ECE478/ECE578
INTELLIGENT ROBOTICS – I
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Homework-1 Report

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1. INTRODUCTION:

This project is designed to give us practical experience with using a Kinect to control a PowerPoint presentation. This is a common yet critical technique and can be modified slightly to be used for controlling a robot. The Microsoft Kinect is a motion sensing peripheral which enables users to control and interact with the console via gestures and voice commands.

Using the Kinect in this initial homework allows us to gain useful experience in how to use Kinect to create commands and data for the Countess Quanta robot. The state machine in the PowerPoint is one of the task which can be extended to a real-time robotic task. Using PowerPoint for scenario prototyping is one other task which we implemented in this project.

This project mainly deals with creating a PowerPoint presentation which has a state machine embedded in it and controlling movement of slides using a mouse pointer which is controlled by tracking the user's right hand with Kinect.

2. POWERPOINT and KINECT:

The PowerPoint presentation includes 11 slides total. The presentation moves to a new slide when the user selects a textbox (using gestures to control the cursor) embedded in the presentation's current slide. In addition, when the PowerPoint transitions to a specific slide, the robot will speak a sentence or ask a question specific of the slide.

The Kinect will initially detect the "right hand" (based on the user's skeleton) then it will control the mouse cursor of the laptop or computer based on the relative movement of your right hand. The Kinect will detect if the presenter wants to perform a left click by detecting how long their left hand is also held up. In other words, if a user wants to do a left click, the user has to move the cursor to a specific location on the screen by using their right hand then the user has to raise their left hand next to their right hand so that the Kinect knows that the user wants to do the left click.

In short, the Kinect will control the movement and the left click action of the cursor based on user's right hand. The PowerPoint will control slide movement and audio output of the slides.

3. STATE MACHINE:

The state machine mimics the PowerPoint slides in such a way that it obtains the coordinates of the mouse whenever a click motion occurs. With those coordinates the state machine then determines which state to go to next. There are some issues with this plan, because the resolution of the screen affects the position of the X coordinates for the labels greatly. With this in mind, we need to make sure we either use the same laptop for demonstrations or have another laptop capable of the same screen resolution.

4. CONCLUSION:

The PowerPoint and Kinect programs work well according to our expectations but there are still a couple of constraints. One such limitation is that the user must stand far enough from the Kinect for it to recognize the user's right hand. Another area for improvement is that the translated movement of the cursor on-screen is not perfectly smooth when the user moves their right hand. These inconveniences may be fixed if some parameter values or algorithms in the code are tuned.

5. REFERENCE:

https://code.msdn.microsoft.com/windowsdesktop/Easy-Kinect-Mouse-09233c52 - This is where we obtained the Kinect interfacing code in order to move the mouse around with our hands (This was our first experience with using the Kinect until we started using the Linux program).

http://mitchtech.net/ubuntu-openkinect-mouse-control/ - This is the other open source version of the code that uses C instead of C#. This is the program we ended up using because we could modify it and implement our state machine with it easily.

http://audacityteam.org/ - We used Audacity to edit and record our voices for use with the PowerPoint slides.