CHAPTER 5

CONCLUSION

5.1 Conclusion

This project has been carried successfully with all the objectives have been achieved. From the results of the design and testing of a tool that has been done, using the root locus method for determining the value of the PID controller parameters, obtain the best parameters $Kp = 5.4117$ $Ki = 0.01$ and $Kd = 0.6108$. Both algorithms are discussed for this project, including the algorithm using digital sensors and analog sensors. In this project has also been compared Arrow-bot system performance using bang-bang controller, using PID controller with digital sensors, using PID controller with analog sensors, and using PID controller with real-time operating system ChibiOS. In the end, the robot can follow the line well. Of research obtained robot using bang-bang controller has the fastest response. On the use of analog sensors have the highest level of accuracy. In conclusion, Arrow-bot uses a PID controller with Real Time Operating System (RTOS) ChibiOS has the best performance because it has good accuracy and fast response.

5.2. Recommendations

Recommendations for future improvement are:

1. Add an auto line detection capability. User can use only button for recording the line and background data output of ADC.

2. Add a bluetooth module for easy downloading software, debugging and communication.

3. Add encoders for both motor drive that can create internal-loop PID speed motor control in order to get precise and reduce line following burden to quickly and smoothly follow the line.

4. Create autotuning algorithm for the gain of PID controller.

5. Create graphical user interface (GUI) for making easy change parameters and know the difference.

6. Add more sensors by using multiplexer concept in order to get more accurate in line detection.