SAG Additional Documentation – Final Report
Human Interactions Robotics lab Project

This semester, our Human Interactions Robotics Lab (HIRo) had a group of 8 students working on projects and researches in the human-robot interaction space. With two robotic arms, a gripper and a depth camera, we set up a humanoid robot called Xamyab to make the robot look friendlier to humans.

Because the robotic arms on the humanoid robot now have two different coordinate systems, we needed to ensure that they could communicate with each other and they would not collide with themselves as well as with the surrounding physical environment. Therefore, we developed a simulated robot in the *Gazebo* simulation software to test out our path planning and control algorithms before executing them on the real robot. For the path planning and control part, we incorporated *MoveIt!* to handle collision checking and to optimize the path planning of the two robotic arms. The final integrated system on the simulation environment works very well, and so we applied that to the real hardware. However, some parts of the simulated system (like controlling the gripper) do not work with the real hardware just yet as the drivers for it are not available at the moment. Therefore, in the next semester, we will develop our own drivers for these missing parts.

Besides, some of our members did an independent study on machine learning this semester. Our goal is to establish a strong machine learning background in our group. We'd like to apply machine learning to solve challenging robotic problems such as object localization and human recognition that are applicable to many human-robot interaction projects.

Finally, we enhanced our documentation by updating the Wiki page on Github (github.com/olinrobotics/hiro/wiki) and putting more projects on our lab's website (olinrobotics.github.io/hiro/). We also re-organized our code base and developed the core software systems that are both maintainable and extensible for future use, which we hope could help new members get familiar with the systems easily. As we already have the core systems, we were planning to create some basic tutorials for newcomers, especially for first-year students coming next semester.