

Obstacle and Edge Detection and Avoidance for Robot

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Abstract- In today's world ROBOTICS is a fast growing and interesting field. ROBOT has sufficient intelligence to cover the maximum area of provided space. It has an infrared sensor which is used to sense the obstacles and edges coming in between the path of ROBOT. It will move in a particular direction and avoid the obstacle and edge which is coming in its path. Autonomous Intelligent Robots are robots that can perform desired tasks in unstructured environments without continuous human guidance.

The minimum number of gear DC motor allows the walking robot to minimize the power consumption and can produce coordination of multi-degree of freedom for the movement of the robot. It is found that two gear motors are sufficient to produce the basic walking robot and one voltage regulators are needed to control the load where it is capable of supplying enough current to drive two gear motors for each wheel.

Keywords- IR Sensor, Motor Driver, Microcontroller, DC Motors, Emits, Robot, Edge, obstacle, sensor.

I. INTRODUCTION

Now a day's Robotics is part of today's communication & communication is part of advancement of technology, so we decided to work on ROBOTICS field, and design something which will make human life today's aspect. There are different types of mobile robots which can be divided into several categories consists of wheeled robot, crawling robot and legged robot. This project deals with a wheeled autonomous ROBOT. It is the part of Automation; Robot has sufficient intelligence to cover the maximum area. This robot uses infrared sensor to detect the obstacle in between the path and then avoid them to completes its objective. The IR transmitter continuously generate an Infrared signal of 38KHz, when an obstacle comes in the path the infrared signal reflected back from the object and is received by the IR sensor and then generate a positive high signal with the help of the receiver circuit that is there is an Obstacle and edge in the path. In such a way the robot is able to detect obstacles and edge of provided space and able to avoid obstacles and edge coming in between the path of ROBOT with the help microcontroller board and complete it journey.

The main motto of designing such type of Robot or the technology is that this technology can be used in today's very fast transportation to avoid the accident generally happen in congested or the Metro Politian Areas by applying emergency break. If we use this technology in the car or any vehicle, it will automatically sense the obstacles then it will take a side to the available free space. An obstacle may be a living things or any object. Autonomous Intelligent Robots are robots that can perform desired tasks in unstructured environments without continuous human guidance. Thus by using this technology in vehicles we make the drive safe. Our goal is to develop an intelligent multi sensor based obstacle and edge detection robot in our daily life .We design the obstacle and edge detection system using sensor. If the obstacle and edge are detected by the sensors then buzzer sound to intimate the occurrence of obstacle and edge in the path.

Robots play a major role in many walks of life and are extensively used in the areas of defense, industries, medical and home applications. They can carry out different risky jobs that cannot be done by human.

The concept of edge and corner avoidance is used when you don't want a self controlled or self guided automatic robotic vehicle to fall while moving on a boundary limited flat surface. If such a thing happens then it will not be good for the material structure of the robot and the involved circuitry. Moreover, one doesn't want the robot getting damaged in such a scenario and its further usage going into uncertainty. Also, in operation areas where the robot is not under human supervision or in other unmanned research tasks, the edge/corner avoiding capability becomes necessary in view of the robots safety.

An *Obstacle Avoiding Robot* may be defined as a robot which can avoid any unwanted obstacle in its path and is capable of changing its path. The basic tasks of an *Obstacle Avoiding Robot* can be divided into 3 sections, namely

- Navigation
- Processing
- Execution

The robot must be equipped with some means by which it can navigate through its surrounding to check if there

is any obstacle or not. In this project we have used IR Sensors for the purpose of navigation.

IR sensor:-

IR Sensor is composed of an IR emitter and an IR Receiver. When the IR Sensor is powered, the IR emitter emit infrared signal continuously and the IR Receiver is for receiving that infrared signal when it is echoed back after striking an obstacle. So, whenever the IR Receiver receives like photo Transistor. After navigating the surrounding the robot must be capable of processing the input data from the navigation section. After receiving the signal given signal is send towards the processing section. The IR Transmitter block mainly used to generate IR signal. It uses timer IC555 in astable multivibrator mode to generate square wave which have continuous pulses of 50% duty cycle of frequency 38 KHz. This transmitter is so arranged that the IR rays are focused on the sensor. IR sensor (TSOP 1738) which gives normally 5v at output of it. After receiving infrared light at output of sensor we get 0v. In this project the processing section in which comes along with microcontroller. While processing the robot takes decision according to the condition robot takes there decision to movement of right or left side. After processing the navigated data the robot must do some work like Movement. In this project we have used motor driver IC to drive the motors/wheels according to the processed output from the microcontroller.

Microcontroller:-

This is the most important block of the system. Microcontroller is the decision making logical device which has its own memory, I/O ports, CPU and Clock circuit embedded on a single chip.

Control board is the main driver circuit of the robot. It mainly contains of the microcontroller and the motor driver. It is a low-voltage, high-performance CMOS 8-bit microcontroller with 2K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel Atmega16 is a powerful microcontroller which provides a highly-flexible and cost.

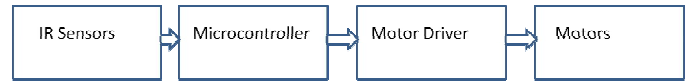
Motor Driver Board:-

The motor driver board consists of ICL293D. It has 4 inputs and 4 outputs. Since, the current from the

microcontroller is not sufficient enough to drive the motors, so we have to use this Driver to increase the current by which we can drive the DC Motors.

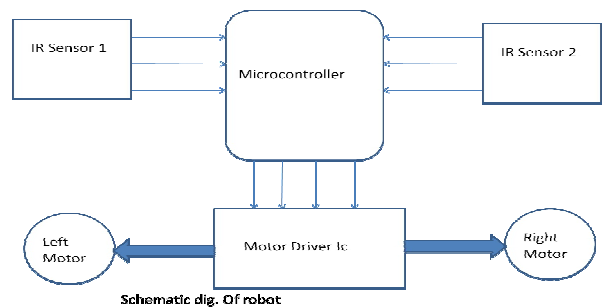
Block Diagram:-

Block level representation of the different blocks of the Obstacle Avoiding Robot.



Block Dig. Of Obstacle Detection & Avoidance Robotic Car

Schematic Diagram:-



Schematic dig. Of robot

Connection Description:-

In this project we have used two IR Sensor modules as obstacle detector and edge detection. Both sensors are placed in middle place of the robot. O/P of sensors are connected to the microcontroller. Microcontroller o/p is connected to the Motor driver IC LM 293 which handle the motors direction in forward or reverse direction separately. Both the Motors and Driver IC will be powered with 12V rechargeable battery.

Scope of the project :-

The project uses microcontroller as the controlling element. It uses IR (Infra Red) sensors and two IR transmitting circuitry. When the obstacle and edge comes in path of robot IR beam is reflected from the obstacle and edge then sensor gives zero or 5v voltage respectively to μc . This zero voltage is detected then μc decides to avoid the obstacle by taking left or right turn. If the sensor gives +5v to μc that means there is no obstacle present in it path so it goes straight until any obstacle is detected. This 5v voltage is detected then μc decides to avoid the edge by taking left or right turn. If the sensor gives 0v to μc that means there is no edge present in it path so it goes straight until any edge is detected.

The two IR transmitter circuits are fitted on front and left side of robot. The two IR sensors are placed near to transmitters' IR LEDs. The connections can be given from main circuit to sensors using simple twisted pair cables.

Two motors namely right motor and left motor are connected to driver IC (L293D). L293D is interface with μ c. Micro-controller sends logic 0 & logic 1 as per the programming to driver IC which moves motors forward or reverse direction.

II. SOFTWARES USED

1. Proteus:-

Proteus proved to be a very handy & easy-to-use tool for the PCB layout process. Many of its features were utilized leading to an accurate & efficient design. It has Design Error Check & Electrical Rule Check tools which proved to be helpful in the design. It is loaded with a huge component list that is categorized in various libraries for giving simplicity. Placement of components is also very easy & they can be rotated in 360° to customize the design.

III. APPLICATIONS

- 1) This logic has been specially designed for vacuum cleaner. By using heavy rating motors, strong mechanical structure and using highly sensitive obstacle and edge sensors, it efficiently work as vacuum cleaner.
- 2) Just by making small changes in software this system can be used for avoiding concealed paths. This robot can effectively sense the obstacles and edge and find out correct path.
- 3) With proper programming we can use it as a weight lifter.
- 4) In Mines.

IV. CONCLUSION

In this paper, we have presented the obstacle and edge detection and avoidance for Robot system. This system was successfully used in a number of different situations; intersections, distance keeping, and parking lots were successfully handled.

In future work, we see that the most beneficial work can be accomplished by focusing on improving the low-level sensor details and also include the Radio Frequency controller i.e. to add the RF Module to control the given project through manually.

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