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Automatic Speed Control System for Line Following Robot

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Abstract - *Accidents are a major cause of death in all over world. Vehicles with uncontrollable speed are the major cause for accidents. Road accidents can be controlled by some measures such as Traffic management, improving quality of roads infrastructure and safer vehicles. With the help of existing technologies we are still not able to reduce the number of road accidents. Hence there is a need to implement a technique called as Intelligent Speed Adaption. In ISA, speed of a vehicle can be controlled with color strips for highways, slow speed zones, schools, hospitals, universities, etc. The method for this is that there will be various colored strips on road and the vehicle will have a color sensor with the help of which the speed is controlled. Another major reason for accidents include driver distraction while driving, the above methodology is implemented in a line following robot which then have no driver at all and the vehicle drives on a given path. This is implemented with the help of IR sensors and color detecting sensors.*

Key Words: Line Following Robot, Colour Sensing, Motor, Speed Control.

1. INTRODUCTION

The basic idea of project is to present a simpler version of autonomous driving vehicles, with less sensors and enough precision. The system incorporates 2 types of sensor, IR sensor and RGB sensors. With the help of these sensors and some fuzzy logic we are building a system which can drive itself on a given path from source to destination, avoiding collisions in its path if any. It also allows the vehicle in case of any obstacle detected on road.

The IR sensors are placed near the wheels and in the front of the toy vehicle. The sensors near the wheels are for tracking the line which is the path for the vehicle. The sensors in the front are for obstacle detection, whenever an obstacle is detected the IR sensor sense it and immediately stops the wheel rotation, which stops the vehicle. The next step it takes is, it goes back a few centimetres and turn to either direction and starts searching for the white line again and follows it once found.

The RGB sensor is placed along with the IR sensor underneath the toy vehicle, near the wheels. This RGB sensor constantly keeps looking for any colour detected on white line. Once a colour is detected it then send converted value to the processor which processes these values and control the speed of the motors.

1.1 Software and Hardware Requirement

1.1 Software Requirement

- AVR Studio

1.2 Hardware Requirement

- Atmega8 Micro Controller
- IR Sensors
- RGB Sensor
- Hub Motors
- 12v Battery
- Tire and Base
- Making field communication, Resistors, Wires and others

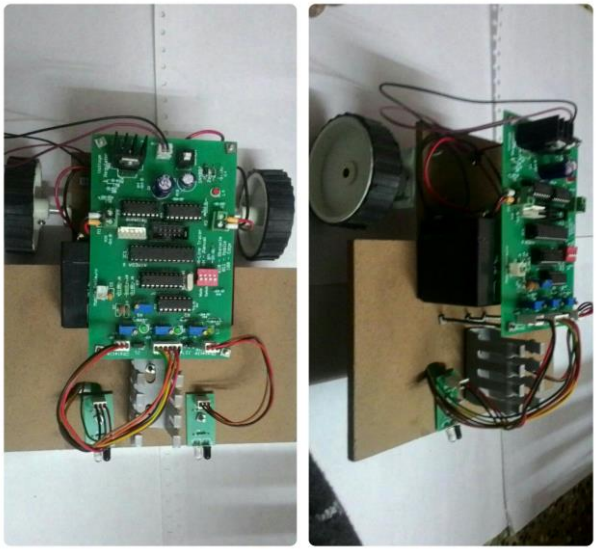

Fig -1: Line follower with obstacle detector

2. BLOCK DIAGRAM

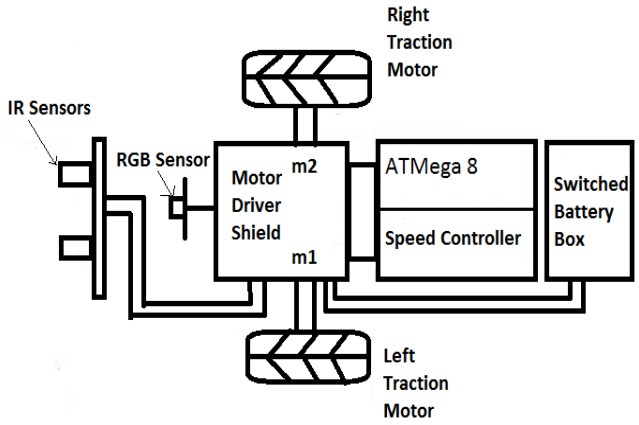

Fig -2: Block diagram of line follower robot

The system has three modes, a line follower, an obstacle detector and a speed controller. The line follower is a simple line following robot that follows a black path over a white surface or vice-versa. The obstacle avoidance system on the other hand checks for obstacles on its path and avoids them if any encountered. The speed controller works as a regulator for the wheels or hub motors where a color strip is responsible for controlling speed of the robot.

3. PROCEDURE OF SENSING THE LINE AND OBSTACLE

The robot has 3 pairs of IR Transmitter-Receiver and 2 modules with one pair each. These Sensors can be utilized and operated to receive a non electrical data from the environment and to convert it to an electrical signal. This signal can thus further processed by the brain of our robot. So this is how it works,

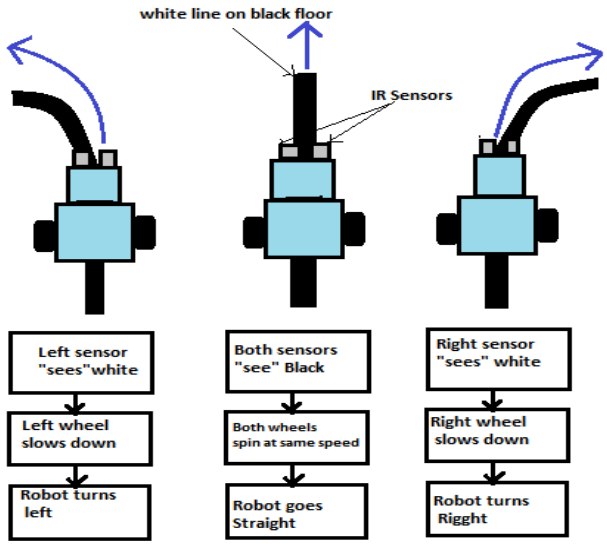

Fig -3: Line sensing decision

In obstacle detection mode, a considerable change in the output occurs when there is an obstacle in front of it, than when it is free from obstacles. In the line following mode the sensor sense the white line over the black surface. There are 3 sensors at the bottom of the robot which constantly keeps track of the black path. When the left sensor sense the white surface, the left wheel slow down and the right wheel takes a turn. Same process takes place when the right wheel sense the white surface. When both sensors sense black line it goes on straight with both wheels rotating at same speed.

4. PROCEDURE OF SPEED CONTROL

The speed controller works with a RGB sensor. The path is filled with colored strips at the areas where the speed is intended to be slow down. When the red color is sensed the speed is slowed down by less than 5cm/sec and the same speed is continued till green line is sensed. On the sense of green color the speed is continued to be previous that is increased by more than 5cm/sec.

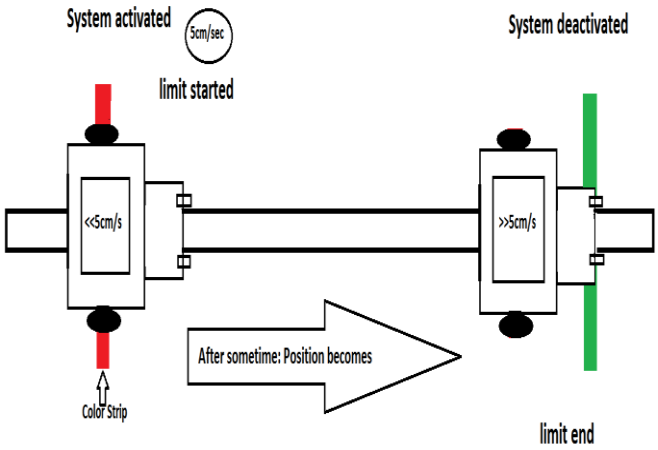

Fig -4: Speed controlling by sensing the color strip

3. RESULTS

The robot is working perfectly as per design and functionality. The robot was tested on a path for line following testing which resulted in sensing of white line over a black surface. Further different obstacles were placed in its way so as to test its obstacle detection which also resulted perfectly fine and the robot took turn on the detection of an obstacle. Different color strips were placed in its way so as to check its speed control capability and that too worked fine. As a result the robot is built-up successfully and it's working perfectly as per its functionality.

3. CONCLUSIONS

The robot is build with 3 different technologies incorporated together. The line follower with the obstacle detection and speed controller is different from other available robots. Other major feature of the robot is that the construction, it is pretty much easier to construct and also cost efficient. These features make it different from other robots. With the efficient control of speed and proper obstacle detection on a line follower the robot makes a space of its own in the world of automation. Thus, building a robot with speed controller and obstacle detection is fulfilled.

3. FUTURE SCOPE

The line follower developed is also sensing any type of obstacle in its way and can also control speed with the help of speed regulator. Further improvement can be done in the robot by using more number of IR sensors or an array or IR sensors. Further the robot can be programmed with fuzzy logic to find its own path among given set of path from source to destination which will be shortest of all.

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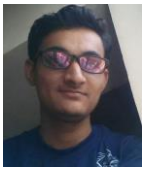

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