

**An Automatic Mobile Robot Obstacles Avoidance in a
Static Environment by using Hybrid Technique
(Fuzzy Logic and Artificial Neural Network)**

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ACKNOWLEDGEMENT

Alhamdulillah, praise and thank to Allah because of His Almighty and His utmost blessings, as finally I was able to finish this research within the time given.

I would like to give a very big thanks to Madam Nohaidda Binti Sariff, my supervisor who give me encouragement, and for doing an excellent job, advises to me to ensure my research is successful as well as spend your time to keep on eye to see my work made the best work. Special appreciation also goes to my beloved parents for their encouragement and support.

I want to say thank to my fellow classmates that helped me in giving ideas regarding this research. I also like to expand our deepest gratitude to all those who have directly and indirectly guided us in completing this project.

ABSTRACT

This project is focusing on testing the performances of the E-puck mobile robot to avoid obstacles in a static environment. Fuzzy Logic (FL) and Artificial Neural Network (ANN) have been used to improve the performances of the robot in term of time and smoothness of its path. The objective of this project is to design an autonomous mobile robot that can avoid obstacles in three different complexities of environment. Fuzzy logic is used to create rules of avoiding obstacles. The rules consist of the input from Infrared (IR) sensor and the output is from the speed of robot motor. Then the output is fed into ANN for training process to get better performance. The result shows that the objective of this project is successfully achieved. The overall performances of the E-puck robot show that integration between these controllers capable to reduce the time taken by the robot avoiding the obstacles. Furthermore, the path is more accurate.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

A mobile robot is an automatic machine that has the capability to move around in any given environment. In many applications, the robot is required to move without colliding with any obstacles. Therefore, the robot needs to have autonomous navigation capabilities in order to complete the task. One approach to autonomous navigation is using model-based. It uses one design of the environment to generate a safe path to the target location [1]. Furthermore, there are many methods to control the mobile robot that make it intelligent in order to increase the performance especially in collision avoidance and path planning.

Based on the previous researchers they recognized that from all types of Artificial Intelligence (AI), Fuzzy Logic is one of famous type that often to be used as a controller in autonomous mobile robot especially for obstacle avoidance. Fuzzy Logic is a form of many valued logic. Compared to traditional binary sets which considered either true or false values, Fuzzy Logic considered variables may have a truth value that ranges in degree between 0 and 1. That combination of many form of logic value will be the input and the controller will measure all of the input and analyze them to become output [2]. There are many types of Fuzzy Logic such as Mamdani, Takagi Sugino, Types 2 Fuzzy Logic and many more.[3]. Mamdani Fuzzy Logic is used for this project and Mamdani Fuzzy Logic Toolbox to create the Fuzzy Logic rules.

As to improve the performances of the mobile robot, another intelligence is used which is Artificial Neural Network (ANN). The input from the controller is being fed into