Warehouse Robotics Management Simulation

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Introduction

This project intends to determine an effective protocol to manage and coordinate multiple autonomous robots in a warehouse setting through simulation. This is an effort to improve the coordination of autonomous robots used in the operation and management of a warehouse.

Background

The automation of manual labour tasks is generally considered to be the history of progress and the motivating factor in the progress of technology. The use of motorised systems to achieve this is what initially caused industrialisation and more recently the use of robotics to achieve these tasks has been at the forefront of what is considered the “bleeding edge” of industrial processes. This is in such cases as the stationary robotic arms used in automotive factories and the also the development of rail based automated pharmacies [1][2]. There are also warehouses developed specifically to be operated by robots, such as the Kroger Ocado warehouse [3]. Of specific interest to the context of this project however, are the autonomous robots being employed in some warehouses, such as the Fulfilment Center, one of Amazon’s warehouses [4]. This project is specifically interested in improving the coordination between such autonomous robots in the operations and management of warehouses to improve the overall efficiency of the warehouses that employ them.

Constraints and Methodology

This is a design project that will be using an approach of iterative testing and benchmarking to ascertain the effectiveness of different protocols to manage and coordinate the robots in a simulated warehouse setting.

To acquire or design the necessary protocols or algorithms, research into the literature regarding autonomous robotics, the coordination of autonomous robotics and the implementation of autonomous robotics in warehouse settings will be done.

Using simulations the testing can be quantifiably ascertained, especially along the lines of time efficiency, by being tested against the same preset task schedules and warehouse conditions which provide the necessary constant to accurately ascertain this data. Additionally, the reliability and consistency of the protocols over varying scenarios can also be determined to show the possible application uses for each.

The software used to do these simulations is a combination of MATLAB and Gazebo. This should allow for simulations in three-dimensional space and ease of data processing and presentation.

The project must be completed before the 24th of October 2024, on a potential budget of R2000.

Objective and Significance

The intended result of this project is to determine a protocol that efficiently coordinates robots in a simulated warehouse environment, with the possibility of assisting in increasing the efficiency of coordination of automated robots in this setting.

This may allow for the development or use of more efficient protocols for automated robots to manage warehouses, which in the manner of industrialisation will create new roles in warehouses, such as managing and maintaining the devices.

Additionally, the coordination of automated robots has broad applications in industries that rely on manual labour and any improvements in the field may assist the development of coordinated robots in these sectors.

References

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