MECH 493 Web Summary

Robot End-effector Orientation Control in a Mixed Reality Programming Interface

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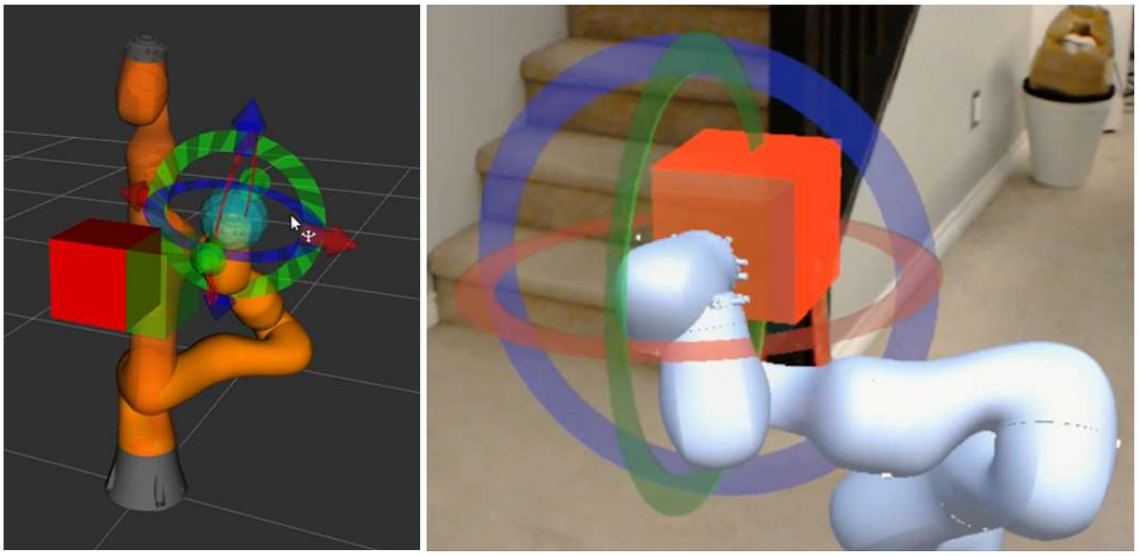

Mixed reality (MR) interfaces have been used for intuitive robot programming. This approach can facilitate the human-robot interaction by reducing/eliminating the required technical background for users. However, the current MR interface designs simply control the end effector positions with limited orientation control. This limitation prevents generalizing of current interfaces to complex manipulation tasks. In this project, we propose an MR-based interface for end-effector orientation control in 3D. To realize the benefits of the proposed interface, a comparison between the 3D and 2D visualization will be conducted. We selected HoloLens as the MR platform to build the 3D interface, and RViz is chosen to realize the 2D interface for comparison. One expert user is selected to participate in the experiment aligning the end-effector of the robot to the normal direction of the cube surface within position and angle tolerances. We measured the task completion time, the number of rotation operations and the mental workload during the experiment. The results show that 3D interface outperformed 2D interface in task completion time and the number of rotation operations, with inconclusive result for mental workload. The results demonstrate that the 3D interface can perform the orientation control of end-effectors faster with fewer operations compared with the 2D interface.