

## Chapter 5

### Conclusion and Recommendation

#### 5.1 Conclusion

The robot was finally running with a few glitches here and there which were sorted in the later revisions of the firmware. The line following robot still has a few shortcomings but achieves most of the objectives.

I earned a lot of knowledge on micro-controllers, a deeper & clearer view of the architecture, ports & all other functional blocks was achieved.

In end we created a circuit that enabled our robot to follow line based on the light reflected off the ground. The robot is capable of following the lines by comparing light on either side of the different through this project we have learned the basics of electronic circuits, motors, sensors, comparators, basics of microcontroller and installation programming into microcontroller.

The car is able to follow a straight path without much trouble. It performs less well on turns, particularly turns sharper than  $45^\circ$ . The turn radius of the car is not wide enough for it to consistently make sharp turns. The car can make turns wider than  $45^\circ$ .

However, one will notice after making a turn, the car will oscillate around the track rather than follow it completely straight. Due to the microcontroller in car's programming to right and left the track and then turn back into it, the car turns back to the road at an angle.

The right sensor will eventually detect the path and the program will turn off the turn motor but because the car will be moving straight at an angle to the road, the left sensor will go over and the right sensor will go off the track. This tells the car to make a left turn. The car will continue to adjust itself in this wobbling manner, although each time the angle at which it comes into the path is reduced. Therefore, we found that the path after a turn should be sufficiently long to allow for this adjusting. We used photo sensors in the project also were the source of some errors. We also found that the sensors work best with black and white, and placing the sensors over a different color leads to a fluctuating output. We believe this occurs because colors other than black would absorb some infrared waves while reflecting others. If the amount of reflected infrared varies, then the output will fluctuate. This behavior unfortunately rules out the prospect of using backgrounds and tracks of different colors

## 5.2 Recommendations

This project leads to several recommendations concerning the line follower robot problems in the evaluation of both source code and hardware were a long processes but after testing, adaptation and correction of the final project work will be exactly as expected and as outlined in the project. The recommendation to the future work:

- Using an artificial intelligence algorithm such as neural network initiative,
- Add ultrasonic in the project fishily the ideal use of this line following robot in Manufacture.
- Use Stepper motors has the advantage of precise angular movement.
- Using WiFi control, exclusive support dual control system, used in Apple and Android products.
- One last thing about this recommendation, instead of using this robot as a line following robot only but capable of Detect obstacles and maneuver around them ,also Identify colors to be able to locate in big project.