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Tel: +94 112881571

Fax: +94 112802551

Email: icma@sjp.ac.lk

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A STUDY ON MAPPING, LOCALIZATION AND AUTONOMOUS NAVIGATION WITH iROBOT CREATE 2 ON ROS INDIGO

Diddeniya S.I.A.P.¹, Wanniarachchi W.K.I.L.^{1*}, De Silva P.R.S.² and Ganegoda N.C.³

¹Department of Physics, Faculty of Applied Sciences,
University of Sri Jayewardenepura, Sri Lanka

²Department of Computer Science, Faculty of Applied Sciences,
University of Sri Jayewardenepura, Sri Lanka

³Department of Mathematics, Faculty of Applied Sciences,
University of Sri Jayewardenepura, Sri Lanka
iwanni@sjp.ac.lk

Abstract

This paper proposes a movable robot that can be used to deliver documents between employees of an unstructured indoor office environment. The study reviews literature on robot navigation, apply promising techniques and test their accuracy in an unstructured indoor laboratory environment. There are many technologies available in robot navigation. We have selected free and open source software and inexpensive sensors and materials to build a low cost but accurate robot. Our system comprised of two units: one that process sensor data and another which is the navigating robot having sensors and actuators. We have used Robotic Operating System (ROS) indigo as the ground operating system. iRobot Create 2 was used as the basic robot and a structure was built to carry a mini PC, power cables and the vision sensor. PrimeSense, the vision sensor for our robot uses IR to measure distance. The processing unit was a workstation computer that was kept still. Two parts mainly communicated through a Wi-Fi connection. We have conducted an experiment to examine the capabilities of the setup and studied its behaviour, mapping and localization specifically. An unstructured indoor environment was selected with five users located on the sides. We considered both dark and light illumination conditions on the room. Then, we allowed the robot to navigate autonomously and randomly between users and monitored its accuracy by looking at the completion of the route to a target user. Results show that the robot has about 92% of accuracy on average in both lighting conditions and 88% and 96% of accuracies for light and dark conditions respectively. Finally this system could be practically used in an office environment in any illumination condition.

Keywords: *Indoor robot navigation, Robotic operating system, wireless robot navigation, environment mapping, robot localization*