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IDENTIFICATION OF DIFFERENT TERRAINS USING OPTICAL ENCODERS IN A MOBILE ROBOT

A dissertation submitted to the
Department of Electrical Engineering, University of Moratuwa
in partial fulfillment of the requirements for the
Masters Degree in Industrial Automation

by

University of Moratuwa, Sri Lanka.
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DECLARATION

The work submitted in this dissertation is the result of my own investigation, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

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I endorse the declaration by the candidate.

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Abstract

This research is mainly focused on identifying terrains for autonomous mobile robot navigation. When compared with other terrain identification researches this is a fully sensor based practical approach for terrain identification with a mobile robot named 'R1'. For the robotic navigation the terrain behavior is one of the most important factors to reach the target without any failure. The results obtained from this research can be used to develop the intelligence of the robot controller board to adapt according to the terrain environment.

An experimental study has been carried out for the system using R1 mobile robot by traveling various kinds of real terrains and collecting data online via a wireless data link.

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The performance of autonomous navigation improves when the vehicle's control system takes into account the type of terrain on which the vehicle is traveling. For example, if the ground is covered with sand, a reduction of acceleration is necessary to avoid wheel slip. So many researchers have developed algorithms based on vision and digital signal processing (DSP) to categorize the traversability of the terrain. Others have used classical terramechanics equations to identify the key terrain parameters.

This thesis presents a statistical algorithm that uses the vehicle's internal sensors to qualitatively categorize the terrain type in real-time. The algorithm was successful in identifying carpet, cement, gravel, sand and grass terrains.

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One's work in this world can hardly be visualized as his own achievements but a result of the hopes and strength given to him by those who are around him, those who want him to succeed and this report of mine is no difference. So I would like to take this opportunity to thank those who have given me so much in this period of research.

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