

Wall Following Robot

1 Introduction

In recent years, robotics has become a major force among automation tasks. Concepts of robotics are applied from small automation tasks to self driving cars. In this challenge, you are tasked with building a simple wall following robot using analog electronic components. For this, you have to measure the distance from the robot to the side walls using analog sensors. Then using a PID control circuit, you should generate a signal so that the robot tracks and travels on the centerline between the walls.

2 Specification

Build a simple wall following robot with a PID controller which keeps the robot at the center as it travels.

- Use of analog distance measurement sensors
- Use analog electronics for the implementation (transistors, operational amplifiers)
- Robot should be able to track the center-line between walls with minimum latency
- Evaluated based on design, speed and performance of the robot
- A design with 2 motors will be sufficient
- You can use a robot kit with chassis (but you are encouraged to come up with a custom design)
- Wall height is 7 cm
- The width between walls is 30 cm
- Maximum robot size is 15 cm x 15 cm

3 Additional Notes

- Any change of project specification is negotiable only before the mid review
- All circuits must be simulated using software (e.g., Multisim, LTspice, PLECs)
- All circuits should be tested on the breadboard and reviewed by the assigned supervisor before moving further
- Circuits must be designed using professional EDA software (e.g., Altium Designer, OrCAD)
- Schematics should be verified and evaluated by the assigned supervisor
- Design for manufacturability should be considered when designing the PCB
- Complete set of design and manufacturing documents
 - Schematics, Layout, 3D file
 - Gerber files, Assembly files
 - BoM

must be generated and properly documented.

- Students are encouraged to procure components from international component distributors (e.g., Mouser, DigiKey, Arrow Electronics, LCSC)
- Students are encouraged to get the PCBs manufactured from international PCB manufacturers (e.g., JLCPCB, PCBway)
- Main functionality of the project must be achieved with basic electronic components such as resistors, capacitors, inductors, diodes, transistors and other analog integrated circuits.
- Using any other pre-built programmable ICs are prohibited.
- Microcontrollers can be only used for user interface operation.
- Enclosure design must be done using a professional software (Solidworks)
- Enclosure and 3D model of the circuit must be assembled and inspected before manufacturing.
- 3D printing, Laser cutting and Sheet metal bending can be used to manufacture the enclosure.
- Students are encouraged to consider the 3D model and PCB co-design (design in parallel by taking their integration into consideration) when designing.
- Final implementation of the project need to done in a PCB.
- Follow provided “General guidelines”.