Lab 5

Leap Motion

Objective

In this experiment, students will use “Leap Motion” device to achieve the following goals:
1. Get familiar with the Leap Motion device.
2. Control the Puma robot to grab an object using their own hands.

Reference Materials

1. Leap Motion documentation in the following address:
   https://developer.leapmotion.com/documentation/Languages/C++/Guides/Leap_Overview.html
2. Examples under LeapMotion directory under /usr/local/src/.

Lab Procedure

Part 1

A. Getting familiar with the Sample program that will be used to read raw data

1. Create a C++ project in Eclipse to edit and compile your programs. You will need to use the Leap library under /usr/lib/.
2. Add to your current eclipse project the "h" and "cpp" files provided under /usr/local/src/LeapMotion.
3. Open and review the source code (Sample.cpp) and try to understand it and the make sense of the raw data returned by the sample code.
4. Within Eclipse compile the Sample.cpp program provided under /usr/local/src/LeapMotion.
5. Connect the Leap Motion Device to a USB port making sure the shiny side of the controller faces up and the green light faces towards you.
6. Open a Command window and run the following command:
   1. /usr/bin/leapd.
7. Open another command window where you will be running your program and enter the following command:
   1. export LD_LIBRARY_PATH=/usr/lib/Leap/.
8. Compile and run the generated binary from compiling the sample program file in the “Release” subdirectory.
Part 2

B. Controlling the Puma robot using the C++ API

1. Add to your current eclipse project the ".h" and ".cpp" files provided under /usr/local/src/Puma_API.
2. Follow steps provided in Lab 2 to turn on the Puma Robot.
3. Compile and run the test.cpp program whose function is controlling the the end effector of the Puma robot using XYZ_OAT.

Part 3

C. Move the Puma robot and grab a cylinder, by moving your hand on top of Leap Motion device

1. Modify the “Sample.cpp” code in order to retrieve only useful data for your program.
2. Make sure to read the documentation in the link above to understand the coordinate system and angles used by the leap Motion device and convert them to XYZ_OAT coordinates used by the robot.
3. Assign two different gestures for opening/closing the gripper (write the required data in the named pipe responsible for opening and closing the gripper under /usr/local/pipes/gripper).
4. Move the Puma robot to the corresponding position specified by hand (if it is a valid position and orientation for the robot).