



Safe and Efficient Robot Collaboration System for Next Generation Intelligent Industrial Co-Robots

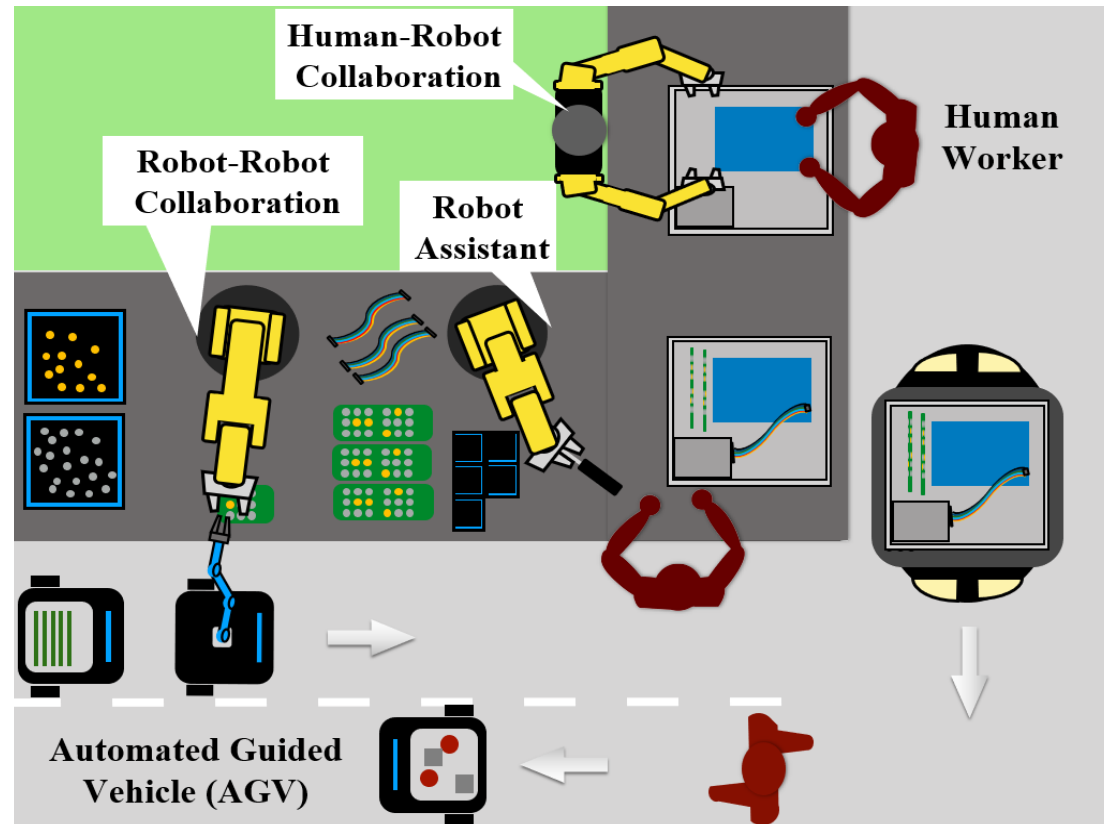
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Objective

Safe and efficient robot collaboration systems (SERoCS)

- Smart factories
- Next generation co-robots
- Design principles

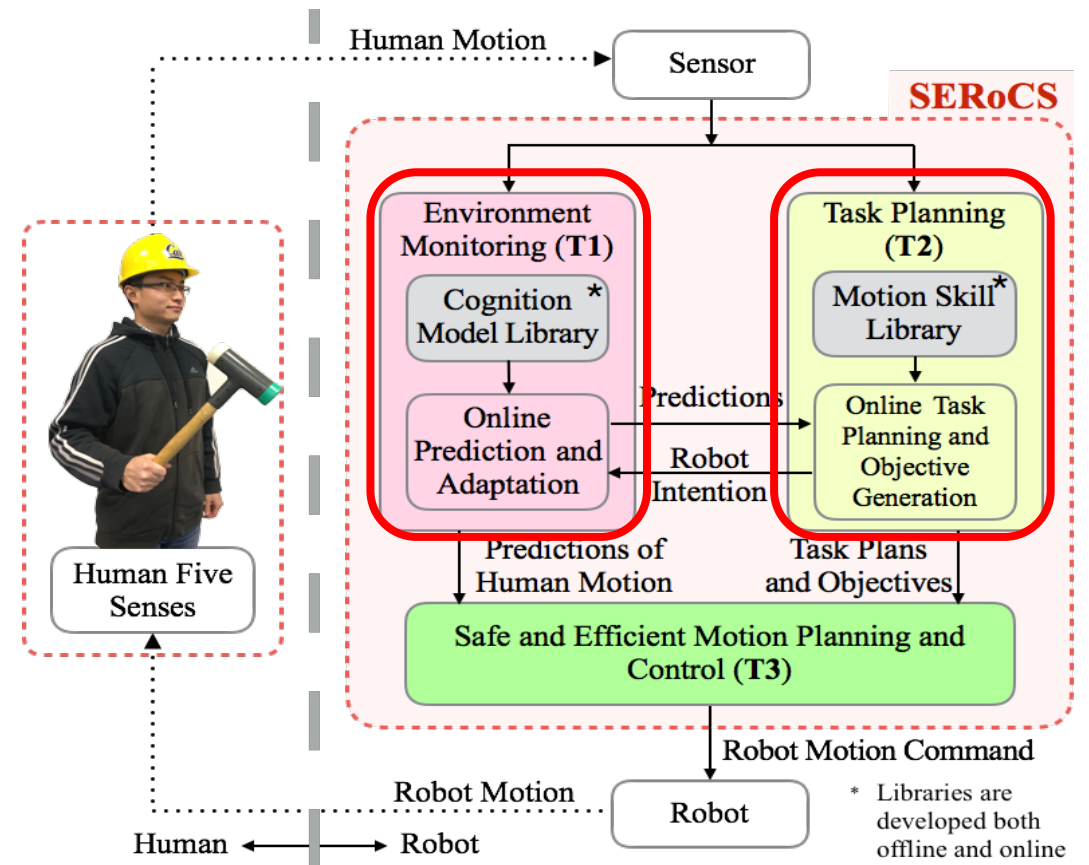


Overview



Safe and efficient robot collaboration systems (SERoCS)

- **Task 1.** Environment Monitoring with Human Motion Prediction
- **Task 2.** Task Planning with Skill Library

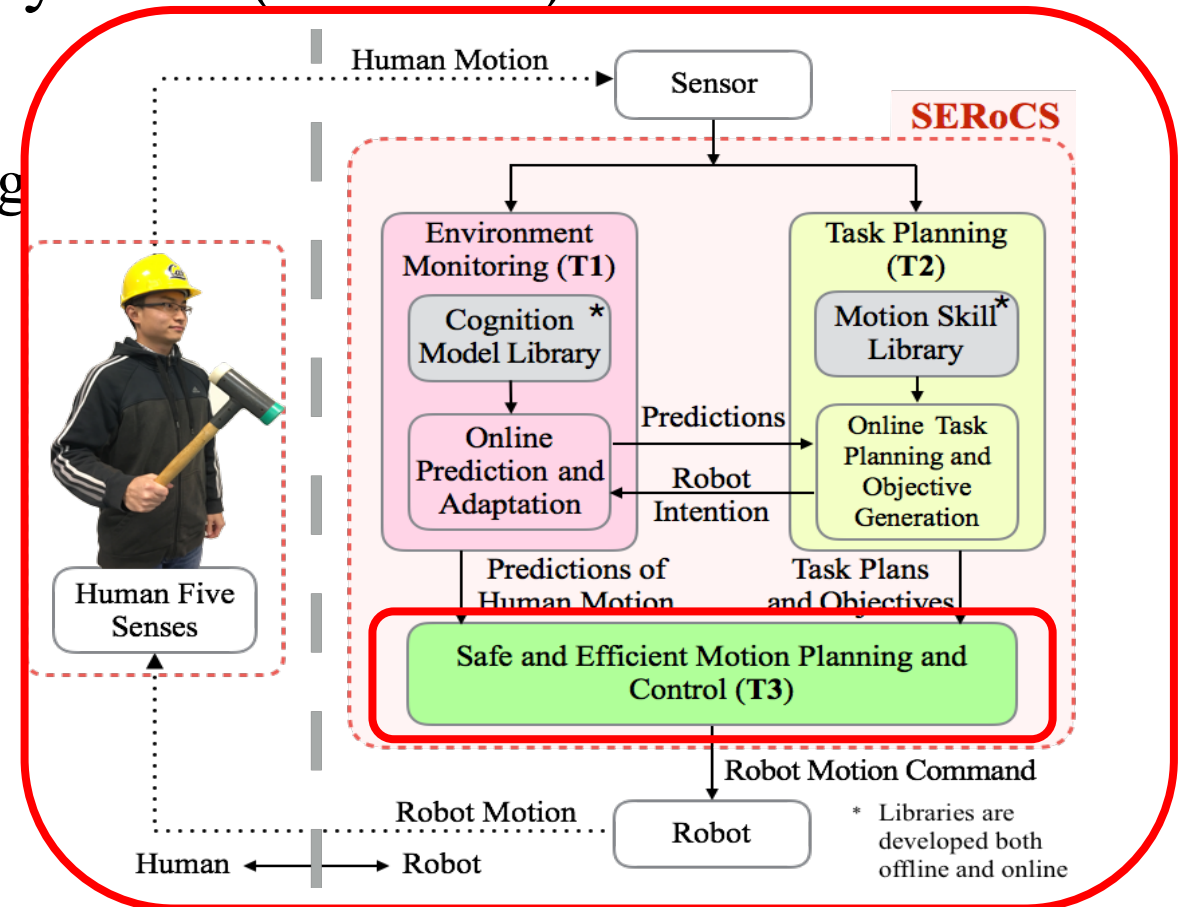


Overview



Safe and efficient robot collaboration systems (SERoCS)

- **Task 3.** Safe and Efficient Motion Planning and Control in Real Time
- **Task 4.** Evaluation of the SERoCS by Analyses, Simulations and Experiments

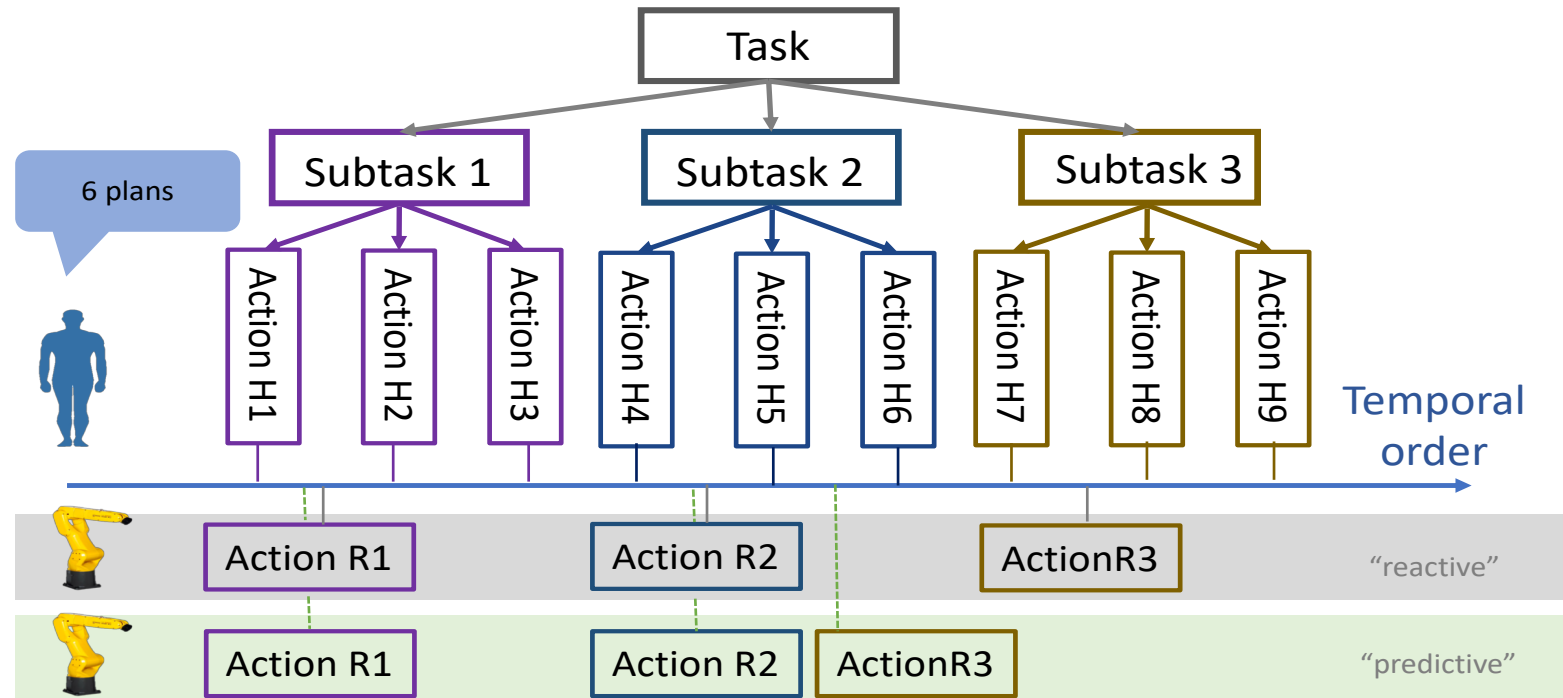




Methods and Results

Task 1. Environment Monitoring with Human Motion Prediction

- Structure of collaborative tasks

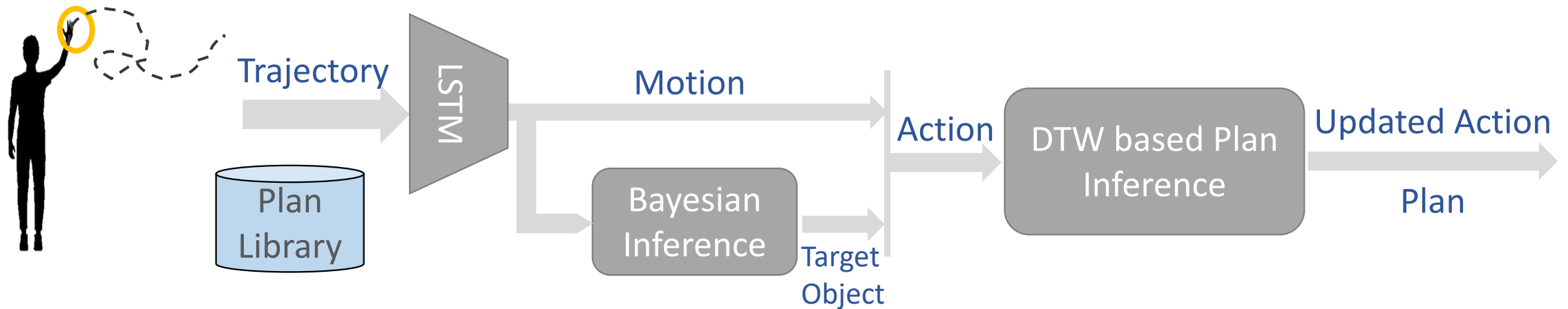


Methods and Results



Task 1. Environment Monitoring with Human Motion Prediction

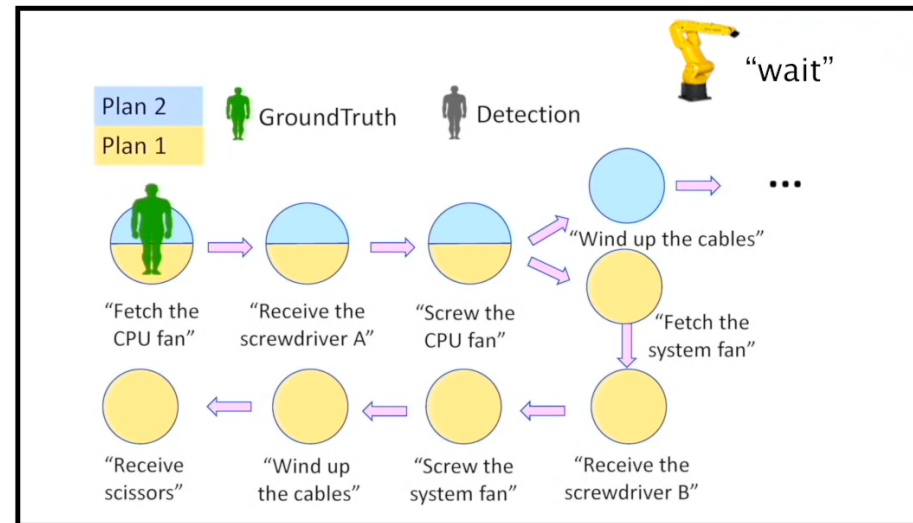
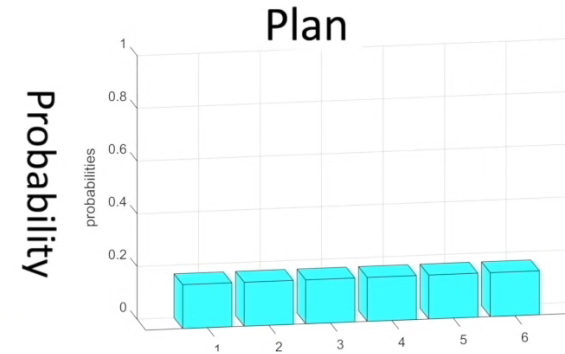
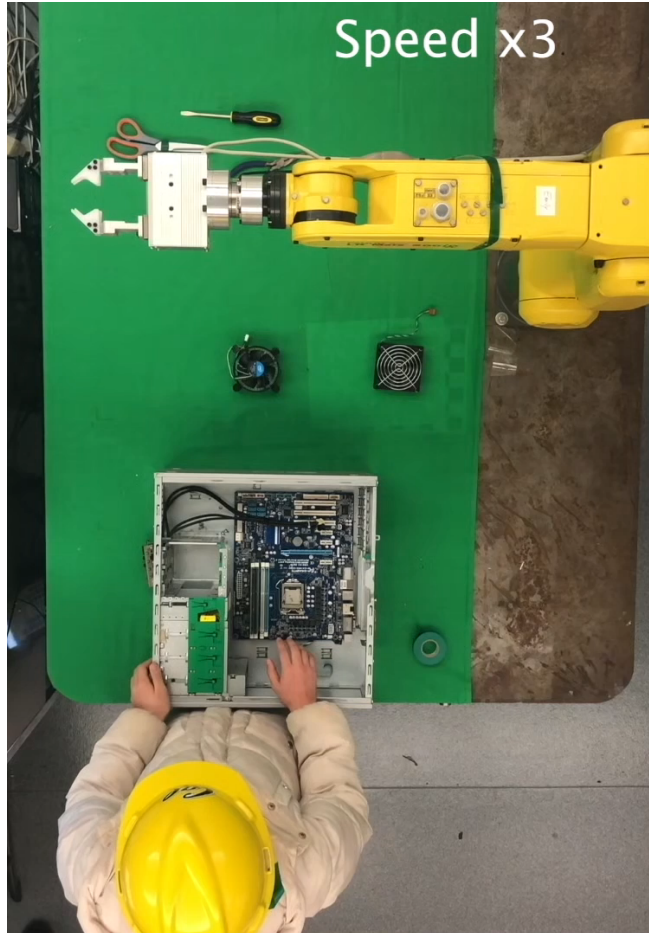
- Predictor



Methods and Results



Task 1. Environment Monitoring with Human Motion Prediction



Methods and Results



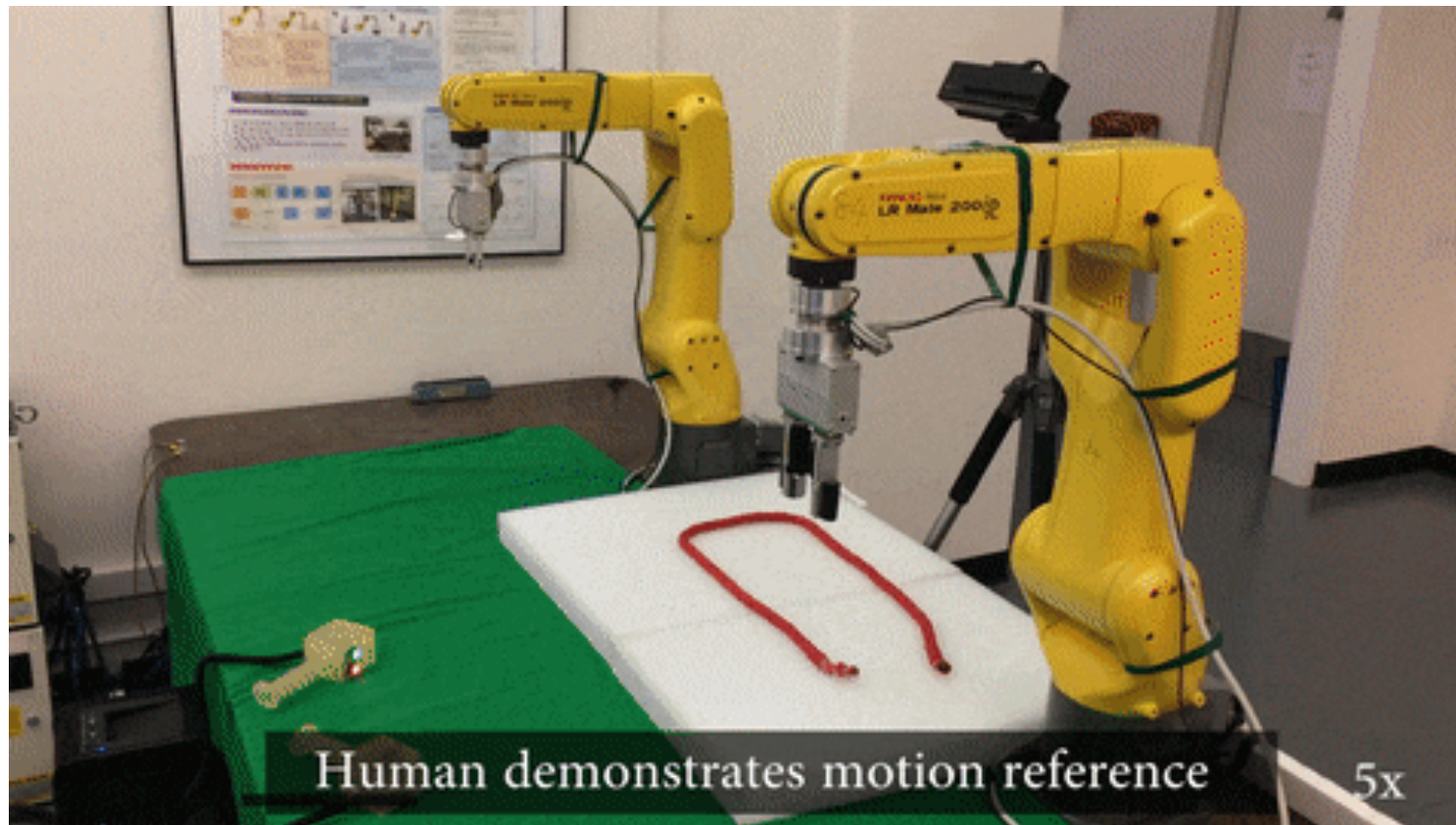
Task 2. Skill Library For intelligent co-robots



Methods and Results

Task 2. Skill Library For intelligent co-robots

- Learning from Human demonstration

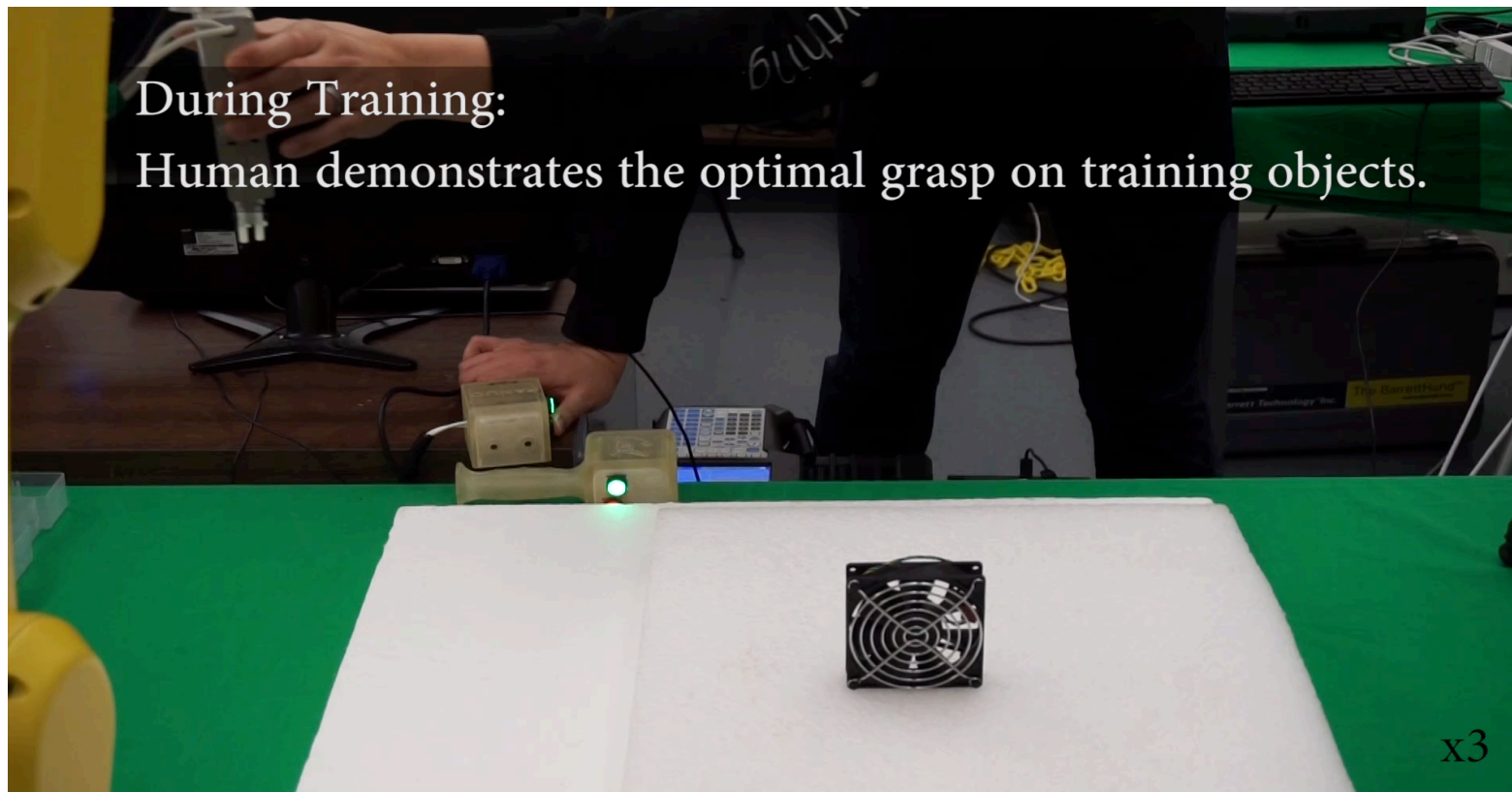




Methods and Results

Task 2. Skill Library For intelligent co-robots

- Analogy Learning

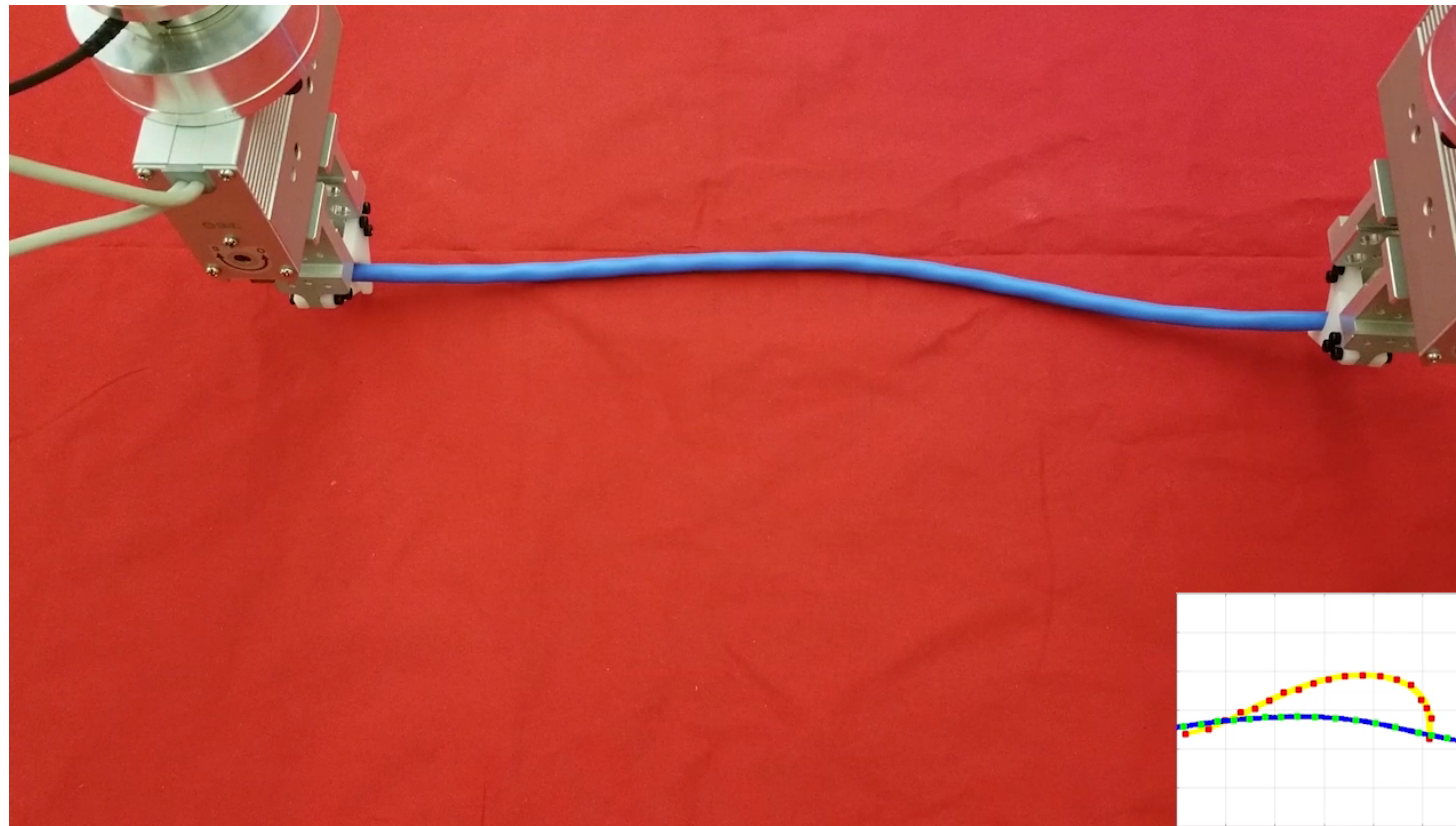




Methods and Results

Task 2. Skill Library For intelligent co-robots

- Cable Manipulation

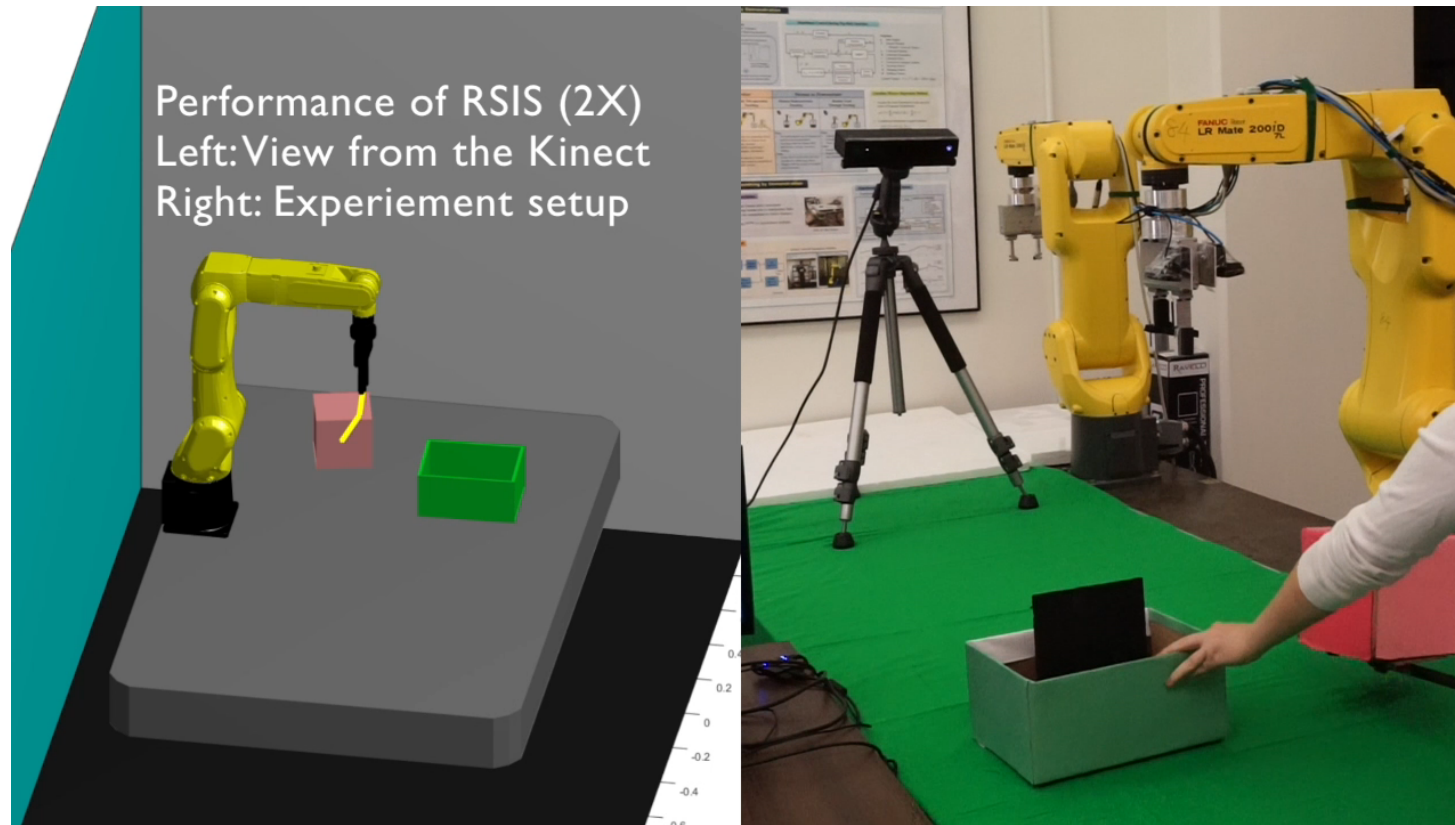




Methods and Results

Task 3. Real Time Safe and Efficient Motion Planning and Control

- Human-robot interaction/collaboration

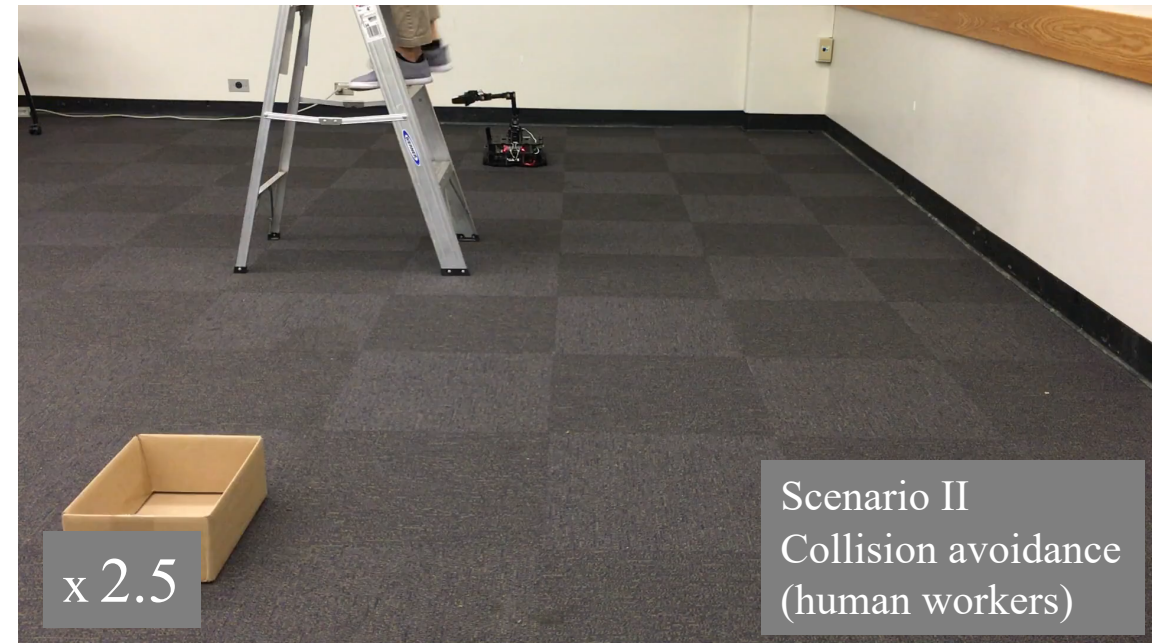
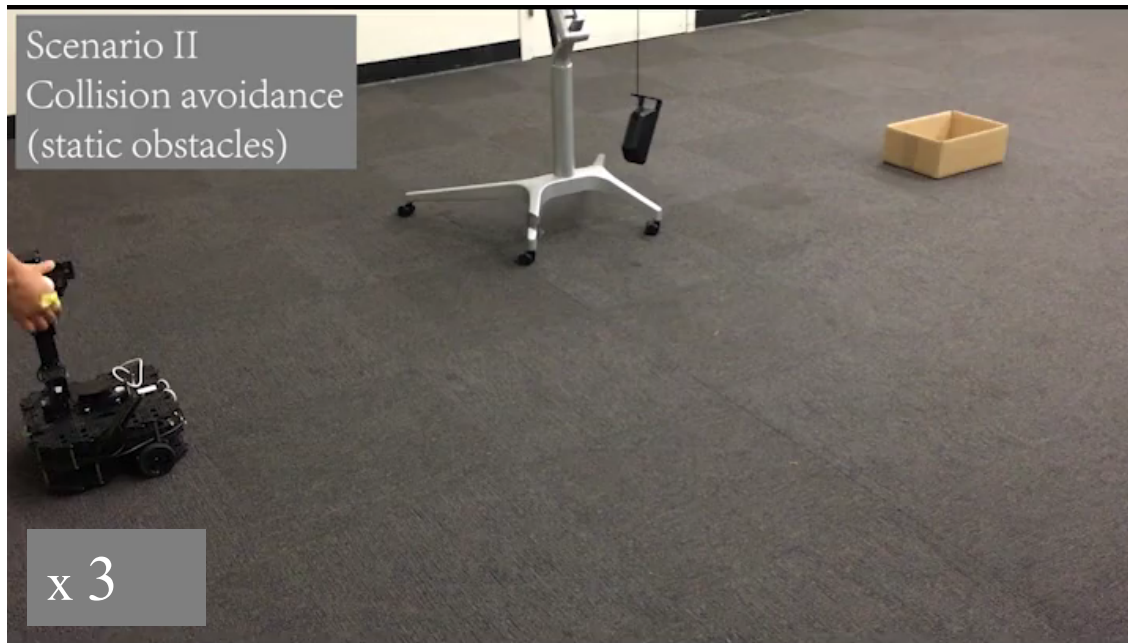


Methods and Results



Task 3. Real Time Safe and Efficient Motion Planning and Control

- Human-robot interaction

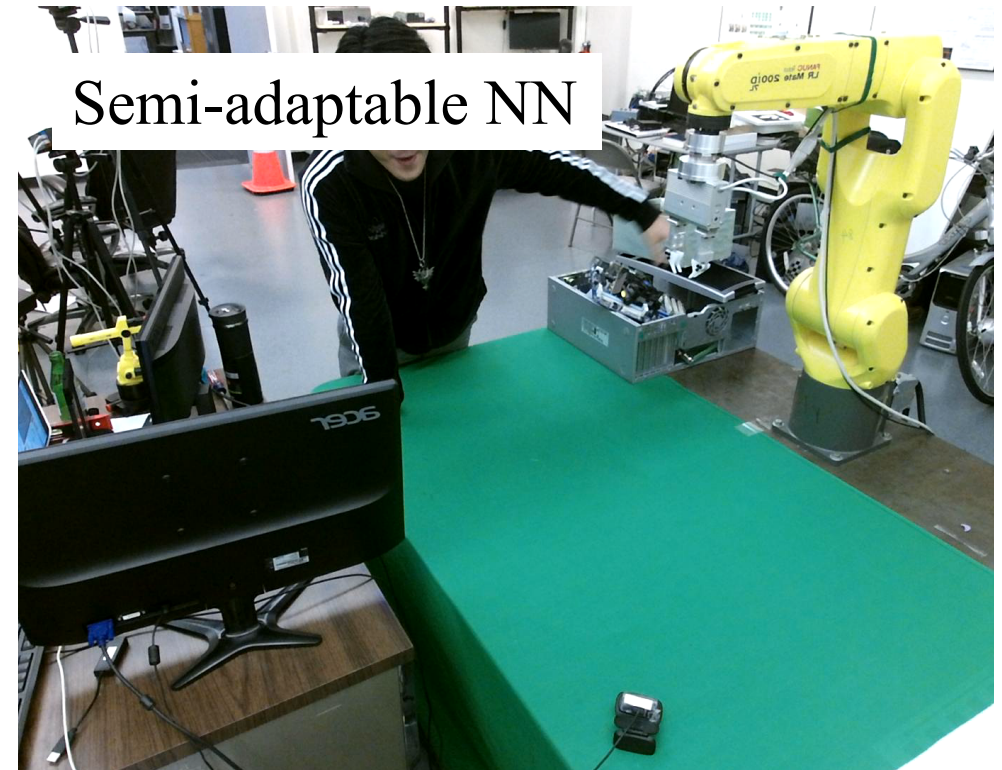
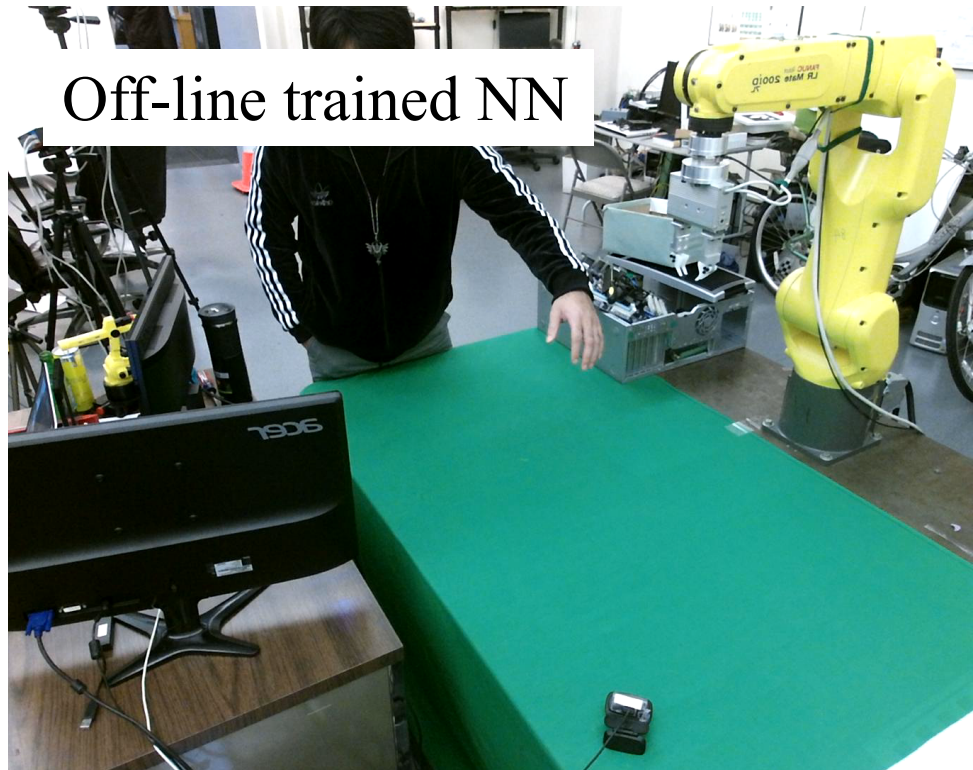




Methods and Results

Task 4. Evaluation and Benchmarking

- Experimental evaluation for T1 +T3

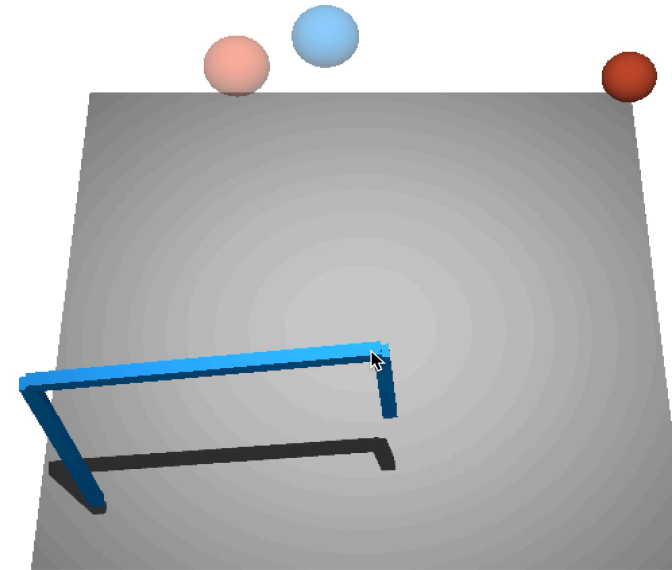
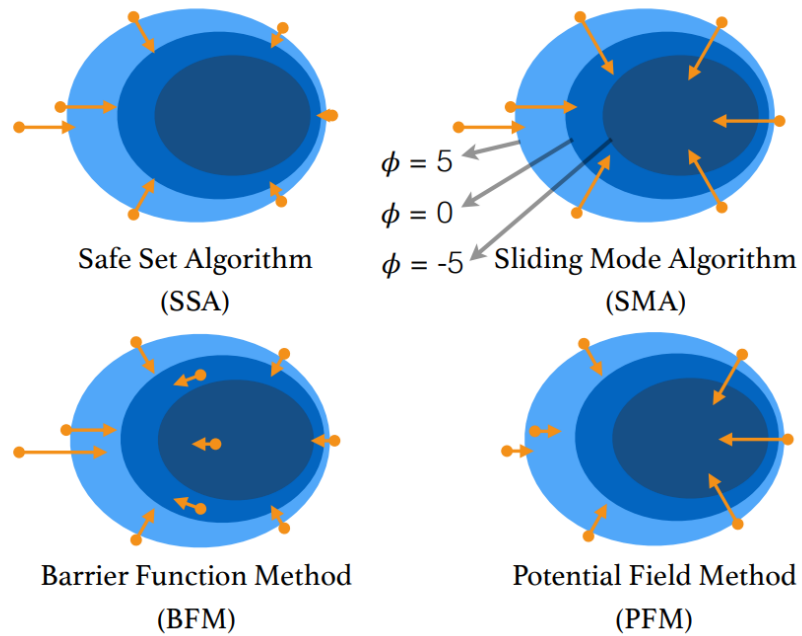




Methods and Results

Task 4. Evaluation and Benchmarking

- Unified Framework

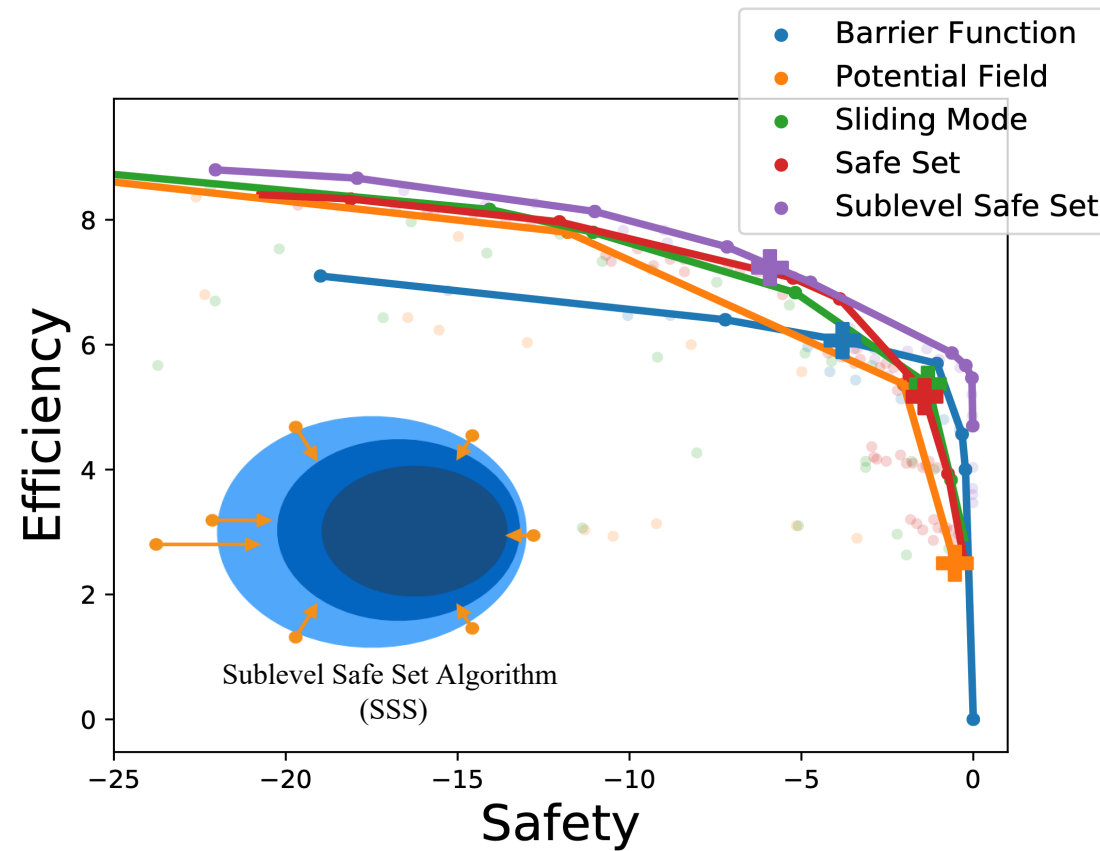


- Human
- Robot
- Human Goal
- Robot Goal

Methods and Results



Task 4. Evaluation and Benchmarking



Conclusion and Future work



- Modules for Prediction, Skills, Planning, and Evaluation have been developed.
- During the remaining funding period, we will
 - Enhance each module,
 - Conduct comprehensive experiments to demonstrate the strength of the whole SERoCS system.