

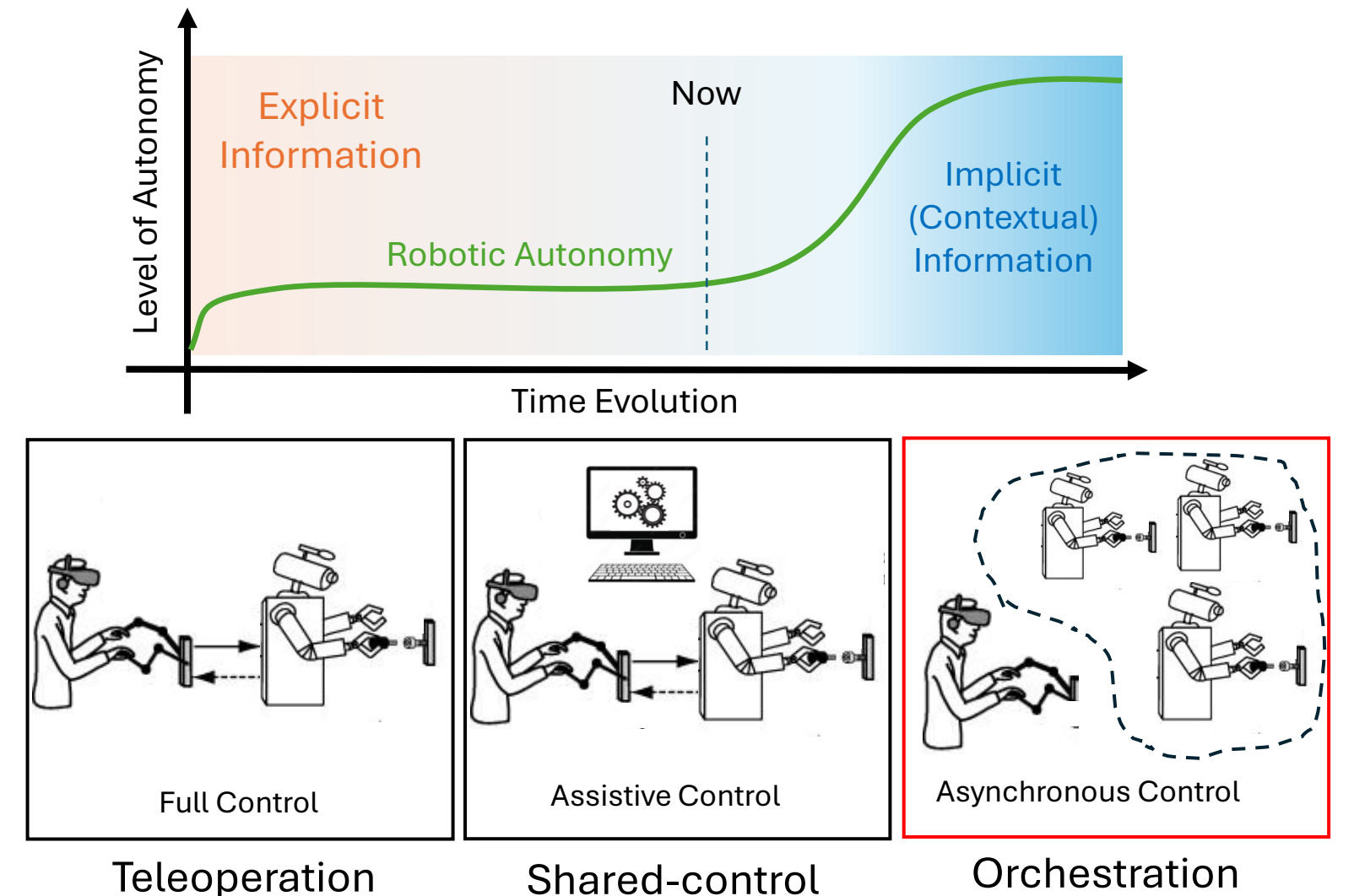
Human-Robot Cooperation for Maintenance and Construction of Future Roads

Arsen Abdulali and Fumiya Iida

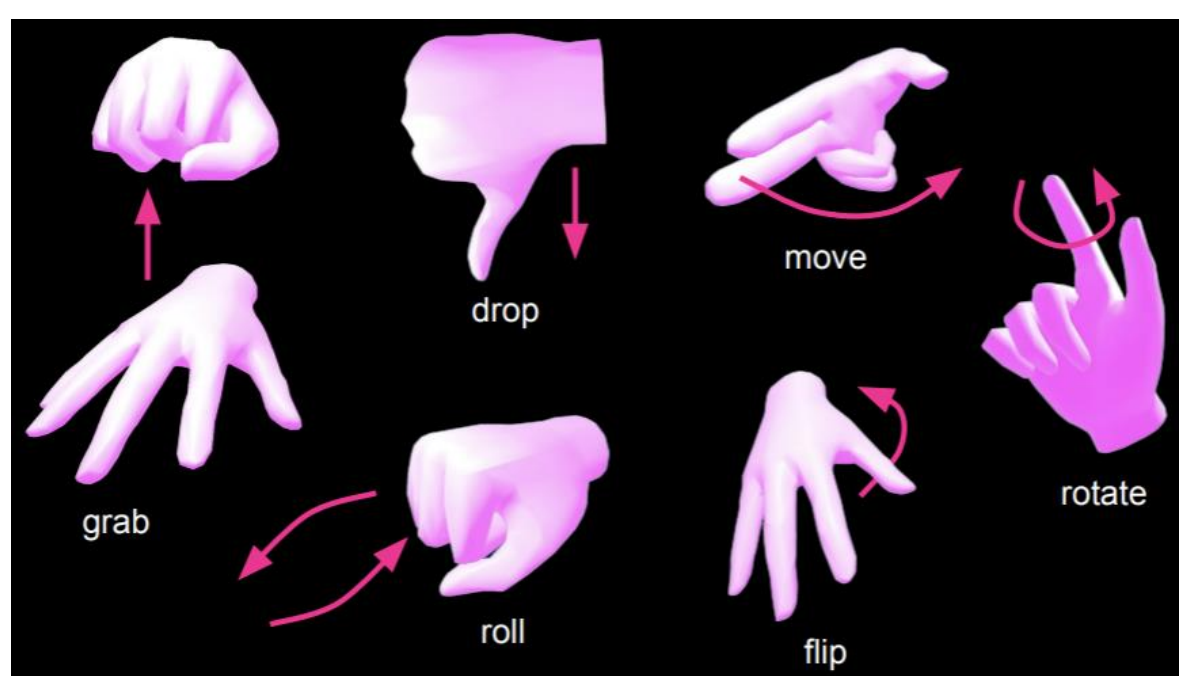
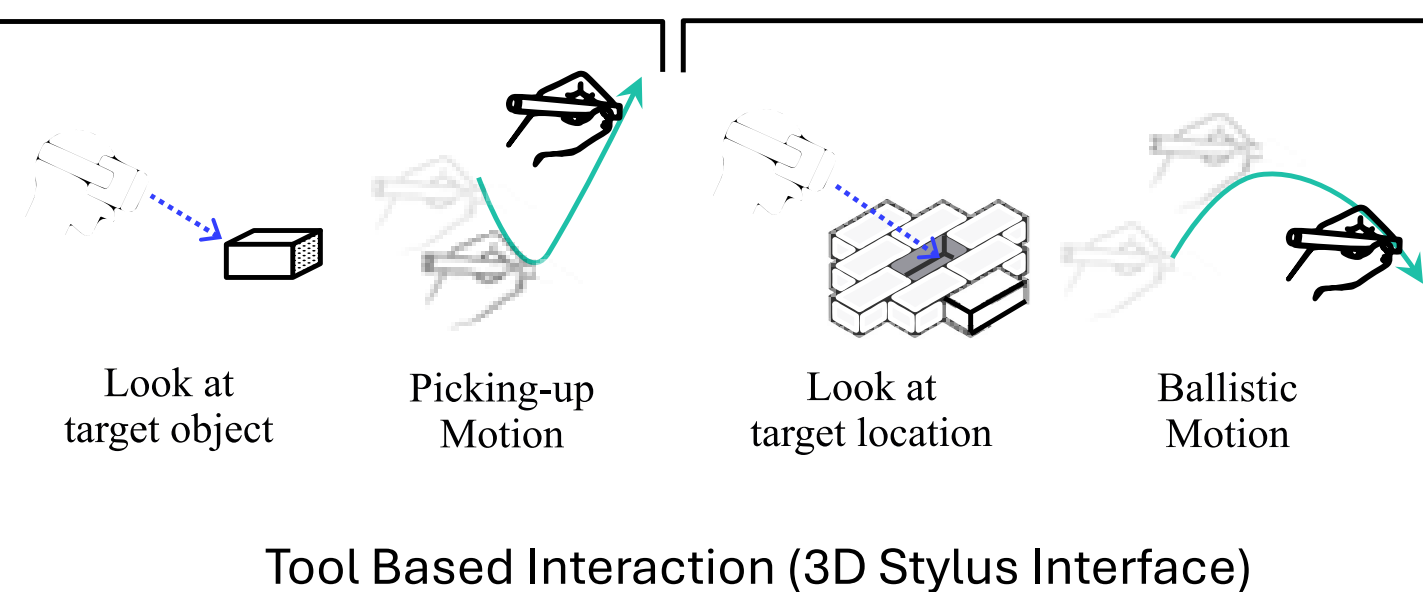
Overview

- **High-Level Robot Control:** Operators will guide robots through abstract commands.
- **Human-Robot Collaboration:** Remote-controlled robots will handle heavy tasks, improving worker safety. **Virtual Training Simulator:** A digital twin will enable safe, remote training for operators.
- **Remote Task Execution:** Robots equipped with tactile sensors will perform precise tasks under remote control.
- **Roadside Infrastructure Works:** The system will be deployed to one of the tasks that require cooperative tasks.

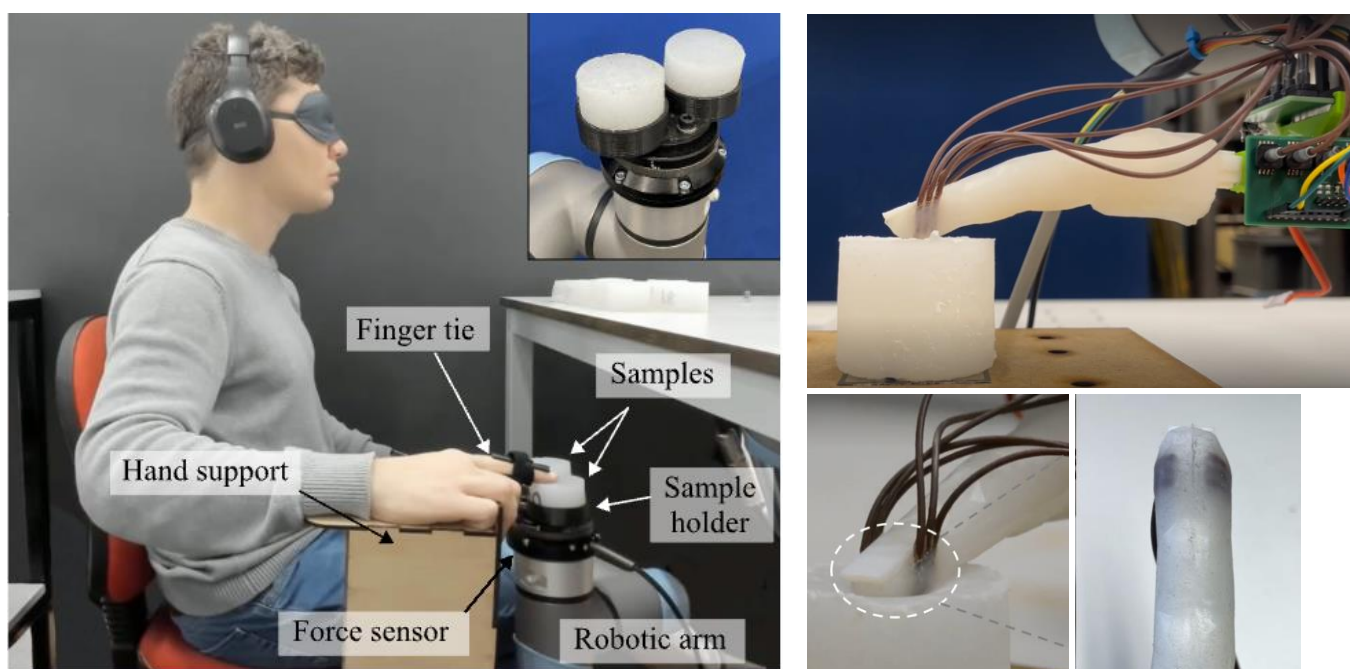
Teleorchestration (Asynchronous Control of Multiple Robots)



Human Behaviour

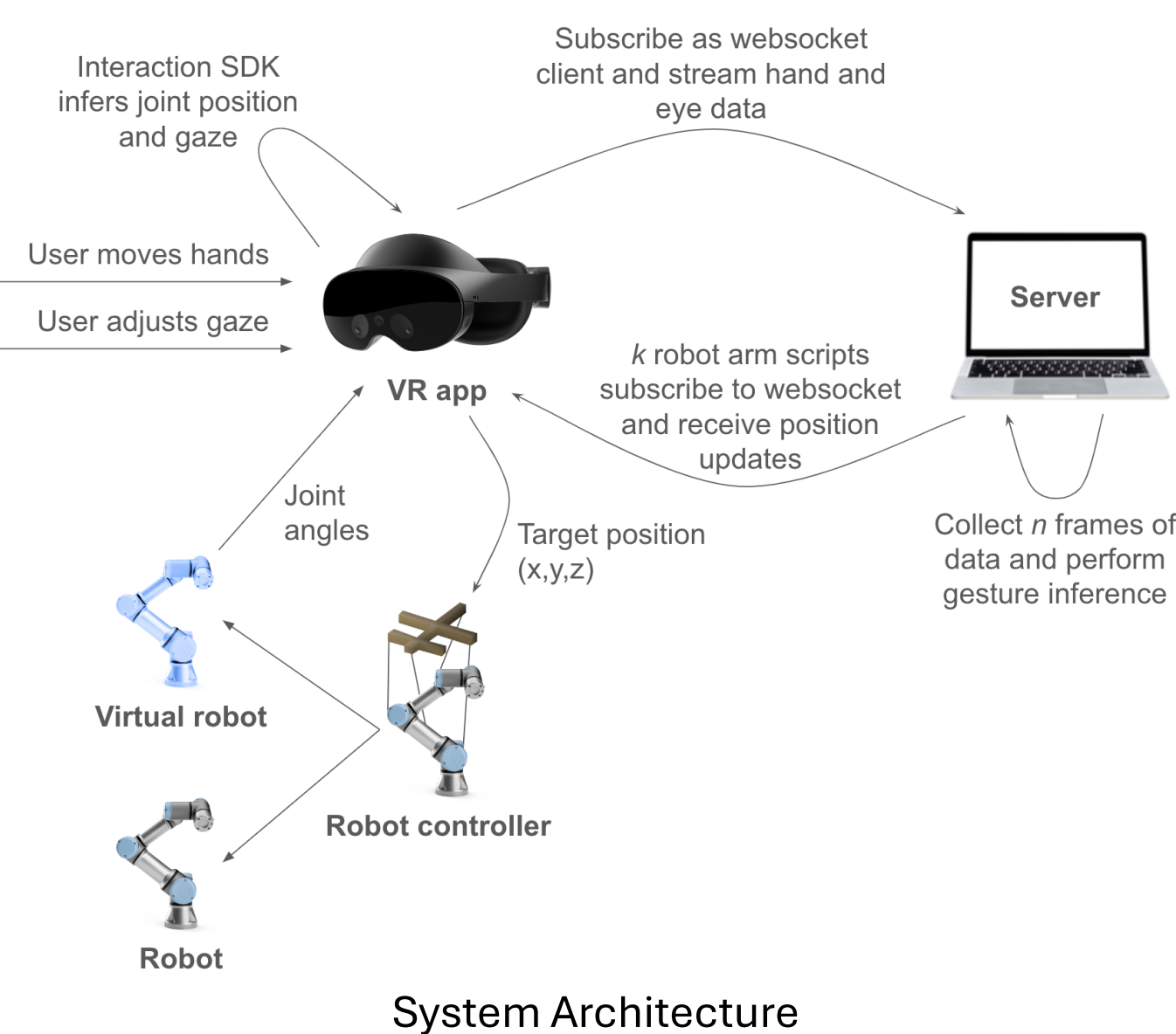


Gesture-based Control

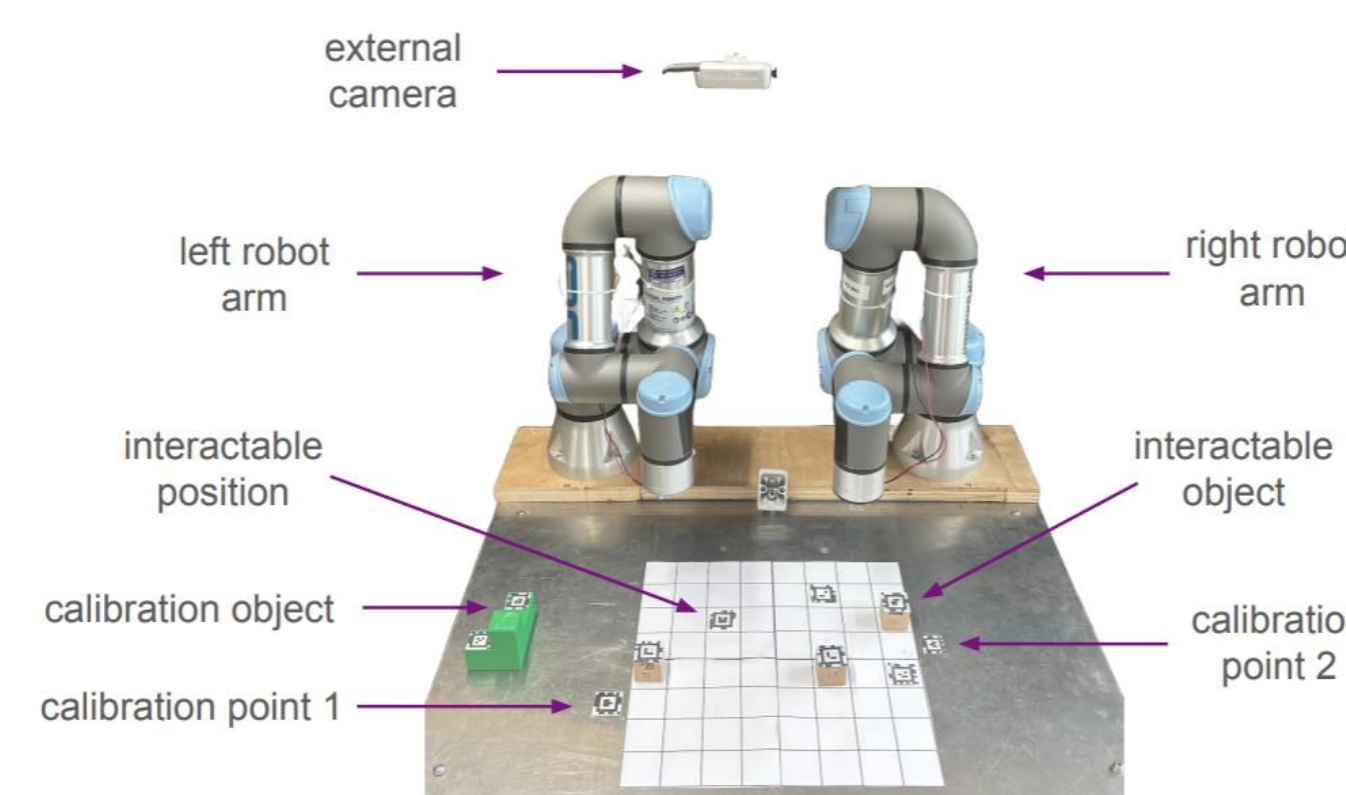


Understanding Human Physical Interaction

Cyber-Physical Platform

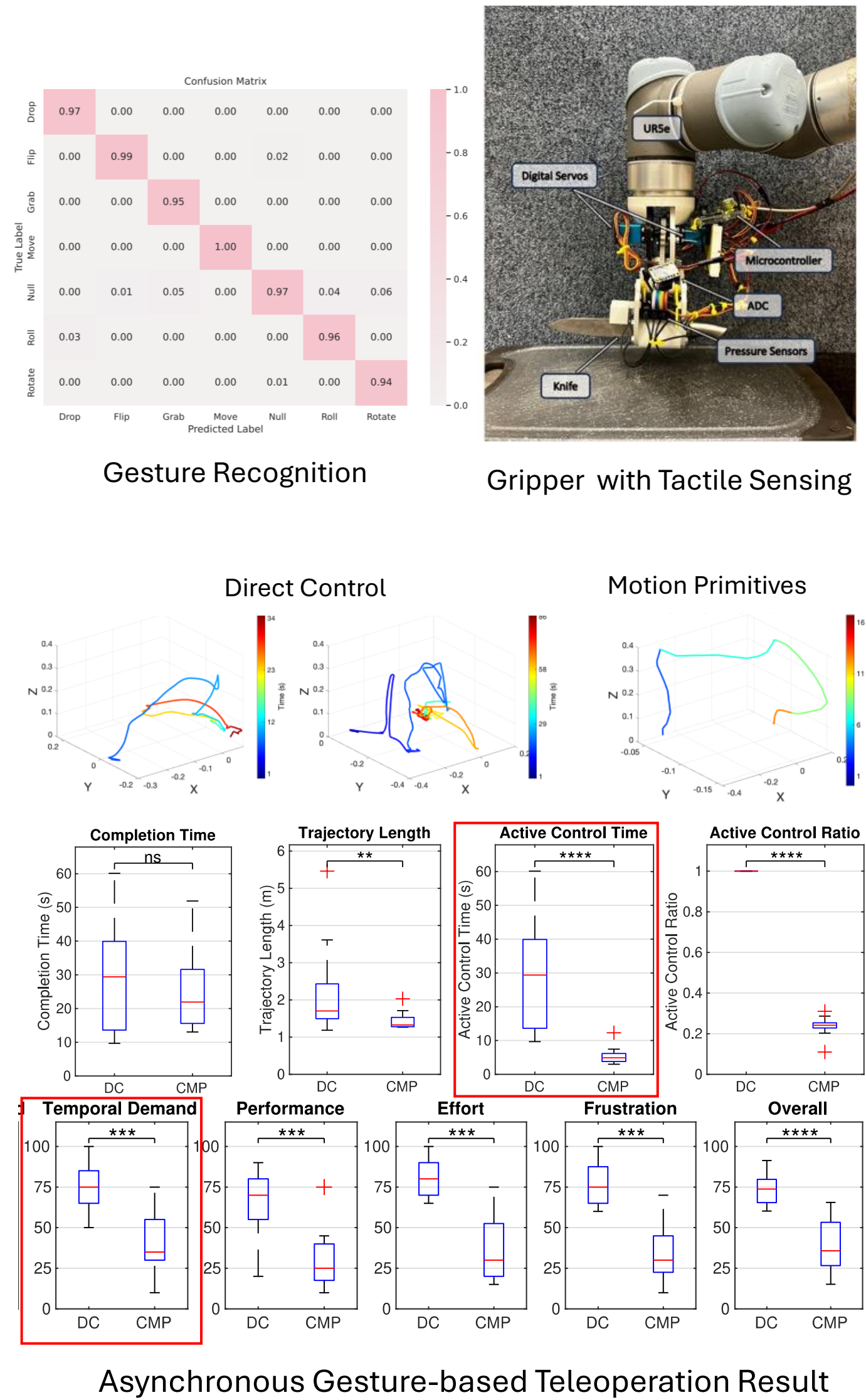


System Architecture



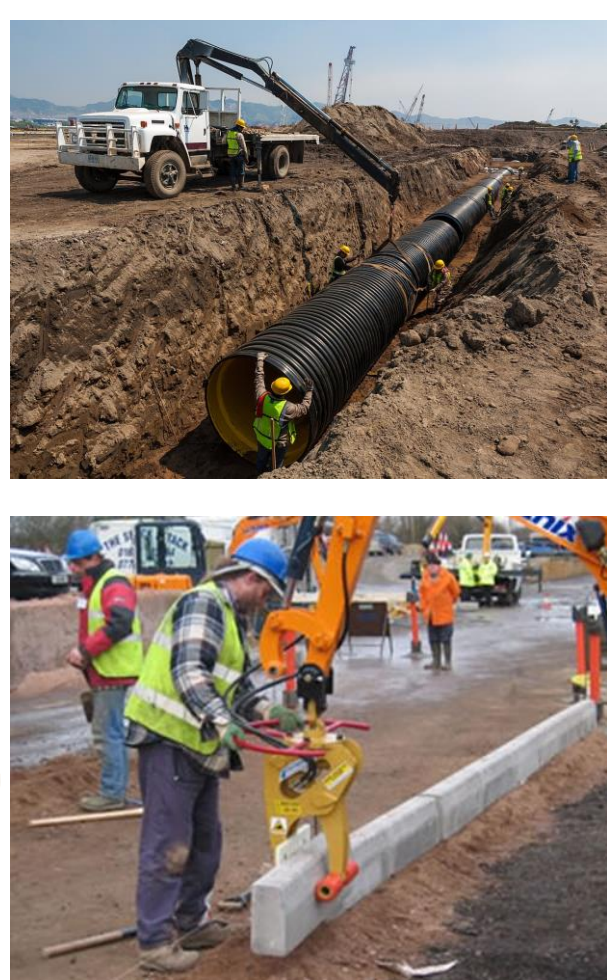
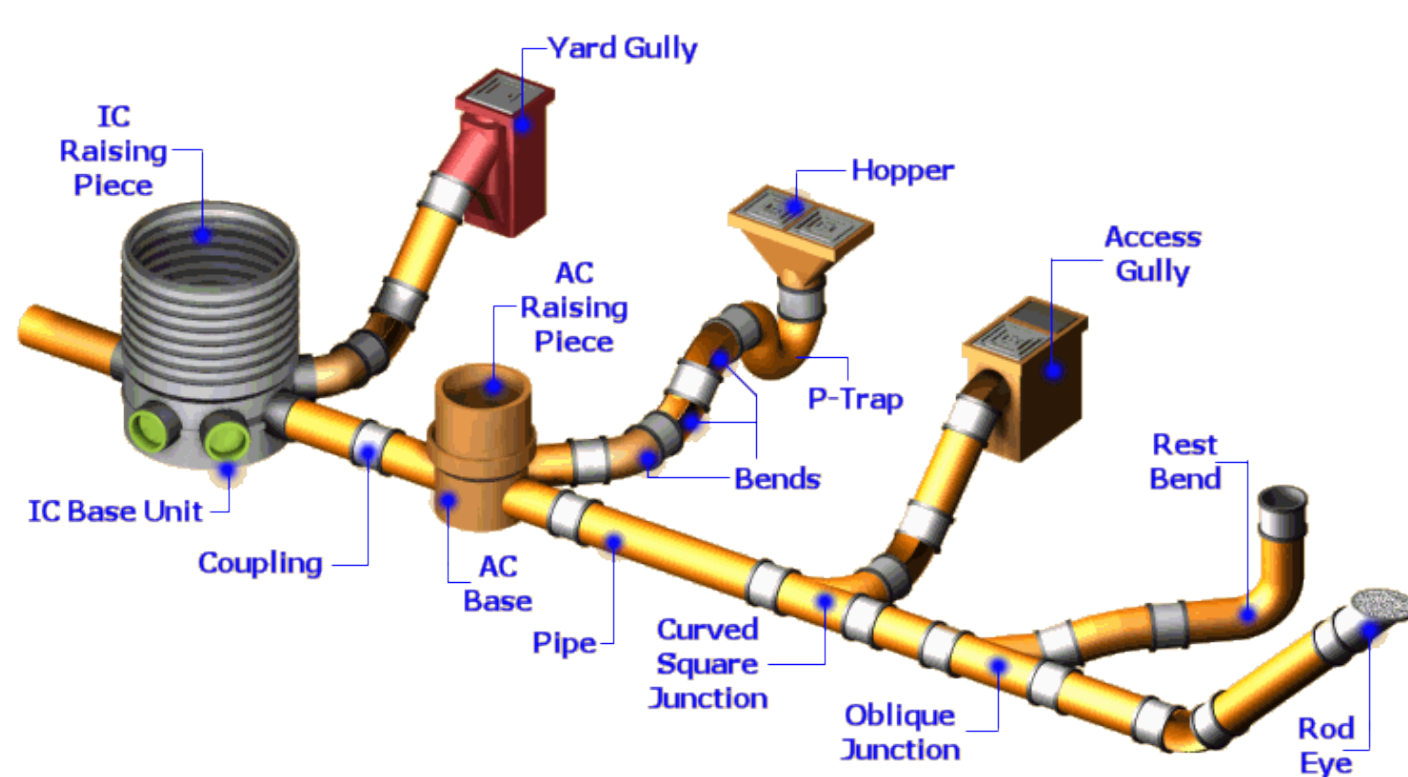
Experimental Setup

Outcomes



Asynchronous Gesture-based Teleoperation Result

Use Case



Acknowledgements:

Panomwat Warattaseth, Clare Heinbaugh, John Dudley, and Ran Xin.

References:

- Abdulali, A., Cornella, A. C., Sirithunge, C., & Iida, F. (2024, September). Effect of Material Viscosity on Tactile Compliance Discrimination. In 2024 10th IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechanics.
- Nonaka, T., Abdulali, A., Sirithunge, C., Gilday, K., & Iida, F. (2023, April). Soft robotic tactile perception of softer objects based on learning of spatiotemporal pressure patterns. In 2023 IEEE International Conference on Soft Robotics.
- Panomwat Warattaseth, Arsen Abdulali, John Dudley and Fumiya Iida "Enhancing Robot Teleoperation using Motion Primitives and Mixed Reality", IEEE Transactions on Visualization and Graphics (Under Review).