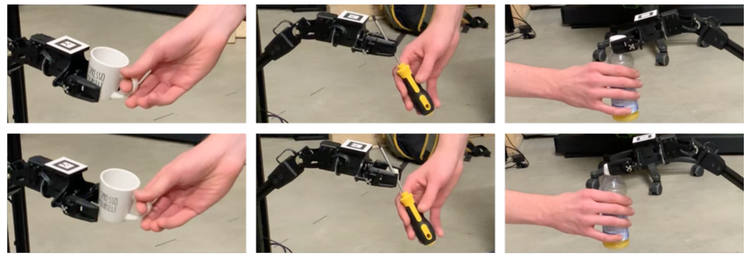
Using Multi-Modal Data to Enable Learning-Based Awareness of Human Grasp Preferences in Co-Robot Manipulators

PI: Natasha Banerjee, co-PI: Sean Banerjee, Clarkson University, Start Date: 10/15/2020

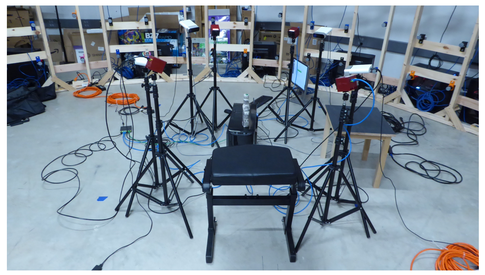
Key Problem: Imbibing robotic manipulators with understanding on human preferences for object handover

Significance: Enabling safe human-aware collaborative HRI in the wild

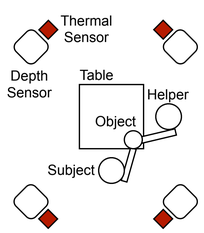


Where? (Location) How? (End Pose) When? (Release)

Solution: Use multi-modal data on multi-person handover of objects to learn human preferences on hold, end pose, and release time



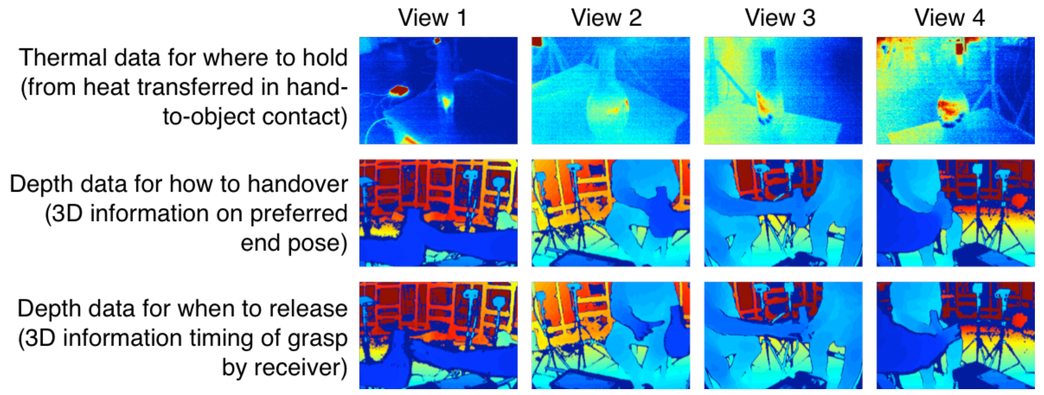
Multimodal Recording Environment



Environment Records Multi-Person Handover

Key Innovations:

- Lead 3D capture and empirical studies of 30 subjects providing preferences on handover interactions with 480 objects using calibrated multi-viewpoint multi-sensor environment
- Provide deep learning algorithms to recognize human handover preferences from input 3D representations of objects as input
- Enhance learning-based grasp algorithms to be human-aware

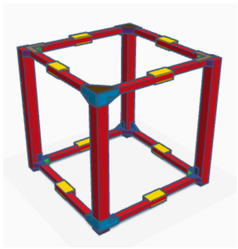


Scientific Impact:

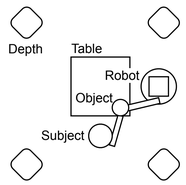
- Informs robotics work on use of multimodal data for collaborative HRI, e.g., handover, lift, and transference of control
- Results can be propagated to multiple agents both human and artificial

Work till date:

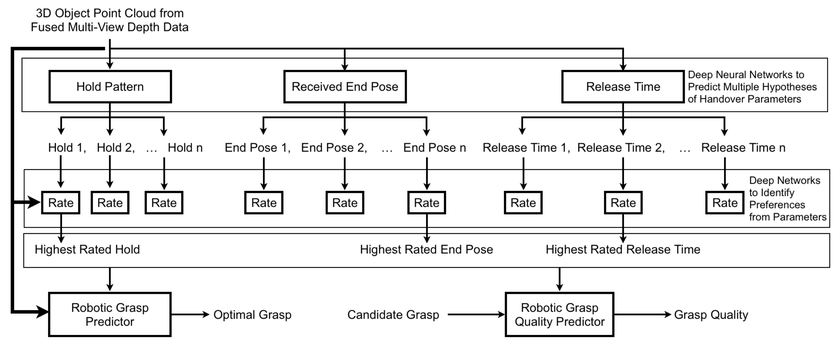
- Compiled dataset of objects to be acquired
- Created model of static frame to house cameras
- Setup of Kinova robot and purchase of objects is currently ongoing



Model of frame to house cameras



Robot-Human Handover Using Human-Aware Grasp Algorithms



Broader Impacts:

Enables co-robots to provide safe assistance in assisted living, warehousing, retail, assembly, and repair.

We will demo the human-aware robots to perform outreach during Clarkson's Open House, Accepted Students' Day, Family Weekend, and Horizons Program.

Currently 1 undergraduate working on the project, will be funded as graduate student in Fall. Plan is to have 5 undergraduates, through directed study & summer research with focus on females and URMs.

2021 NRI & FRR Principal Investigators' Meeting
March 10-12, 2021

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