

DEVELOP AND DESIGN OF SENSOR BASED COLOR LINE FOLLOWER ROBOT FOR EDUCATE AND EFFICIENT WORKER FOR FUTURE APPLICATIONS

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(visible). Its applications start

Abstract: The Importance Of industrial Automation has been increased as the growth of any Industry is directly depends on It. For quick and accurate measurement and control of Industrial Process Robots with Sophisticated Sensors are used. In This Research, An Idea of a Robot that can classify line even there are many black line directions but still good enough to sense the line and follows the track and also the robot is capable to carry some load. The Objective of This Project Is to Design an Efficient and Automatic sensor Based System, which means quick and accurate measurement and control of a process efficient way and it capable to carry load. Where as in the case of economical the Cost of the Product is low and time saving in working. In The Proposed systems line follower System Is Developed With line detection Technique. Line detection Technique identifies the line and travels along the given path. This Information is transferred to motor Mechanism circuit. The Controller Used simple sensor based circuit and it is more efficient in Performance, Low Cost. Basic applications, with provide path guidance it can be used in public places like shopping malls, museums etc.

Keywords— sensor circuit, motor, line follower.

I. INTRODUCTION

A Robot is any machine which is completely automatic, decides its own way of work and stops on its own. It is actually a replica of human being, which has been designed to consume the time and work of human. It can be controlled using hydraulic way control. Robots can be stationary robots or movable robots. Movable Robots are robots with a movable base which makes the robot move freely in region. One of the advanced movable robots is the Line Follower robot. It is basically a robot which follows a particular path and decides its own action. The path can be a black line on the white floor

This robot movement completely depends on the track. The robot can do anything you set them to do.

II. PROBLEM DEFINITION

The government bodies try to implement various policies to increase the strength of industrial automation systems in the countries. But they generally fail due many reasons such as high budget, expensive equipment and lack of skilled persons. Our government taking backward step in prevention and most of the of the energy and resources are spent on treating ailments.in order to reduce cost, time. Now-a-days prevention should be the new mantra. Then, question arises how to prevent it?

III. SYSTEM OVERVIEW

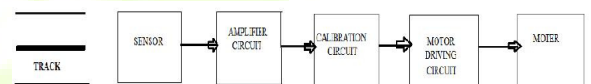


Fig.1 Block diagram Of Track Follower Robot

Description of block diagram:

- **SENSOR:-** We used IR Emitter-Sensor pair for sensing the track. When the robot with sensor passes over the white surface area the light from it is reflected back to the sensor, when it is on a black surface area and thus the resistance of the sensor goes high due to that it switches off the motor.
- **AMPLIFIER-** we used NPN transistor BC548 as the amplifier circuit. It can't amplify the high intensity signal but it can amplify low intensity sensor signal and provides it to the input of the driving circuit.
- **CALIBRATION CIRCUIT-** A preset or variable resistor of value 500K ohms is used to

variable the sensitivity of the sensor.

- **MOTOR DRIVEN CIRCUIT-** Transistors are used as motor driving circuit. It is operated by the response of low input signal.
- **MOTOR-** In this we used the DC motors which are used to drive the boat Ahead.

IV. RELATED WORK

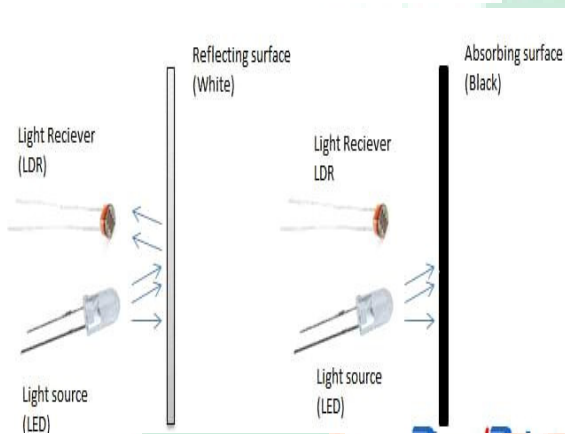


Fig.2 Line detection logic

The overall circuit for this robot is shown in fig.3.

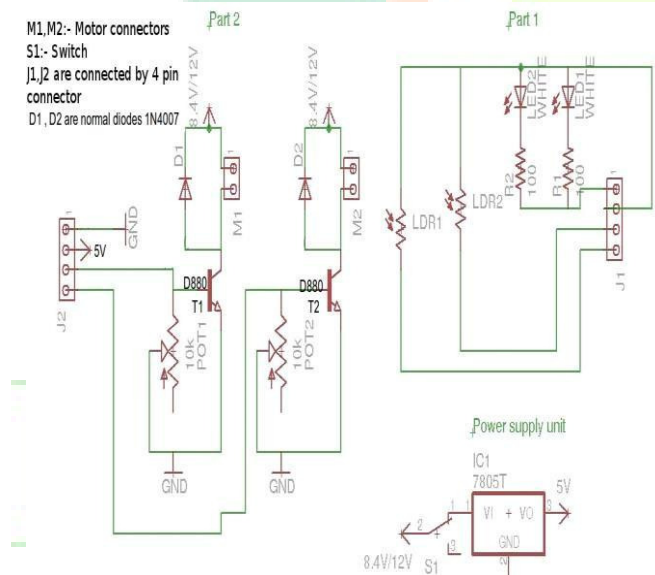


Fig.3 line follower circuit

A. Circuit explanation:

The robot uses the both IR Photo diode and IR-LED's combination to sense the presence of line. Here IR Photo diode act as resistor, but its resistance is proportional to the light falling on it, means with the increase in resistance causes decrease the intensity of the light. The basic principle in this project is that objects light in color radiate the light falling on them while dark

colored objects don't. So w black line the light emitted by the IR-LED is non-

radiated by the floor, hence the resistance of the Photo-diode increases. When the robot back on the white surface is quit opposite to it. In our robot the IR Photo diode is used as a voltage divider circuit. The voltage divider circuit is given fig4.

The resistor whose value is 500K ohms is a potentiality. In our design, we will be using 500k ohms presets, that is, we will use presets whose resistance can be changed from 0K ohms to 500K ohms. When the robot is above the white surface the light emitted by the IR LED's fall on the photo diode and decreases its resistance, due to that the voltage at Vout reduces.

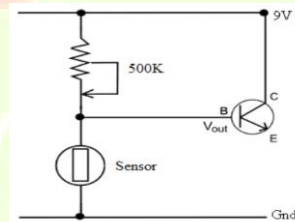


Fig.4 voltage divider circuit

Which causes the output voltage at Vout high when the sensor on the black line. During both the cases it is necessary to adjust the 500K preset in such a way that, when the robot is on white surface, voltage at Vout is less than 0.8V (so, the voltage at the emitter is LOW) and when the sensor is on the black line the voltage is greater than 0.8V (so, the voltage at the emitter is HIGH). For controlling the two DC motors, we used the L293D motor driver because it has high noise immunity (voltages up to 1.7 V as LOW), perfect for a robot which deals with analog signal.

B. Construction:

For base, we will be using a sheet with of dimension 14x13cm square and chassis with 4mm thickness, it can be available easily in the market.

Our first step would be drilling holes to fix caster and clamps for motors. Now fix motors, caster and also

attach wheels to the motors. Now the chassis is complete. We have placed photo diode and LED pairs in front of the boat. Ensure that distance between two photo diodes must be 4-5 mm greater than the width of the black line. It is necessary to cover the LED photo diode pair with some absorbing material in order to avoid ambient light to fall on LDR.

Second part consist of motor driver circuit and the threshold adjusting variable resistor. The reason for placing potentiometer in this part is that it would be easier to adjust sensor threshold.

Now all the chassis and circuit part is done lets combine them all.

Fix the sensor part place in front caster, facing downwards ensure that there is very less clearance between sensor covering and ground.

Now connect the battery to the circuit and also plugin the motors in their respective connectors.

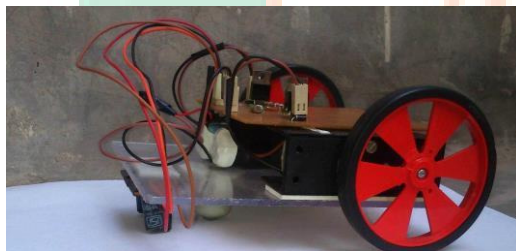


Fig.5 Line follower Robot

Adjust the threshold of LDR such that when sensor is on black line voltage at base of transistor must be less than 0.5Volts. If motors are rotating in reverse direction just change the polarity of that motor. Therefore we constructed the line follower robot as shown in fig.5.

C. Components description:

i.LED (Light Emitting Diode):

LED belongs to the family of P-N junction devices. LED is a diode that will give off visible light when a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device due to that it get energized. This effect is called electro-luminescence. Using LED for indication purpose.



ii. DC MOTOR:

A DC motor is an electric motor that runs on direct current (DC) electricity as shown in fig.6. A DC motor is a simple electric motor that consumes electricity and a magnetic field to produce torque, which turns the motor. A DC motor requires an electric coil and two magnets of opposite polarity, which acts as an electromagnet. Advantages of DC motor low initial cost, high reliability, and speed of motor is controllable. Disadvantages are high maintenance and low life-span for high intensity uses.

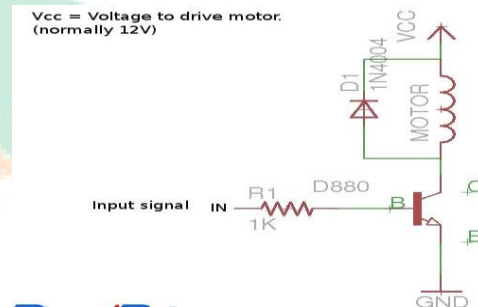


Fig.6 Dc

motor iii.Light Dependent Resistors (LDR)

The name itself suggest, resistance of a LDR depends on the amount of light incident upon it. Normally its resistance is around one mega ohm and when light falls on it, the resistance drops to a few kilo ohms. It is a bilateral device. The circuit in fig .8works on the principle of wheat stone bridge.

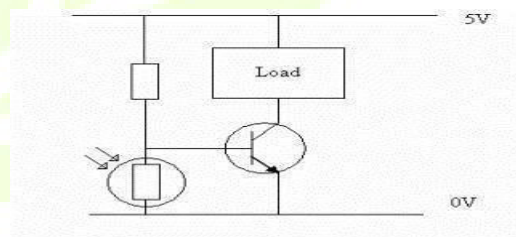


Fig.7 LDR

V. QUANTITY AND POWER CALCULATION

Power:

| | | |
|---------------------------|---|-------|
| 1.maximum power by motors | $300\text{ma} \times 12\text{v} \times 2$ | 7.2w |
| 2.power absorbed by LED's | $10\text{ma} \times 9\text{v} \times 4$ | 0.36w |

Quantity of equipment:

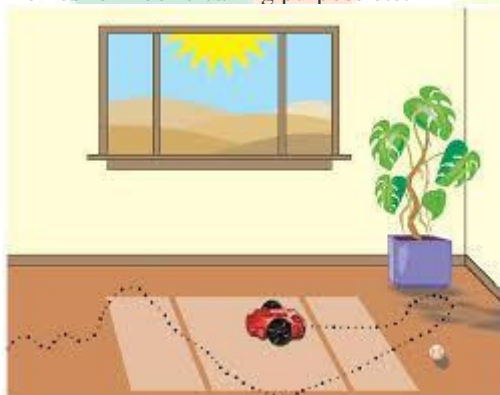
| Equipment | quantity |
|-------------------|----------|
| DC geared motor | 2 |
| Mechanical body | 1 |
| Led and resistors | required |
| Transistors | 2 |
| LD 293 | 1 |

I. EXPERIMENT RESULTS

| ROBOT MOVEMENT | LEFT MOTOR | RIGHT MOTOR |
|----------------|------------|-------------|
| straight | straight | straight |
| Left | stop | straight |
| right | straight | stop |

Applications of line follower robot:

- These can also be used for domestic applications at homes for floor cleaning purpose etc.



- These can also be used for guidance applications in public places like shopping malls, museums etc. to provide path guidance.



Advantages:

- Automatic robot movement.
- Used for longer distance applications.
- Simple in building.
- Effective system.
- It is used in homes, industrial automations etc.

VII. CONSLUSION

The line follower robot works most effectively and successfully to track on black line. On a white surface they are many black line directions but still good enough to sense the line and follows the track and also the robot is capable to carry some load. In a country like India where population is humongous and resources are scare. It became really very difficult to step into such expensive projects and availability of skilled persons everywhere. But it provides an alternate to existing systems by replacing skilled labor with robotic machinery, which in turn can handle more works in less time with better accuracy and low cost.

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