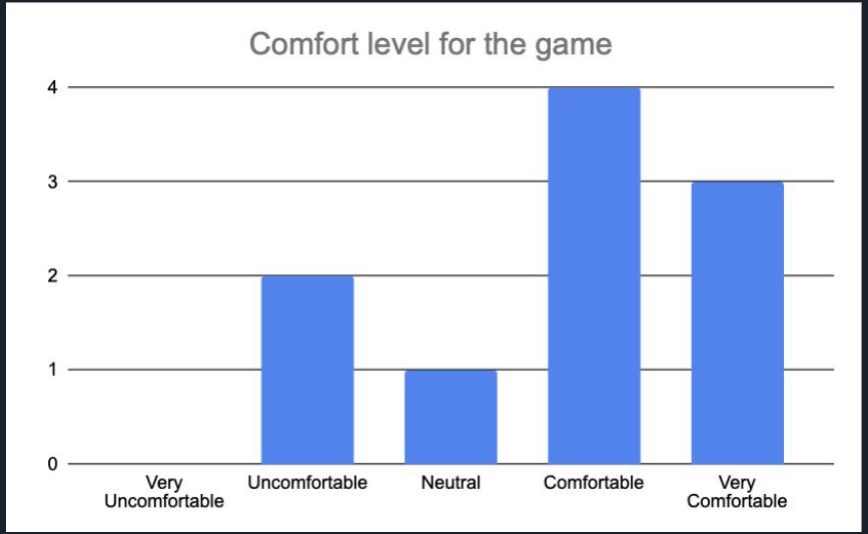
- Deliberate Model
  - Sensing and action
  - Planned actions
- Componentized Design
  - Lightring, Sound, Movement etc.
  - Easy to switch between Deliberate Model and Wizard of OZ

Methodology

1. Combination of Wizard of OZ and program execution.
2. Recruited 2 groups of people each group has 5 people
    a. Mean Age 22.9
    b. Stddev Age 1.37
3. Each group experience all cues in different orders that indicates player is out
    a. Light – the blinking light
    b. Audio – the robot will speak
    c. Move – the robot will move towards player
4. After experiment, a questionnaire was distributed asking how do they feel about the level of comfortability of the game and how well do they receive the signal.
5. After collecting the data, we will analyze the data with statistical method to evaluate how do they feel about the game.
6. With limited data sample, we also focus on the qualitative analysis.

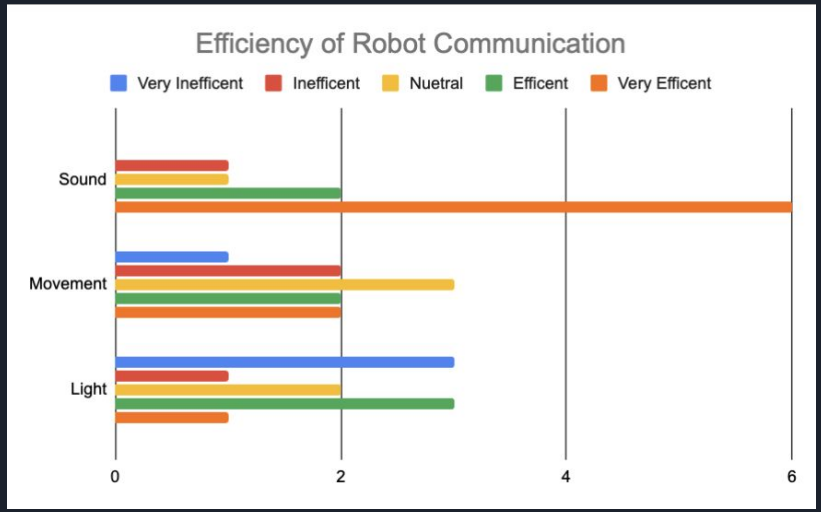
Results

- Comfort Levels
  - Game
  - Each Cue
- Participants found the movement cue to be frightening but comedic because of anthropomorphic features
- Group identification and trust played a big role
- Participants were overall comfortable with receiving commands from robot and listening to the rules described for the experiment



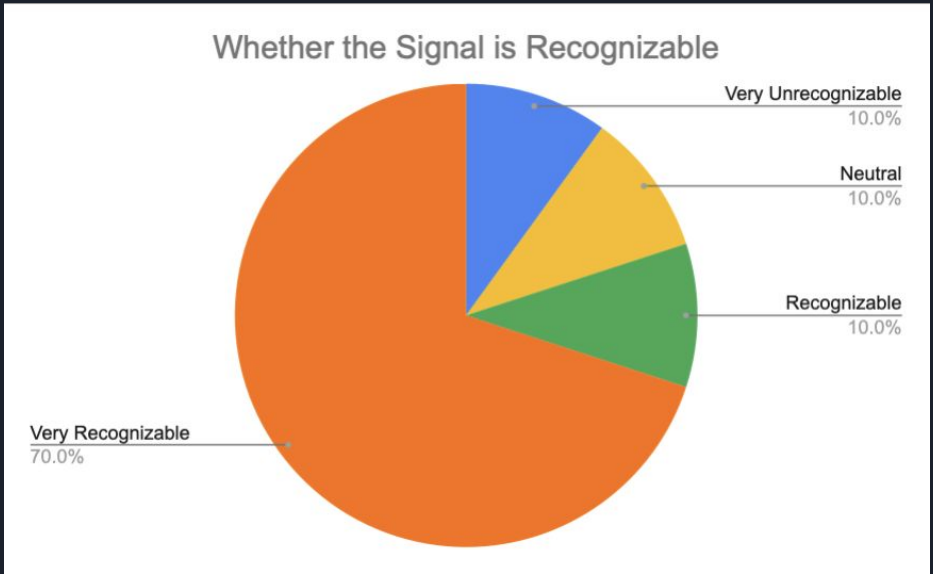
Results (Experience with cues)

- Can you rate your experience when the robot communicates with you?
  - Audio
  - Movement
  - Light
- Qualitative analytics
- Sound yielded the best efficiency results and responses
- Light and movement efficiency yielded mixed results



Results (Recognition of Signals)

- How well do you recognize the signal is give to you?
  - Very Recognizable ~ Very Unrecognizable
- Participants recognized and listened to the signals presented well
- The proximity did not affect the overall understanding of the signal
- The only cue that was affected by the proximity was the movement because of size of the robot and constrained space



Movement Video

Sound

Light

Discussion & Future Work

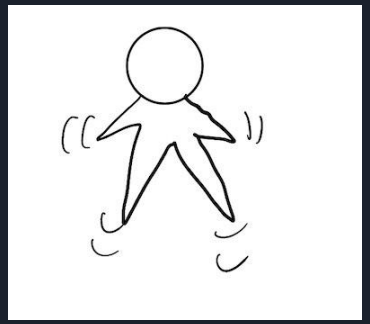
1. Recruit more people and perform in between-subject manner:
    a. Each group will experience all of our cues in a random sequence
    b. More rounds of experiments should be conducted
2. We should decorate the robot to a more human-like appearance and adding more interactions on top of the robot like arms and others to enrich the possible ways of interactions.
3. Larger space in different configurations, more immersive
4. We should make the overall robot programing more intelligent:
    a. Fully automatic human detection and tracking system
    b. Enable multiple interactions via autonomous cues

5. Advice - Use a larger space, make study more isolated with non partial individuals

Discussion & Future Work

Analysis-

- The three cues of light, noise, and movement were all effective tools in communication, Auditory noise command -> Best outcome
- From observation, comfortability was achieved in the individuals participating in this group-based experiment
- Participants were content and cooperative with taking commands from the robot
- Proximity did not play a key role in the comfortability of the individuals in the group



Discussion & Future Work

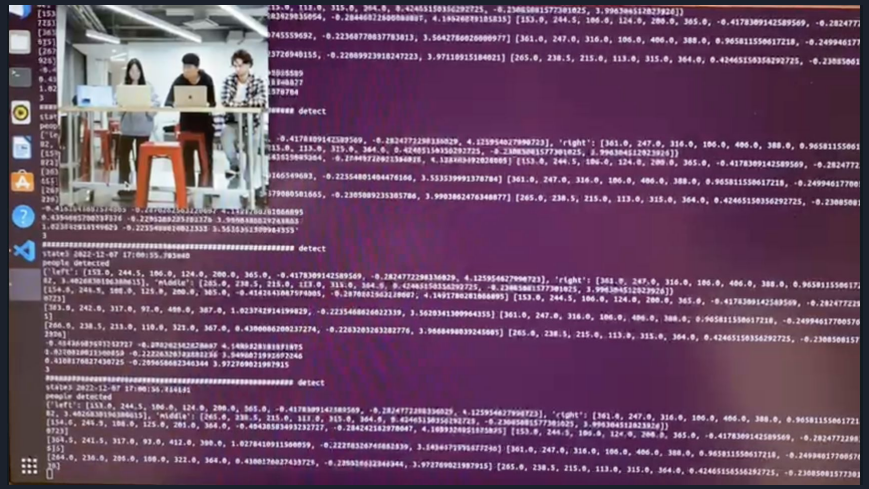
Extensions-

- Recruit more participants in an unbiased manner to conduct quantitative analysis rather then just validation
- Making the robot more Anthropomorphic in appearance with limbs and human characteristics
- Conduct experiment in a larger space to not be constrained
- Make robot autonomous so WoZ interaction can be avoided

Discussion & Future Work

Advice-

- Explore for larger space to conduct the experiment
- Do pre-testing with your own group before experimenting with the actual test participants -> LED Lesson
- Start with a smaller amount of participants due to technical abilities(motion capture) and work your way up



Thank You!
Any Questions?