HTC Vive Interface for Baxter robot

Sean Skilling

2207516s

Proposal

Motivation

Virtual reality devices provide us with an opportunity to interact and control devices such as the Baxter robot in a way that is far more in-depth and precise than a keyboard or controller. One issue with such devices is that most do not run on Linux systems. The HTC Vive does run on Linux and could prove key in building a single computer VR control for the Baxter robot.

Aims

This project will develop a system that allows the HTC Vive to interface with the Baxter robot on a single Linux machine. This will convert the Vive controller's movements into instructions for Baxter, and stream Baxter's visual feed to the Vive headset.

Progress

- Basic ROS/catkin workspace set up and running

- Researched previous attempts at this project for ideas and implementation

- Decided on use of SteamVR to run HTC Vive on Linux

- Vive setup tested in lab

- Initial version of controller-gripper software developed, which will be improved in the coming weeks

Problems and risks

Problems

- Initial plans to develop on a laptop running Linux fell through after many weeks stuck at setup.

- Running VR software on Linux is fairly new and thus prone to far more issues than running on Windows.

- Vive can be temperamental when being set up, resulting in wasted hours trying to get the headset working.

- Many errors that pop up for SteamVR on Linux are poorly documented, resulting in long periods of time spent looking for ultimately simple solutions.

Risks

- HTC Vive can be tricky to get running even in identical setups. **Mitigation:** have managed to narrow down the setup to work first try roughly 6/10 times

- Integrating the two separate sub-components (visual and control) could prove difficult due to compatibility issues with available software due to running on Linux. **Mitigation:** a few options for integration of the sub-components have been selected to attempt.

- There is a discrepancy in reference frames between the Vive and Baxter. The Vive's base is the headset, while Baxter's base is its body. While this can be adjusted for, the Vive's references are all from the headset which means that tilting the headset tilts all of the other coordinates and moves the controllers in reference to the headset. **Mitigation:** the Vive Tracker accessory (sold separate from the normal HTC Vive system) could be purchased, attached to the user's torso and set as the base to remove the referencing issue

Plan

Semester 2

- Week 1: determine if the Vive Tracker accessory is a necessary purchase, tidy up and refine controller system in spare time

  - **Deliverable:** either a controller-gripper system with fixed referencing or proof that such a system is impractical in the timeframe.

- Week 2-4: research into whether implementing ZED camera interface in OpenGL or converting the Vive controller system to Unity is the better option, and implement ZED camera connection in chosen framework.

  - **Deliverable:** basic ZED camera system that works with the Vive

- Week 5-6: combine both systems into a single system that runs both visual and controller systems at once.

  - **Deliverable: combined system.**

- Week 7: further refine the controller system and tidy up code.

  - **Deliverable: refined, most likely final, combined system.**

- Week 8-10: Write up

  - **Deliverable: first draft submitted to supervisor at least two weeks before final deadline.**