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UBot-5 Head Object Detection using Tensorflow and ROS

The project I’m proposing is for the robot head for the Ubot to actively model and query an environment. Using the Kinect Sensor, we will scan the environment using ROS and then connect it to the open source framework, Tensorflow Object Detection API built on top of Tensorflow to make it easy to construct, train and deploy object detection models. Given some prior distribution, it will again use ROS to reconfigure the robot head accordingly to search for objects and simultaneously update the object.

This project is needed because the Laboratory for Perceptual Robotics plans to have an end goal for making the robot do multiple general tasks. Right now, it can pick up boxes; however, we will need the robot to learn how to detect a specific object, for example a coffee mug, so it can pick that up instead of picking up only boxes. Before making the robot being able to pick up coffee mugs, it has to search and identify the object.

My team and I have already assembled the robot heads, displayed it on rviz, zeroed the Servos motors, and started to calibrate the Kinect sensor. This step took one week. One of our next step is to use Tensorflow to detect object given an image, which should take two-three weeks. Our next step is to do the previous step but given many different images since the Kinect sensor will be modeling in real time, taking a picture and updating the model every second or so; this will be our hardest step and will probably take one month. Our next step will be making the robot head give those images to Tensorflow and create models and detect that object, this should take two weeks. Our next step is to make the robot head probabilistically and automatically move towards an object instead of the head randomly search for the object; this step will also take a month.

I am qualified for the project because I am currently in an undergraduate research with Joydeep Biswas working with Tensorflow to create models to detect X’s and O’s given a picture of X’s or O’s. I will also be taking Machine Learning next semester to couple with the undergraduate research to learn more about machine learning. My dream is to continue robotics and machine learning after my bachelor’s and work for iRobot in the future. I also plan to only take three computer science courses so I want to take this undergraduate research for 6 credits so I can make it my priority.

I plan to meet with the team, composed of Khoshrav Doctor, Hia Ghos, Mike Lanighan, and another undergraduate student. We plan to meet weekly to update each other and I plan to work in the lab when programming or working on my contributions to the project.

At the end of the spring semester, I hope to deliver a lab presentation during one of the Friday robotics meeting. ­