The Potential Use of Kimera for Spatial Mapping to Predict Human Intent

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Introduction

Many existing robotic lower-limb assistive devices available today are reactionary in the sense that they must first be prompted manually by the user to begin assisting with a particular action. Our research is focused on building a system that will allow the assistive device to predict the user's intent and begin helping with the action before a forced prompt, allowing for a more seamless and intuitive user experience.

Skills Learned

- Linux: how to use and approach linux systems by using the terminal
- ROS: learned both ROS 1 and 2 with the goal of running Kimera inside of a catkin workspace
- Kimera: installation for use with SLAM

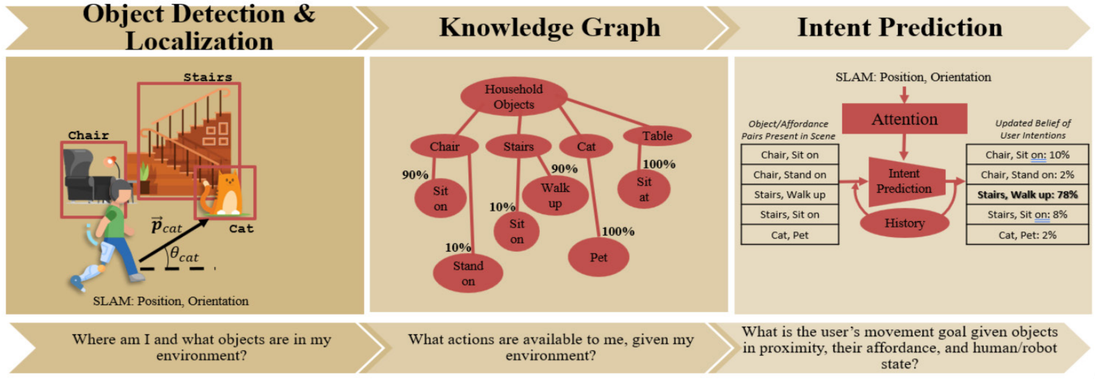

Fig 2. Shows the proposed process for solving user intent recognition. It begins with using SLAM to find objects in the environment, we believe Kimera to be the best tool for this. Then intent prediction can be implemented based on whats found in the environment resulting in the predicted action.

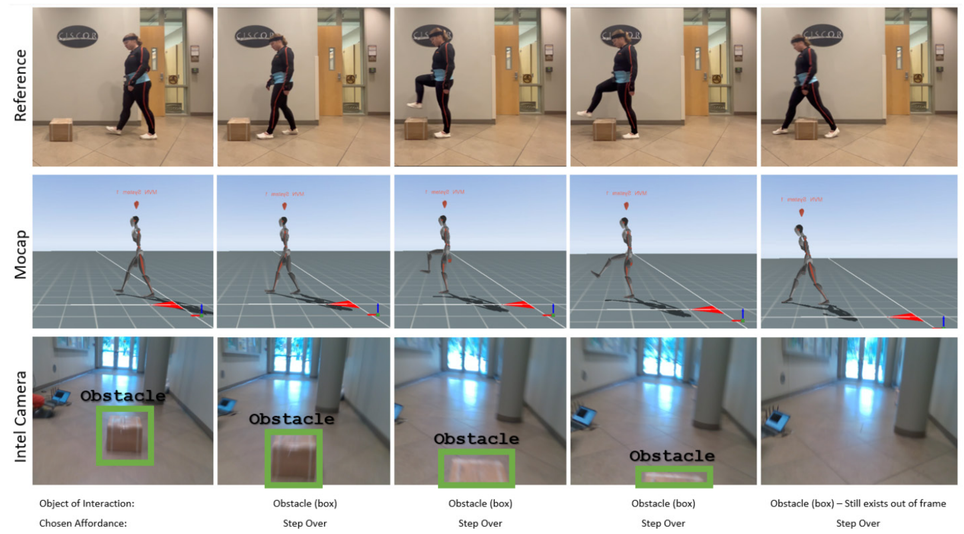

Fig 1. Above images shows the process of walking from multiple perspectives with how we intend to collect the data we want to use. In the first row my mentor Dr. Higgins is wearing a motion capture suit allowing here movements to be digitally captured giving us the movement of the person (pictured in second row). The third row shows the Intel RealSense Depth which is what we plan to use with Kimera to capture the environment. With both user and environment digitally recreated we can implement our intent prediction.

Background

We would like for the device to be able to recognize that a user wishes to sit down based on visual information revealing that they are approaching a chair and moving in a way consistent with sitting. To do this we first need to find the chairs using existing computer vision toolboxes such as the Simultaneous Localization and Mapping toolbox 'Kimera' developed and made open-source by MIT. We hypothesize that Kimera will help us towards our intent-recognition goal by spatially mapping the surrounding environment while also providing semantic labels for the objects.

Conclusions

So far, the project has required an extensive knowledge of the Linux operating system, terminal programming, and extensive debugging. Despite the dearth of instructions for implementing Kimera, we are excited to have Kimera successfully installed and are ready to begin testing it's capabilities this semester.

References

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