Line Following Robot

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Abstract

The abstract will talk about the project as a whole in no more than 150 words.

# Introduction (0.5 - 1 page) F

This is the introduction section. It should talk about our project in general and the goals, motivation, and real life applications of this project.

# Related Work (0.5 - 1 pages) F

This is the related work section. It should talk about the work being done that relates to this project, such as, other designs for line following robots, learning techniques, and controller methods.

# Method (2-4 total pages)

This section should talk about what we are using to make this project.

Hardware (2 pages) F

This section discusses the hardware used to make the line following robot. The focus of this section is on the design decisions made while constructing the robot such as what parts were used in creation of the robot including sensors, microcontroller (MCU), Wireless Command and Reporting, Power, and Motors. It will also cover some of the hardware limitations and the cost of the robot.

Sensors

Motors

Robot Controller

With the sensors and motors chosen, the next choice is what will receive the input from the sensors and use this data to drive our motors to achieve the goal of line following. The Pololu Baby Orangutan B-328P was chosen as our robot controller. This decision was based on the fact that this robot controller uses an 8-bit Atmega328p microcontroller in a 24-pin form factor complete with headers for an easy to manage prototyping environment. The Atmeg328p comes with the ability to drive two independent motors with a continuous current supply of 1 Amp per motor with a peak current at 3 Amps per motor. In addition, this MCU comes with 8 analog inputs, which is exactly how many we need for the 8 sensor inputs.

Power

Wireless Command and Reporting

Cost

PID controller (1 page) J

This section should talk about the PID controller and how it works. It should include Explanation of the controller and terms include pseudo-code and the control system loop. Explain how we are calculating error and how the manual tuning process works for us. As well as, the values of P, I, and D we used for our default values that yielded good results.

Learning PID values (0.5 – 1 page) J

This section should talk about the learning technique used to find PID values.

# Evaluation (2 total pages)

Performance based on speed being 75% and the total accuracy being 25%. So, the speed will take priority over the error, but still allow for more accurate values to overcome the speed.

Comparison between Controllers (1 page) F

A PID controller to a P, PI, and PD controller will be tested with similar values. This will show the benefit to having each of the terms and how they affect the performance.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Run | P | I | D | Error | Time |
| 1 | 20 | 0 | 0 |  |  |
| 2 | 20 | 0 | 10 |  |  |
| 3 | 20 | 0 | 15 |  |  |
| 4 | 20 | 0.05 | 0 |  |  |
| 5 | 20 | 0.05 | 10 |  |  |
| 6 | 20 | 0.05 | 15 |  |  |
| 7 | 20 | 0.1 | 0 |  |  |
| 8 | 20 | 0.1 | 10 |  |  |
| 9 | 20 | 0.1 | 15 |  |  |
| 10 | 25 | 0 | 0 |  |  |
| 11 | 25 | 0 | 10 |  |  |
| 12 | 25 | 0 | 15 |  |  |
| 13 | 25 | 0.05 | 0 |  |  |
| 14 | 25 | 0.05 | 10 |  |  |
| 15 | 25 | 0.05 | 15 |  |  |
| 16 | 25 | 0.1 | 0 |  |  |
| 17 | 25 | 0.1 | 10 |  |  |
| 18 | 25 | 0.1 | 15 |  |  |
| 19 | 30 | 0 | 0 |  |  |
| 20 | 30 | 0 | 10 |  |  |
| 21 | 30 | 0 | 15 |  |  |
| 22 | 30 | 0.05 | 0 |  |  |
| 23 | 30 | 0.05 | 10 |  |  |
| 24 | 30 | 0.05 | 15 |  |  |
| 25 | 30 | 0.1 | 0 |  |  |
| 26 | 30 | 0.1 | 10 |  |  |
| 27 | 30 | 0.1 | 15 |  |  |

Table – Experiments with Different PID Values

Comparison of PID Values (1 page) J

The PID values found in the method section will be tested against the learned PID values. This will show the benefit of the learned PID values over the user set values.

# Conclusion (0.5 – 1 page) F J

This section should be concluding remarks about the project talking about the strengths, weaknesses, and possible improvements.

# References

Pololu Baby Orangutan B Users Guide. Available from http://www.pololu.com/docs/pdf/0J14/baby\_orangutan\_b.pdf.

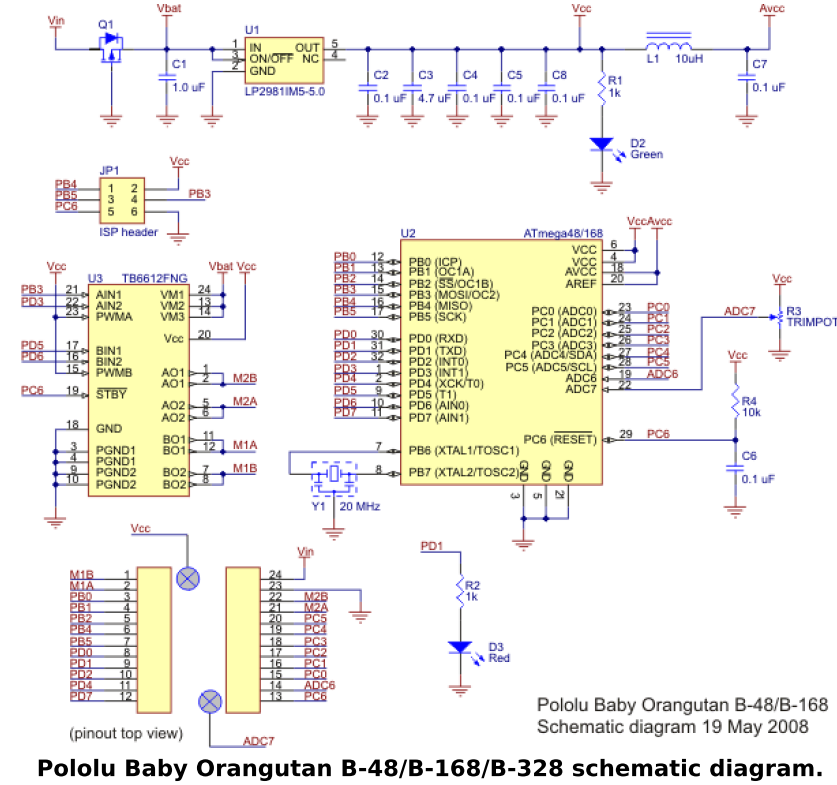


Figure 1 - Pololu Baby Orangutan B-328 Schematic diagram (Pololu Baby Orangutan B Users Guide)