Identifying Objects with related Angles using Vision-based System integrated with Service Robots

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Dedication

I am dedicating this thesis to four beloved people who have meant and continue to mean so much to me. My appreciation goes to Mr. Samantha Rajapaksha for his guidance in preparation of the final document and to my family for their support.

Declaration

I hereby declare that to the best of my knowledge, this submission on the project "Identifying Unknown Objects using Service Robots" is my own work submitted to Sri Lanka Institute of Information Technology and it neither contains direct material previously published nor written by another person or material, which to substantial extent, has been accepted for the award of any other academic qualification of a university or other institute of higher learning except where acknowledgement is made in the text. This project work is submitted in the partial fulfillment of the requirement for the award of the Master of Science in Information Technology. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

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Abstract

Manipulation an object can be done with the collaboration of a human to a robot by introducing the object in a proper way. To do this in an easy way, we can model the object inside the robot head and add some sensors and cameras to identify the specific object. But when it comes to the real world, we cannot model all the objects in the world inside a robot head. If we can manipulate every object there can be more work would have done by the robots in efficient way.

This research will present a strategy to identify the unknown objects using a vision-based system and with the perspective angles of the detected object and the system is integrated with service robots. This will go in a way when the robot should be able to identify the objects around the robot in an asynchronous manner with rotational angles and the pitch and roll angles, perspective to the robot standing surface. The research will be based on Artificial intelligence, Machine learning, and Robotics. Robotics operating system is used for simulating the robots and identification.

For the identification process, a few ways can be used. Vision-based identification using color and depth images from an RGB camera, and this research is mainly based on this RGB, and depth feature integrated with YoloV5. And there are some other ways to identify objects like using a 3D-LiDAR laser scanner. However, this learning process, should have a stable object to model and train the object. After the object recognition, by using the proposed methodology robots can calculate and estimate the angles of the detected object.

After the acquisition, the robot should be able to identify the object any time when it sees the object. Since this is a robot, we can use this to model unknown objects and retrieve the data from its database and manually name them if there is no one to name it in the time being.

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