The University of Western Australia
School of Engineering
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Robot Manipulators and Automation
AUTO4507

Lab Assignment 5+6 –*Groups of 2*– Serial Robot/VisionPoints: 10+10

Make yourself familiar with the UR5 robot documentation and the interfacing via Ethernet.

Lab 5 – Moving in Space

Experiment 1

(a) Joint Space
Write a program that moves the robot in a sequence to the 4 corner points of a **square** of size 20cm. Let the robot stop for 1 second after reaching each position.

(b) Cartesian Space
Repeat the same experiment, but let the arm move along a straight line

Experiment 2

(a) Joint Space
Write a program that moves the robot in a sequence to the 8 corner points of a **cube** of size 20cm. Let the robot stop for 1 second after reaching each position.

(b) Cartesian Space
Repeat the same experiment, but let the arm move along a straight line

Experiment 3

Write a program that moves the robot gripper along a circle of diameter 20cm.

Lab 6 – Vision System

Let the robot arm rest about 50cm above the table with the camera looking down. Using OpenCV in Python or C++, solve the following experiments.

Experiment 1

Identify all objects on the table and classify them as either triangle, square, (half-) circle or star shapes using OpenCV function: `approxPolyDP`

See link for shape detection:

`https://stackoverflow.com/questions/11424002/how-to-detect-simple-geometric-shapes-using-opencv`

Print out each object's type.

Experiment 2

For each detected object:

- Calculate and print the global coordinates of its 2D center-point.
- Move the robot arm so the object's center is in the center of the camera image.