LINE FOLLOWING HEXAPOD ROBOT

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Abstract: **Hexapod Robot is built with six legs so it is capable of performing basic mobility tasks. A Line Following Hexapod Robot is an automatic robot which is able to follow a black line that is drawn on a contrasting color surface. It is designed in such a manner so as to move automatically and follow the line. The robot uses signals from the IR module to identify the line, thus assisting the robot to stay on the track. The code written based on the sensor input makes its movement precise and flexible. The robot is driven by servo motors to control the movement of the legs. if there is a obstacle blocking the path of the robot, the robot changes its path moves forward and then keeps on following the black line.**

Index Terms–**IoT,Mqtt,Pothole.**

I. INTRODUCTION

A robot is machine that can be programmed and designed to perform a certain set of tasks preferred by the designer. Some of the tasks may include transportation purpose, personal use etc. Line following Hexapod robot is an automatic robot. Automatic robot works by itself by understanding its surroundings based on the different sensors used by it and it also has a microcontroller to allow the robot to perform its task based on the sensor inputs. Hexapod robot is a six-legged robot. It is more stable compared to a robot with wheels due to the dynamics of legs. It can be used in rough terrains due to its stability. It walks with similar mechanism of walking as a spider. The basic working of robot is that it follows a black line and if there is a obstacle blocking the path of the robot, the robot changes its path moves forward and then keeps on following the black line.

II. LITERATURE SURVEY

In paper [1] they have designed line following robot which has two wheels, two IR module and follows black line drawn on a white surface. They have used their microcontroller as Arduino Uno. We have taken their line following concept and implemented in hexapod and used one IR module to follow black line, instead of wheels we have used legs controlled by servo motors and we have used a microcontroller as Raspberry Pi4. In the published paper the robot follows most of the curves but hexapod has problems while following curved path due to single IR module.

In paper [2] they have designed smart home irrigation system where they check the water tank level using ultra sonic sensor that is to calculate the distance, they have used Raspberry Pi as their microcontroller and code using python language. We have used ultrasonic sensor to detect the object in front of the robot and we have also used microcontroller as Raspberry Pi, we have referred their code to measure the distance. We had planned to use three ultrasonic sensors for object evading, but due to shortage of VCC pins in Raspberry Pi, we could not execute it.

In paper [3],[4] and [6] the design of the leg was discussed. The design is done such a way that it should stand properly with high stability. Design is done so that the I should hold the full body of the robot. While walking each leg and leg support should work parallelly. Because of unauthorized design the leg support and leg will contact each other and it will damage the legs. Since the robot works in degree of freedom the height of the robot will be adjusted. Suppose if it increases or decreases it will affect the walking process. The bottom of the

leg is design such a way that it will stand stable in the ground. Sometimes because of friction the leg will not move forward.

III. PROPOSED SYSTEM

A shown in the figure 1 we use Raspberry Pi 4 as the microcontroller, we need 12 servo motors for the robot. But Raspberry Pi has 40 pins, so we use PCA 9685 16 Channel PWM driver to hold 12 servo motors. There are two power sources for the robot one is given to Raspberry Pi that is 5V,2A and the other is 9V which is connected to buck converter to reduce the voltage to 5V and is connected to servo motors through PCA 9685 16 Channel PWM driver.
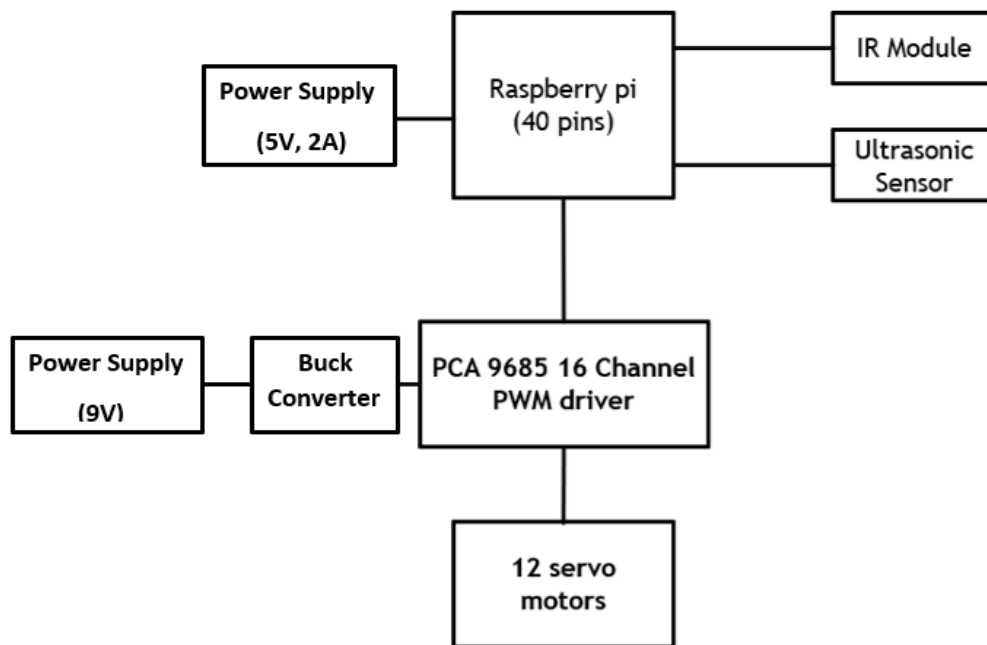

Fig 1. Block Diagram

We used IR Module used to detect the black line drawn on white surface. Robot will follow the black line whenever it fails to detect robot will stop. We added some features like object detection using ultrasonic sensor. We used 3 ultrasonic sensor which placed in three directions of the robot.

IV. Flowchart

The figure 4.2.1 shows the working of the robot. The whole project works inside the loop. The IR module will sense the black line which is drawn on the surface. When it senses the line then front ultrasonic sensor will try to detect the object. If it doesn't detect the object then it will move forward. When the robot detects the object infront of it, it will stop. Then the left sensor will try to detect the object whether there is object on left or not. If there is no object in the left the robot will move left and then take forward step then it will continue the path.
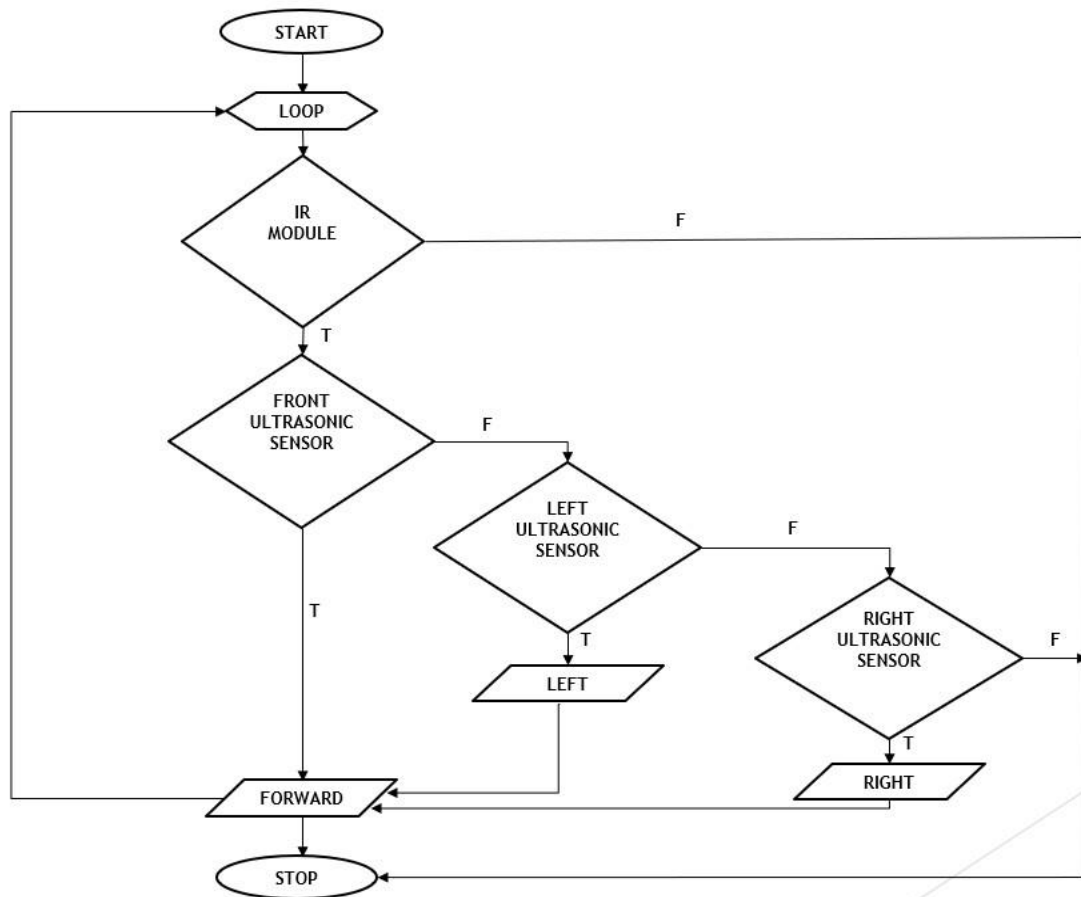
Fig 2. Flowchart

If there object in the left side then the right ultrasonic sensor will sense and move towards right and then take forward step. If there is object in all the side the robot will stop, when the IR module doesn't sense the black line, the whole process will come out of the loop.

V. ADVANTAGES AND DISADVANTAGES

A. Advantages

- It is autonomous robot.
- Used for long distance applications
- Used in home, industrial automations

B. Disadvantages

- Slow speed and instability on different line thickness or hard angles.
- It always needs a path to run either white or black since IR signals should reflect from the particular path.

VI. CONCLUSION

Hexapod is a six-legged robot, it follows a line, due to the body design hexapod is a bit unstable. It follows a straight line properly, but it has some problems while following curved path due to single IR module. We had planned to make hexapod to evade object using three Ultra Sonic Sensor, but due to shortage of VCC pins in Raspberry Pi, we cannot connect three Ultra Sonic Sensors because one is connected to IR module, one to PCA 9685 16 channel PWM Driver and the other to one Ultra Sonic Sensor. Another reason we cannot make it to evade object is we need to draw add extra lines to left and right which is ok for straight path but causes problems when there is a curve or intersection.

VII. REFERENCES

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