Applications of Line Follower Robot in Medical Field

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Abstract:

A line following robot carrying medicine has been designed for providing the medicine to the patient whenever they need it. A Line follower robot is an electronic system that can detect and follow the line drawn on the floor. Generally, the line is specified a predefined path that can be either visible like a black line on a white surface with a high contrasted colour. Light dependent resistor sensor has been attached with the robot whose resistance varies with light intensity. When the LDR receives maximum amount of light then its resistance goes to its minimum value, ideally zero and when no light falling on the LDR then its resistance goes to its maximum value, ideally infinitive. A switch with IR sensor has been fitted near the patient, which connection has been made by the robot too. If the patient presses the switch then a flag bit set in the microcontroller, from which line following robot follows the line and got reached near the patient and provide the medicine to the patient with the help of dc motor. A proximity sensor also has been attached with the robot so that robot can detect any obstacle on their ways and can alarm.

Keywords:

Health care, LDR, Medicine, IR Proximity sensor, Microcontroller, Comparator, DC motor, Motor driver, Alarm circuit.

I. INTRODUCTION

A health care system is defined as the organization of the people, resources and the institute to provide the health care services to the person or population. The goal of health care management system is to provide good health. For maintaining the health different organization, institutes, charities, religious and the government are planning around the world. This health care system also includes the hospitals, health care institution or clinics either these are operated by government, private for profit organization and also private not for profit organizations. All around the world, many patients suffers because of to pay medical practitioners taken by the health care system. This health care system includes the health care staff personnel that are doctors, nurse, security guards, sweepers and many more.

II. MOTIVATION

Around the world thousands of patients died because of not properly monitored them. Research shows that the number of patients died because of few numbers of trained medical staff. Shortage of nurses is 'killing thousands a year': Patients in overstretched hospitals developing fatal complications which could have been cured. A lot of hospitals have stopped recruiting nurses and medical personnel since 2005 and 2006. From the past

two years there is an increasing trend of recruiting more doctors than the nurses. If sufficient number of nurses based on the patient numbers visiting a hospital are recruited than the number of deaths can be estimated decreased by 10 %.

III. RELATED WORK

In robotics there are many system invented which has different applications in different fields. Robotics is very popular field for research and manufacturing. A two wheels balancing robot has developed by Nor Maniha Abdul Ghani et.al, which has the line following capability and for balancing it, they used infra-red distance sensor to solve the problem in inclination. Pakdaman M. et.al has design a small line following robot which used IR sensors to detect the line drawn on floor. That system has designed for the robot competition. Colak I. et.al has design a line following robot to use in the shopping malls for entertainment. That system used 4.8 cm wide black line to carry maximum load of 400 kg. They also used a manual control with the help of remote controller. A physical robot with 50 individual controls is generated by Gomi T. et.al from which the ability and gait to lift the body can be improved. That robot can move its legs in forward motion and tested in different conditions.
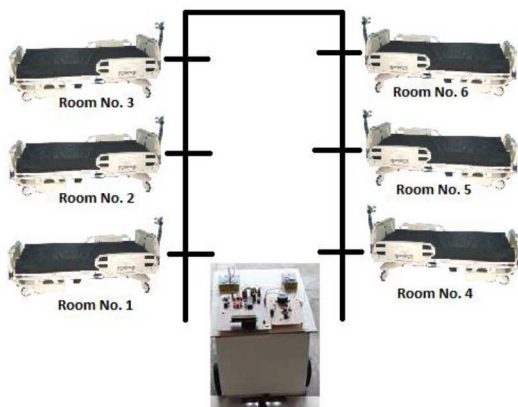

Figure 1. Line Follower Robot plays the role of a Nurse.

IV. OVERVIEW

This smart and intelligent Line following robot based health care management system has divides in several parts- sensing, comparator, motor driver and actuators. This device is LDR and IR proximity sensors for sensing purposes. LDR is used for which a robot can follow the line drawn on the floor. IR proximity sensor used for stop the robot when any object came to it path. Comparator circuit is used for set a threshold value from which it can set logic when it detects the light. Motor driver is use for controlling the motor. And actuator is use for make the system dynamic.
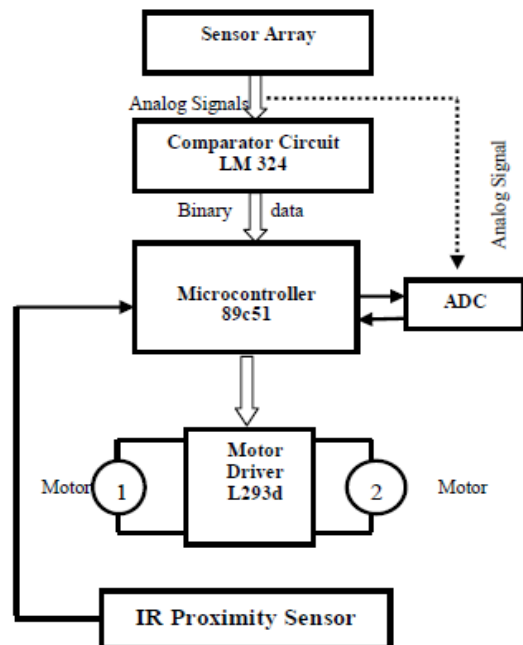

Figure 2. Block diagram of Line Following Robot

The system is connected with the microcontroller to make the system automatic. When it detect the light or any obstacle then the flag bit of microcontroller is set from which the dc motor can be controlled.

V. TYPES

1. Sensors:

This system has used two type of sensors circuit. One is LDR based another is IR proximity sensor.
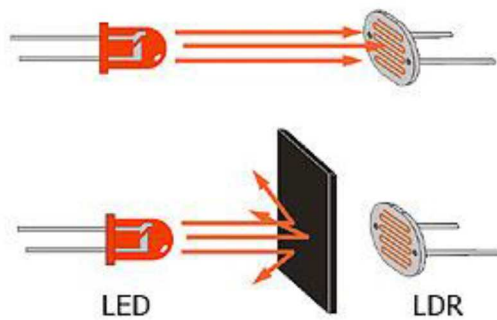

Figure 3. Light Dependent Resistor (LDR) sensors.

LDR is a light dependent resistor which works by incident light on it. Its resistance varies according to change in the intensity of light. As the light falls on the LDR then it shows very high resistance ideally infinite and when there is not any light beam incident on it then it shows very less resistance ideally zero. That means if a voltage apply in the one terminal of the LDR then it gives zero voltage at another end if there is any light falls and vice versa.
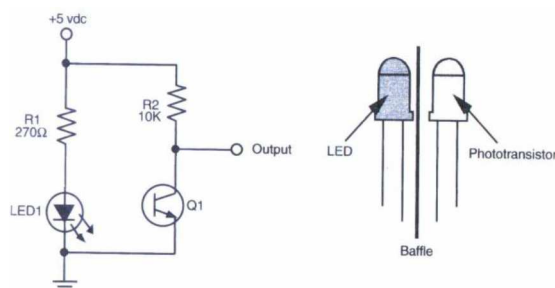

Figure 4. IR Proximity Sensor

IR proximity sensor is the infrared sensor, which use for detect the obstacle. If any obstacle comes between the IR transmitter and the IR receiver then it gives the output. That output can be used as making device automatic

and set the flag bit of the microcontroller. It plays a vital role in the field of detecting any obstacle.

2. Comparator:

Comparator is use to make the system sensitive as per the requirement. It usually compares the voltages between the inverting and non inverting terminals. A threshold voltage is set on the reference voltage in the operational amplifier in inverting or non inverting terminal. If another terminal voltage that is input voltage is greater than this threshold voltage then it gives the output. And if the input voltage is less then threshold voltage then it cannot gives any output. The sensitivity of the sensor can be varying by set a threshold voltage in the comparator circuit. By using this circuit a LDR sensor can be used for low beam of light and a IR proximity sensor for detect the obstacle from a large distance.
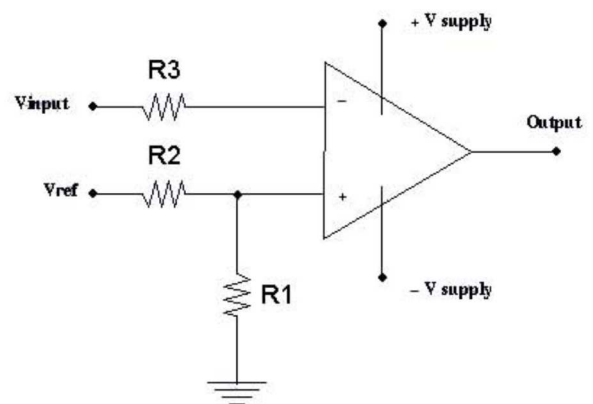

Figure 5. Comparator Circuit.

3. Motor Driver:

Motor driver act like the current amplifier. It is use for controlling the current in the motor. The motor drive provides high current as the dc motor need when it receives low current in the circuit. For drive the motors a high value of the current is needed. L293D IC can control the two dc motor simultaneously. It can rotate the motor in the forward and reverse direction. By using the motor driver a line following

robot can be move in clockwise and in anticlockwise directions. It completely controls the movement of the dc motor that's why it has been called as motor driver.
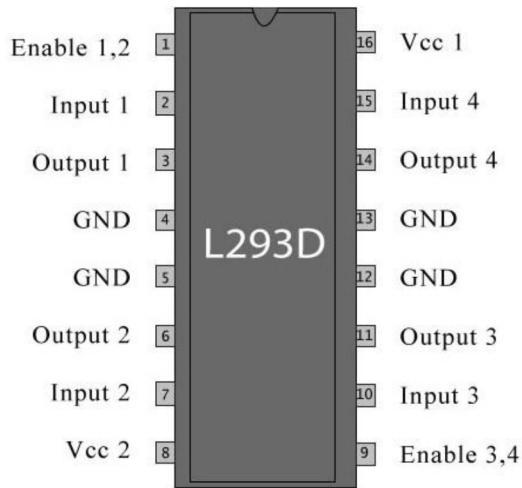

Figure 6. Motor Driver IC

4. Actuators (Motors and Wheels):

For the proper movement of the system two dc motors has been used in the circuit and a castor wheel is attached in the front side of that Line Following Robot Based Health Care Management System. Caster wheel enable the movement of the robot is easy in every direction. Two dc motors at the end side of the robot is controlled by the motor driver. For controlling the complete system a microcontroller is used, which set its flag bit as per the different situations. And this complete system need a small power supply of 9 V, which can be provided form a battery. That is why this system is cost effective and operates in very low power supply.

ROBOT MOVEMENT	LEFT MOTOR	RIGHT MOTOR
Straight	Straight	Straight
Left	Stop	Straight
Sharp Left	Reverse	Straight
Right	Straight	Stop
Sharpe Right	Straight	Reverse
Reverse	Reverse	Reverse

Table 1. Movement of Line Follower Robot.

VI. CONCLUSION

The cost of health care majorly depends upon the expensive machinery, land and building and round the clock staff to maintain and use that machinery. In a country like India where the population is humongos and resources are scarce. It becomes really difficult to set up such a capital extensive project at each and every location with availability of skilled staff. So what this system provides is an alternate to the existing system by replacing skilled labor with robotic machinery, which in turn can handle more patients in less time with better accuracy and a lower per capita cost.

VII. REFRENCES

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