Pre Lab 2

Object Recognition and 3D Pose Estimation

Objective

Students in this experiment will continue using stereo cameras, an image acquisition program and image processing algorithms to identify different objects and estimate their positions (XYZ coordinates) as well as orientations (OAT angles) in the camera field of view. Once the poses of the objects are calculated, you are to move the robot to simulate the grasping for each object in the robot workspace. You are required to achieve the following goals.

1. Learn how to use image processing algorithms to identify different objects in an image.
2. Learn how to incorporate the camera calibration matrix obtained in the previous lab experiment to calculate the pose (position + orientation) of the objects in the robot workspace.
3. Learn how to manipulate PUMA 260 robot.
4. Define a successful grasping strategy for picking up different objects.

Reference Materials

a) Lecture notes, i.e. 3D reconstruction and image processing.

b) Matlab Image Processing Toolbox. Some of the functions are very useful in this lab, hough, houghlines, houghpeaks, regionprops, etc.

c) VAL/VAL II programming manual (distributed at the beginning of the semester).

Assignments

a) Please read the following materials:
   Lecture notes about “Stereo Vision”, “3D Reconstruction”, “Edge Detection”, “Hough Transforms”.

b) Explain the performance of the following MATLAB functions (submit it at the first of the next session):
   hough, houghlines, houghpeaks, regionprops

Note: There may be a small quiz at the first of the first lab session related to these materials.