LIST OF ABBREVIATIONS

DC - Direct Current

V - Volts

LIDAR - Light Detection and Ranging

IR - Infrared

PIR – Passive Infrared

USB – Universal Serial Bus

LED – Light Emitting Diode

ICSP – In Circuit Serial Programming

IDE – Integrated Development Environment

AI – Artificial Intelligence

GPS – Global Positioning System

IC – Integrated Circuit

IN – Input

OUT – Output

PWM – Pulse Width Modulation

HTML – Hyper Text Markup Language

CSS – Cascaded Style Sheets

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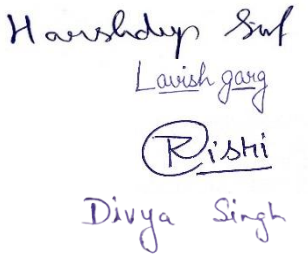
CERTIFICATE

This is to certify that the project report of B.Tech. major project entitled "**Real Time Implementation of Optimal Path Planning for Autonomous Robot**" in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology in Instrumentation and Control Engineering of Dr. B.R. Ambedkar National Institute of Technology, Jalandhar, India** is an authentic record of our own work carried out during the period from July, 2022 to May, 2023 under the guidance of **Dr. Afzal Sikander** at Dr. B.R. Ambedkar National Institute of Technology, Jalandhar. The matter presented in the report has not been submitted by me/us for the award of any other degree of this or any other Institute.



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ABSTRACT

The aim of the project is to develop an obstacle-avoiding robot that moves from a given source to a destination through the shortest valid path. Path planning or trajectory planning is one of the most important aspects in object picking and placing tasks which are usually performed by autonomous robots. They have the ability to make their own decisions and perform tasks without any human intervention. One of the key challenges in autonomous robot applications is optimal path planning. Autonomous robots having the capability to avoid obstacles can be of great use in hazardous industries, disaster-prone areas, and war-affected environments where navigation difficulties are common. A lot of time, energy, and cost can be saved if the robot moves through the most optimum(shortest) path out of all the possible paths and avoids all the obstacles at the same time.

The robot travels in a rectangular environment consisting of obstacles that are placed at specific coordinates and the robot can move from some restricted paths only. The environment is pre-fed to the robot, which uses recursion and backtracking computations to find the valid shortest (optimal) path from all the valid paths in a pre-movement stage. The shortest path is computed using the concept of Depth First Search. Depth First Search finds all the paths by exploring each valid path through which it can move and subsequently find the path with the minimum distance the robot can reach from source to destination. This data is passed to the robot which uses an Arduino microcontroller to move through the environment from the computed valid shortest path. The proposed system consists of a robot equipped with sensors, a computer, and a control system. The robot consists of an Arduino-UNO, Ultra-sonic sensor, Bridge motor driver L298, DC Motor, Servo motor, Omni-direction wheel, jumper wires, and 9V battery.

The objective of the project is to develop a technique that solves the problem of robot path planning to have static obstacles avoidances characteristics which will ensure the safety and shortness of the path. The project also includes a user interface that shows the visual description of the computed optimal path. Future aspects include the techniques of data acquisition from image processing using machine learning.

Keywords – Path Planning, Backtracking, Depth-first-search, Obstacle-Avoidance, Arduino-UNO sensor.