Robot Challange

Enhanced Productivity by Enabling Intent Detection

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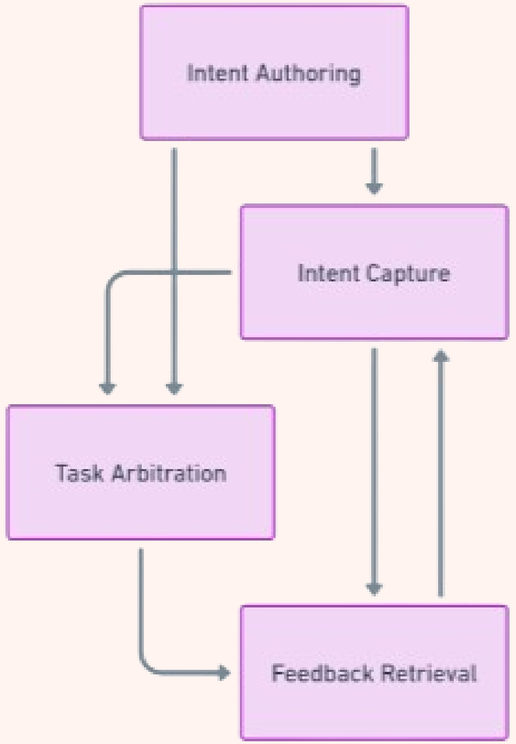
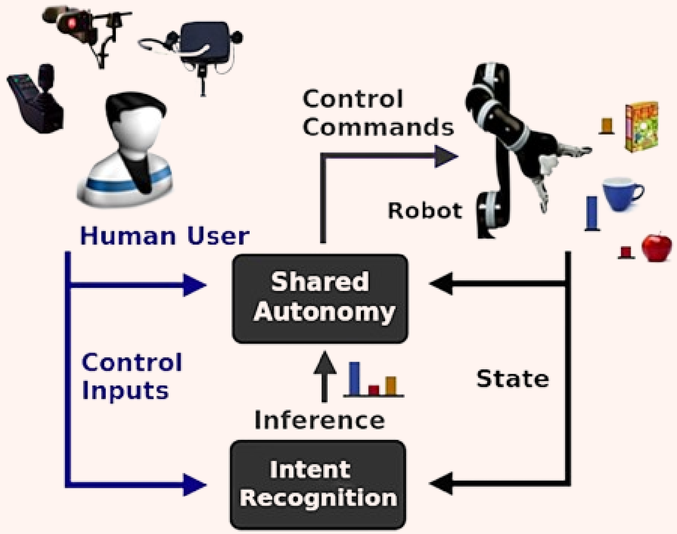
Key Understanding from State of Art

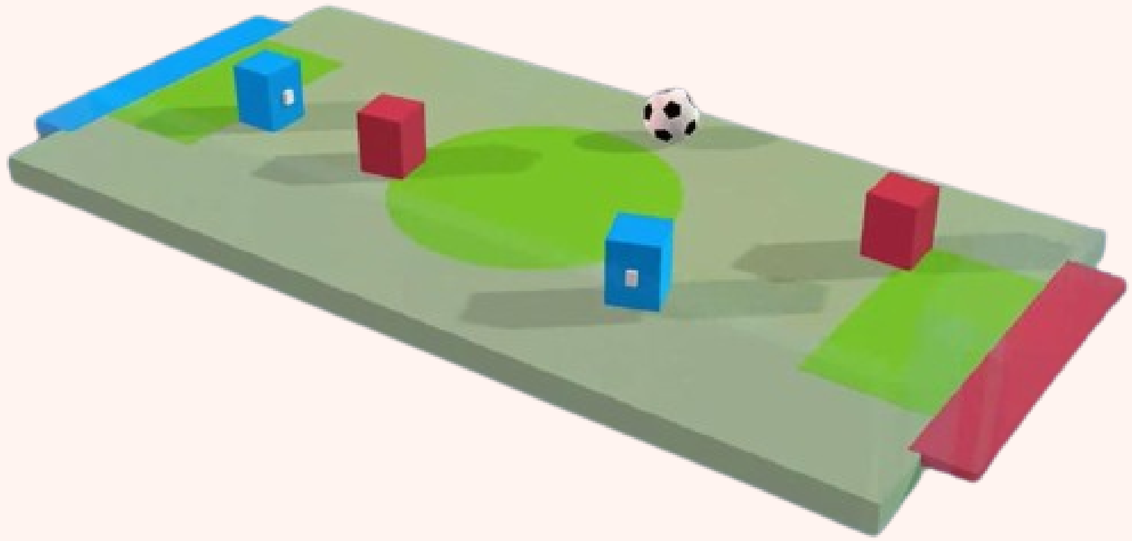


- 4 basic Elements of Intent Capturing: Intent authoring, intent capture, task arbitration, and Feedback retrieval.
- Understanding Beyond Words: Mirroring empathy
- Probabilistic Modeling of Intent
- Improved Accesibility

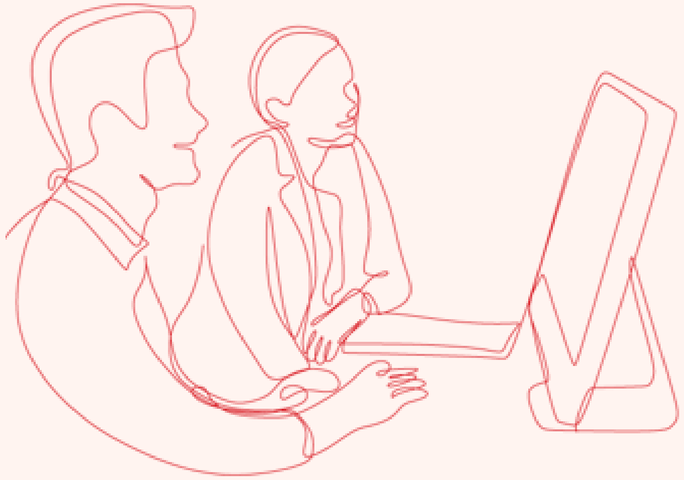


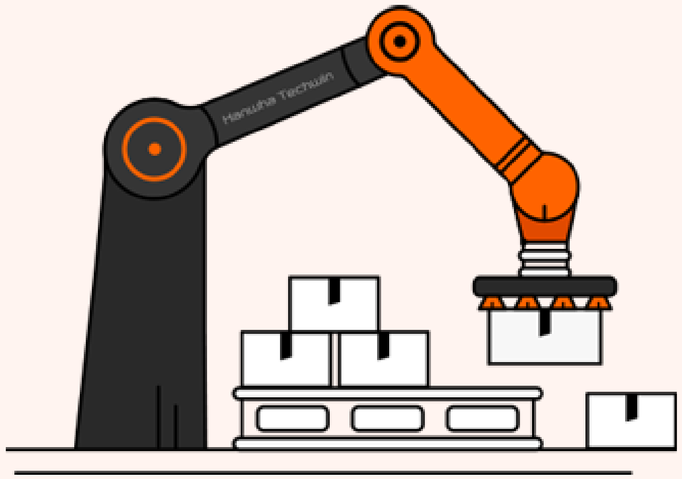
Experiment Design (Concept)

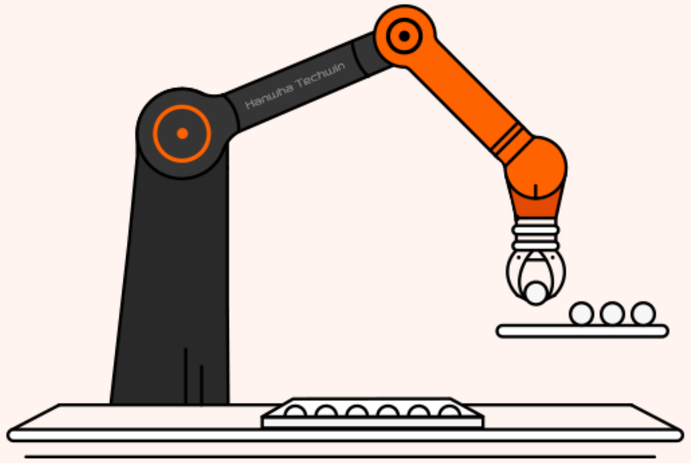
- To include perception in the system for Intent Capturing.
- I tried using an ML agent, to recognize intent just based on mouse gestures but I couldn't translate it to Unity and issues with UR3_moveit package.
- So More realistic approach was established.



Experiment Design (Realistic)



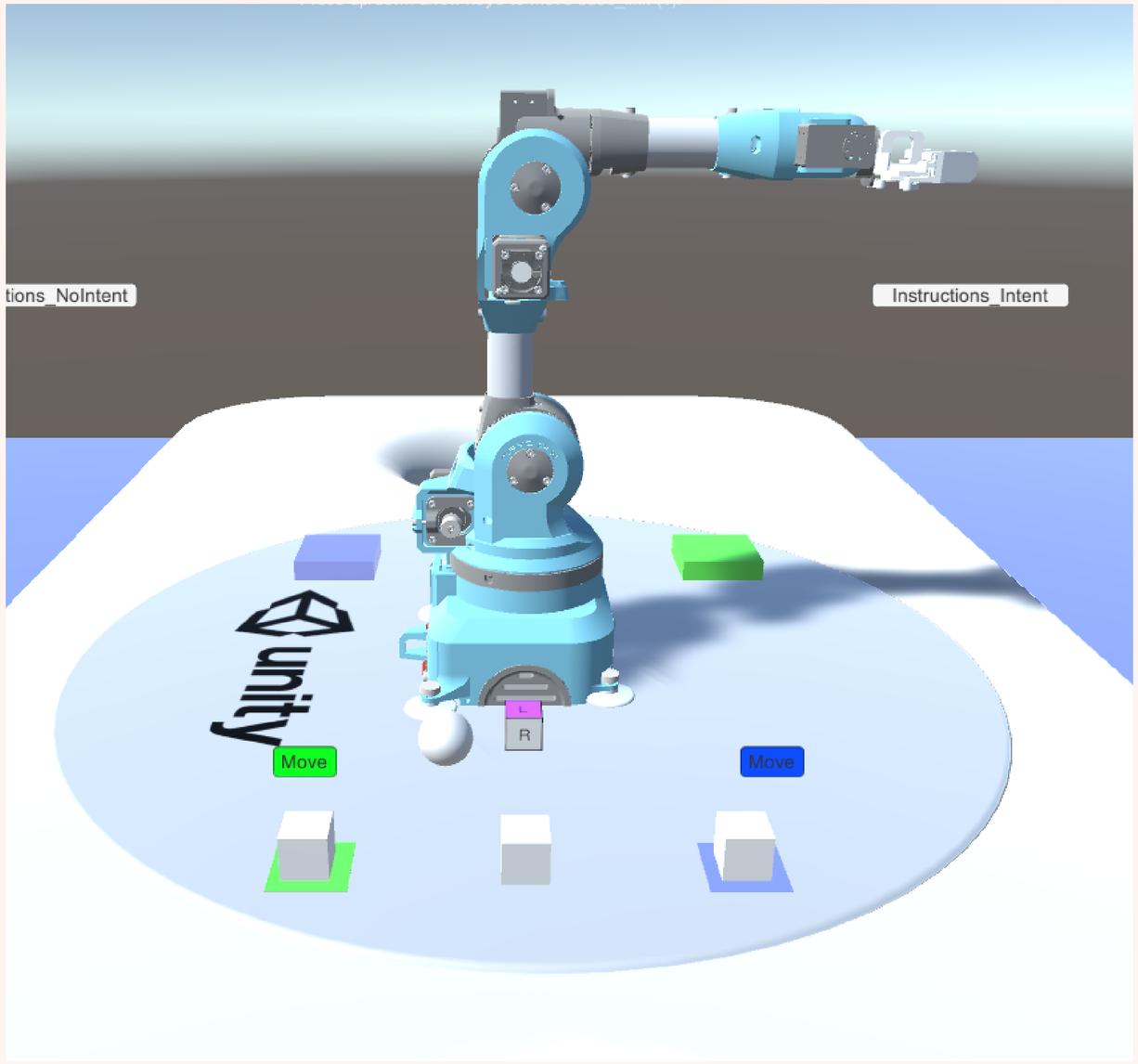




- Humans monitor robot path and change object positions to avoid collisions. This intent is captured and the robot plans its trajectory to avoid collisions in subsequent scenarios.

- Robots Captured humans intent to sort objects by colors.

Live Demo - People have fun throwing cubes at Random



Questionnaire

- Confidence in Robots ability
- Robot Efficiency
- Time Saved
- Stress while Monitoring
- SUS questionnaire
- Intuitiveness of UI and control
- Robot adapted to your actions and intentions over time

Participant Demographics

- The study consisted of 8 participant of various backgrounds age between 20 and 30.
- 60% of the participants come from a non technical background.
- The next results are based on the data received from first 4 participants and the it would be updated later, based on further studies.

Qualitative Results

- Confidence in Robots ability: p value of 0.096.
- Improved Efficiency: p value of 0.007
- Reduced Monitoring Stress: p values of 0.01
- Average time completion
  - 1st scenario: 2 min 52 seconds
  - 2nd scenario: 1 min 48 seconds

Qualitative Results

- People felt more comfortable interfacing with robot in 2nd Scenario.
- People complained about fatigue and boredom in the 1st scenario.
- People got confused initially with the proxy intent modality and keystrokes, there was learning curve

Key Takeaways

- Intent detection reduces fatigue
- Efficiency increases but with decreased intuitiveness.

further course of Research

- Behavioral Authoring
- Probabilistic Intent Detection algorithms
- Improved Safety in Cobots
- Can Intent Detection have an effect on Agency?