OBSTACLE AVOIDANCE SYSTEM USING FUZZY LOGIC SYSTEMS

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ABSTRACT:- **There were many reports about an obstacle avoidance of a mobile robot. In this paper, we design a fuzzy logic system and propose an obstacle avoidance algorithm for a path planning in unknown environment for a mobile robot. The main goal of obstacle avoider robot is to reach the destination without any collision. For obstacle avoidance several algorithms have been proposed, which have some drawbacks and benefits. Thus by using this technology in vehicles we make the drive safe . The concept of introducing mobile robots in familiarizing engineering technology students with various robotics problem solving approaches, is widely being implemented for educational purpose nowadays .**

Index Terms:- **Fuzzy logic system,Obstacle avoidance**

Introduction:

Robotics has become one of the essential segments of modern automation systems. Autonomous mobile robots are noticeably being used in various industrial and non-industrial applications nowadays. The fuzzy logic system has widely used for one of effective means in unknown and complex industrial environments. In many research results, a fuzzy logic system has usually implemented for improving the efficiency of obstacle avoidance and path planning of mobile robot at unknown environments. There are different types of mobile robots which can be divided into several categories consists of wheeled robot, crawling robot and legged robot.It is the part of Automation. In this paper we propose a fuzzy logic system for obstacle avoidance. For Obstacle recognition ultrasonic sensor is used . Here the left and right wheels' angular velocities are controlled by a fuzzy logic system. The methods for fuzzification and reasoning are singleton and Mamdani's method, respectively. The motion of the robot is controlled by two pairs of mechanically geared wheels driven by two DC Servo Motors.

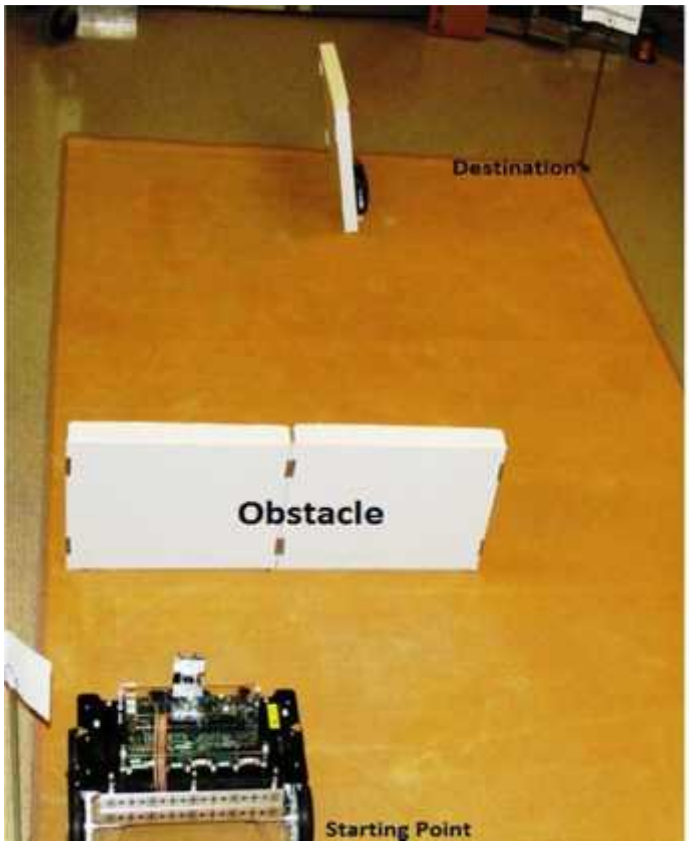

Figure 1: The Path of Travel for the Mobile Robot.

System Overview

This mobile robot is designed to explore in the environment by detecting obstacles and avoiding collision base on the distance measurement information obtained from the infrared sensors. This robot system is obstacle avoiding robot using infrared sensors. Infrared sensor senses the obstacle along its path. In this robot three IR sensors are used for left, right and front. The Infrared sensors, used for obstacle avoidance, are connected to the processor via analog ports. The input signals are received from sensor circuit and ATMEGA32 is operated according to the received sensor's signal

The reason to choose IR sensors as Obstacle detected device is that to determine the range of object and by this data, to control the Obstacles

avoiding process. Analog to Digital Converting (ADC) process is done in ATMEGA32 by software and these data used to control the require outputs that will effect to the second Module, Navigated Control System. The basic circuit that makes these processes is shown in Figure 2.

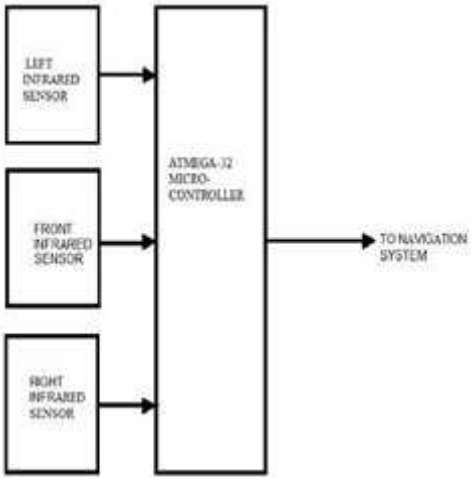

Fig.2 : Obstacle Avoidance System for Mobile Robot block diagram

Infra red Sensor

In this paper, three infrared sensors are utilized for distance measurements. The infrared sensor consists of a LED emitting the infrared light and a photo diode. This sensor enables to detect objects without any influence on the color of reflective objects, reflectivity, the lights of surroundings. Maximum range that can be detected is from 10 to 30 cm. It generates an analog voltage that is a function of range. The output voltage can be measured by an analog-to- digital ADC input line. It has three wires, positive (+5V), negative (ground), and data output.

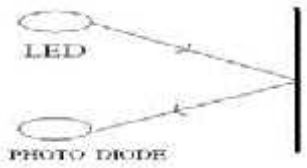

Fig. 3 : IR Sensor

Design of Fuzzy Logic Systems

The conventional fuzzy logic system mainly includes fuzzification, knowledge base, fuzzy reasoning and defuzzification. The fuzzification converts the accurate input variables into input grades named as fuzzy variables. The knowledge base is used to store relevant data and control rules. The fuzzy reasoning generates fuzzy results from inferencing of the knowledge base and the inference engine. The defuzzification converts fuzzy variables to accurate output variables. Its typical architecture is shown in Figure 2.

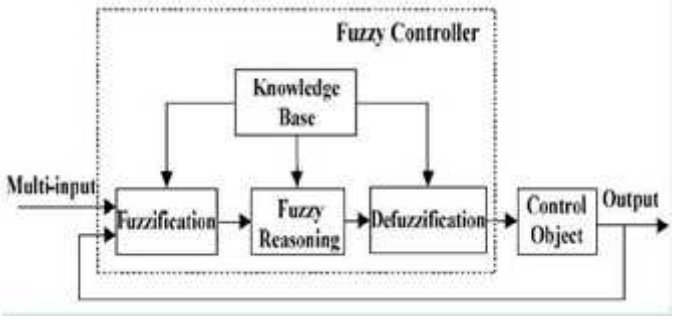

Fig 3. Typical structure of a fuzzy logic system

Determination of Input and Output Variables

The inputs for the proposed fuzzy logic system are distances measured from the obstacle to the sensors and the angle between the robot and the goal. The sensors are located at left, right, and front sides of the robot. The angle means an angle between robot's orientation and target position. The output variables are velocities of the left and right wheels.

Fuzzification

Linguistic variables "near" and "far" are taken for the distance from the obstacle to the sensor. Eight conditions are defined by the location of the obstacles like Table 1. The domain for the angle between the robot and the target position is constructed with {left, front, right}. Here "left" means that the goal is located at the left side of the robot. The domain for velocities of the left and right wheels is constructed with {slow, L-slow, mid, L-fast, fast}, where L and mid stand for "Little" and "middle", respectively. The membership functions are shown in Figure 3

Table 1. Eight conditions according to the detection of obstacles

	left-obstacle	front-obstacle	right-obstacle
D1	near	near	near
D2	near	near	far
D3	near	far	near
D4	near	far	far
D5	far	near	near
D6	far	near	far
D7	far	far	near
D8	far	far	far

Conclusion

From this study, a walking robot that achieved the stated objectives had been developed. This robot is able to produce the basic walking movements using two gearmotors.we developed the robot with a very good intelligence which is easily capable to sense the obstacle and by processing the signal coming from the sensor it is perfectly avoiding the obstacle coming in between the path .Robot take the left or right or the forward movement in according to the sensing signal with the help of the two gear motor which makes the movement of the robot smooth .

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