

PROJECT 3

Due date: May 22 2:20pm

PROJECT DESCRIPTION

In this project, you will develop a tracking robot, which is capable of tracking a target by using vision information. The robot (or called a manipulator) can carry a camera and control its orientation. We will use red ball and blue ball in the Lego kit as the targets. By analyzing the information from the camera (you may use color segment), the robot needs to rotate the camera toward the target at all times. The robot has to be at least two degree of freedom so that the camera can locate the target on the center of the view of the camera. This project will help you gain a good understanding of how to integrate vision sensors and actuators to perform a basic motion of an autonomous robot. The following three major components need to be developed and described with sufficient details in the written report.

1. **Manipulator:** You need to build up a manipulator so that you can control the digital camera freely. The camera can be rotated both vertically and horizontally for tracking targets. To achieve the precise manipulation, you may need to test different ratio of the gears to obtain appropriate angular velocity. (30%).
2. **Tracking objects:** You need to develop a function to analyze the vision information. Specifically, the color segment of the red/blue balls should be identified so that the manipulator can know which direction to rotate to (30%).
3. **Distant estimator:** You also need to develop a function to estimate the distant between the camera and the ball (30%).
4. **Written report:** In the written report, you have to briefly explain the above components you have developed visually and verbally. Any visual-aides, such as VPL diagrams, pictures of the robot and the flowcharts that can enhance readers' understanding are highly encouraged. If you would like to obtain extra credits, please also list the additional works you have done. (10%).
5. **Extra credits:** The following works may obtain up to 10% extra credits.
 - Tracking two the distances of multiple targets simultaneously.
 - Build up the meaningful scenarios to make use of the function of the tracking objects.
 - Other extra work that can improve the functionality of above functions.

DEMO AND SUBMISSION

The program will be demoed in the class of May 22. Each group has to submit a written report and source codes (please zip the source codes of whole project) to TA's email account (hlchi@caece.net) before the due date. Late submissions need be approved by the instructor, but the grade may be subtracted 10% for each additional day.