



# TechFest

X

# RAC

Cosmo Clench and Meshmerize  
Workshop





Techfest is the annual science and technology festival of Indian Institute of Technology Bombay, consisting of social initiatives and outreach programs throughout the year.





OFFICIAL AFTERMOVIE

2022-23





# What is Robot?

A robot is a automated machine that can execute specific tasks with little or no human intervention

<https://www.youtube.com/watch?v=4o0FZalxIYw>

<https://www.youtube.com/watch?v=Jky9l1ihAkg>



# Essential Characteristics of Robot



## Sensor

Detects the robot's environment



## Actuator

Executes movements or actions based on sensor data



## Intelligence

Processes sensor data and makes decisions



## Energy

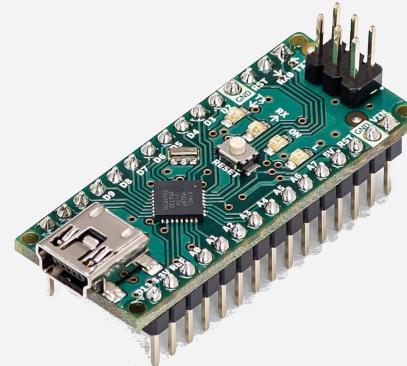
Powers sensors, actuators, computational processes



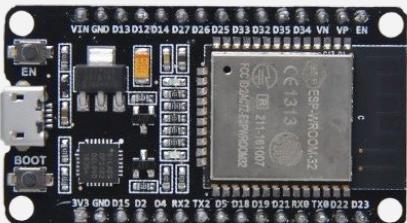
# Development Boards



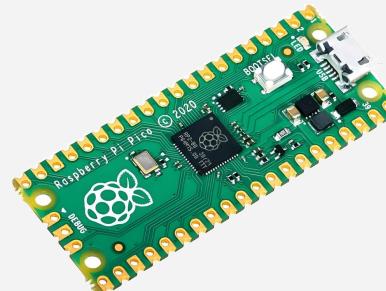
Arduino Uno



Arduino Nano



ESP-32



Raspberry Pi Pico



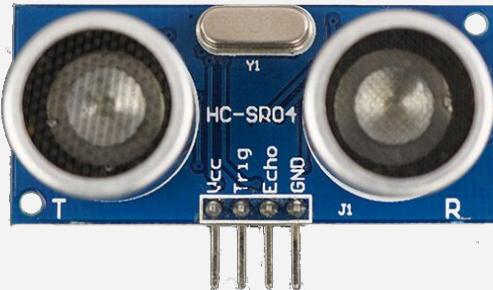
# Our Recommendation

- Easy to use
- Budget friendly
- Uses C / C++
- Versatile
- Open-Source:
- Wide Range of Libraries

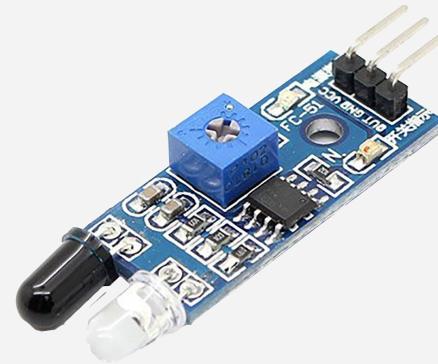


# Sensors

## Ultrasonic



## InfraRed



# DC Motors



Micro Metal gear/  
N20 Motors



Gear DC Motors



BO Motors



Servo Motors





# Batteries

- Battery type
- Voltage & Current



**LiPo Battery**



**Li-Ion Battery**





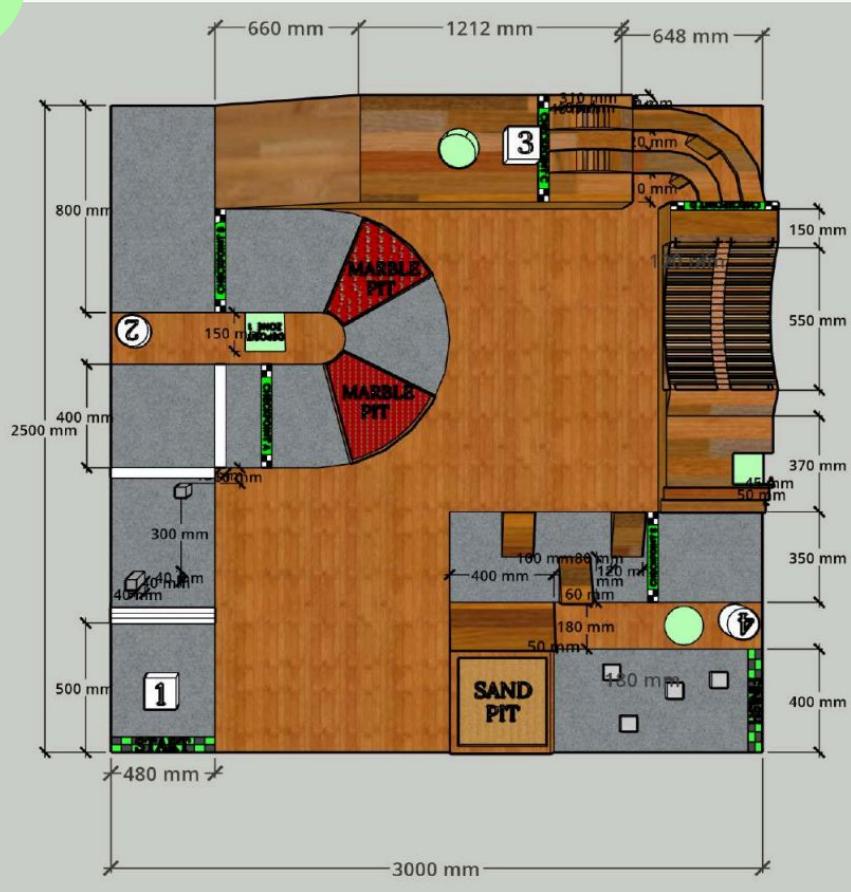
01

# Cosmo Clench



# Problem Statement

Teams have to build a manually controlled bot that can do simple tasks of gripping objects and putting them in target zones so that it can complete the route by overcoming the hurdles in its path.



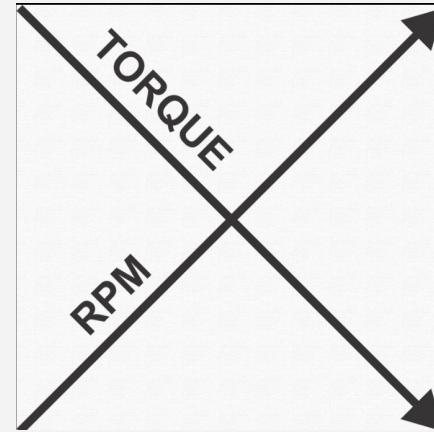
# Chassis

- Strength and Durability
- Ground Clearance
- Weight distribution
- Size and Dimensions
- Modularity
- Safety
- Aesthetic and branding



# Motor and Torque

- Torque and Rpm Relation
- Types of motors



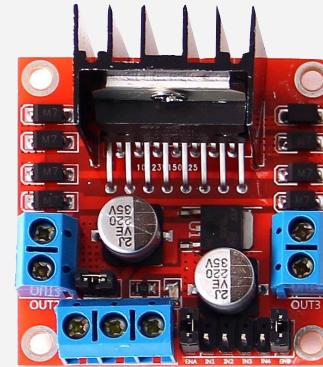
# Gripper Mechanism

- Claw type
- Parallel type
- Soft gripper type



# Motor Drivers

- Current amplification
- Direction Control
- Speed control
- Protection



L298n

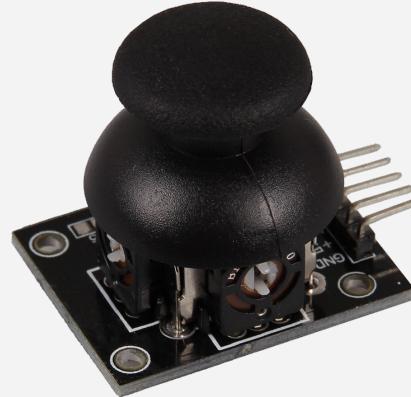


Lilon Battery

# Controlling the bot

You can go with joystick

- joystick ky-023
- 2 Axis Control
- Budget friendly

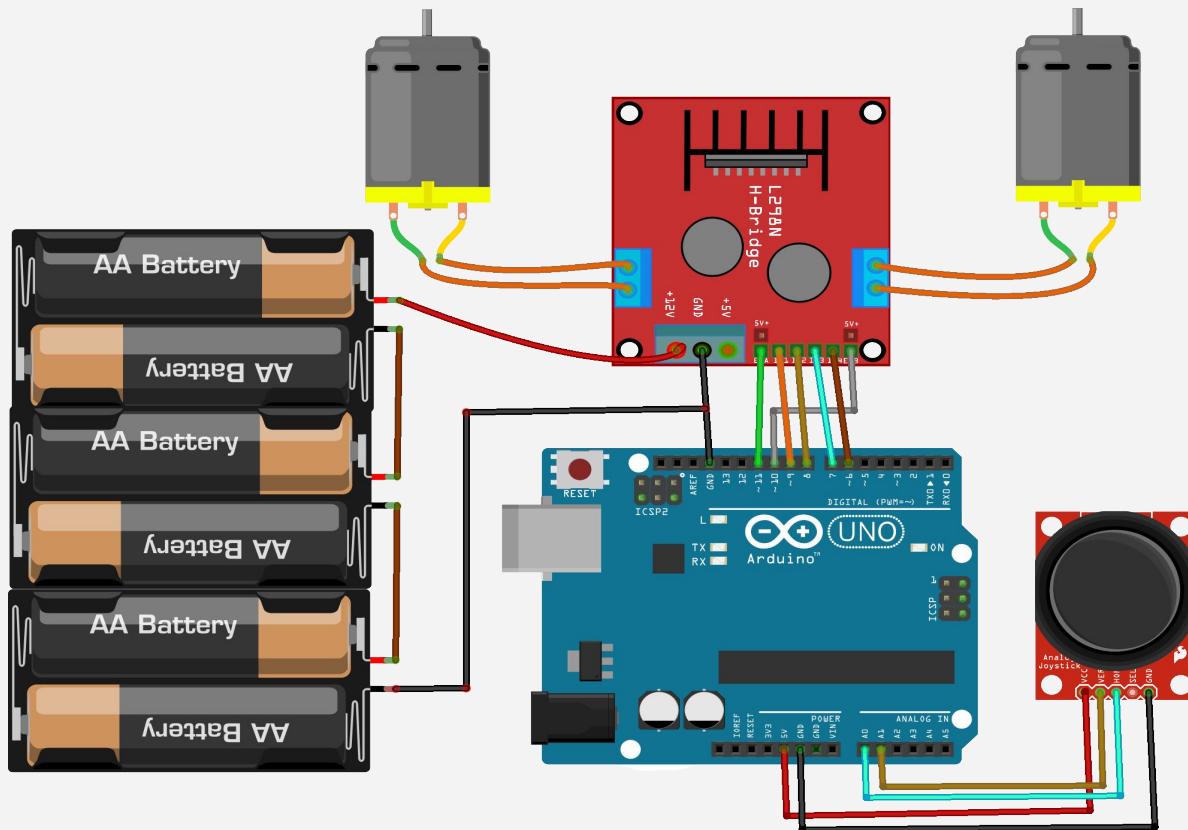


For demo purpose we can

- Radio Master 2.4ghz module
- More channels for additional features



# Circuit Diagram



# Control

Depending on values of X & Y axis these analog values are sent to arduino to make a decision for movement of bots using If-Else statements

Status	M1	M2	m1	m2
Forward	1	0	1	0
Reverse	0	1	0	1
Left	0/1	0/1	1	0
Right	1	0	0/1	0/1



# Control

For eg Taking Ref analog voltage 3 , using if-Else if Voltage on axis X increases on Right then set truth table for Right

If Value goes below 3v take Left Algorithm

```
if (MSFB > 10) // Bot goes Forward
{
    digitalWrite (EN1, MSFB);
    digitalWrite (EN2, 0);
    digitalWrite (EN3, MSFB); |
    digitalWrite (EN4, 0);
```

Status	M1	M2	m1	m2
Forward	1	0	1	0
Reverse	0	1	0	1
Left	0/1	0/1	1	0
Right	1	0	0/1	0/1



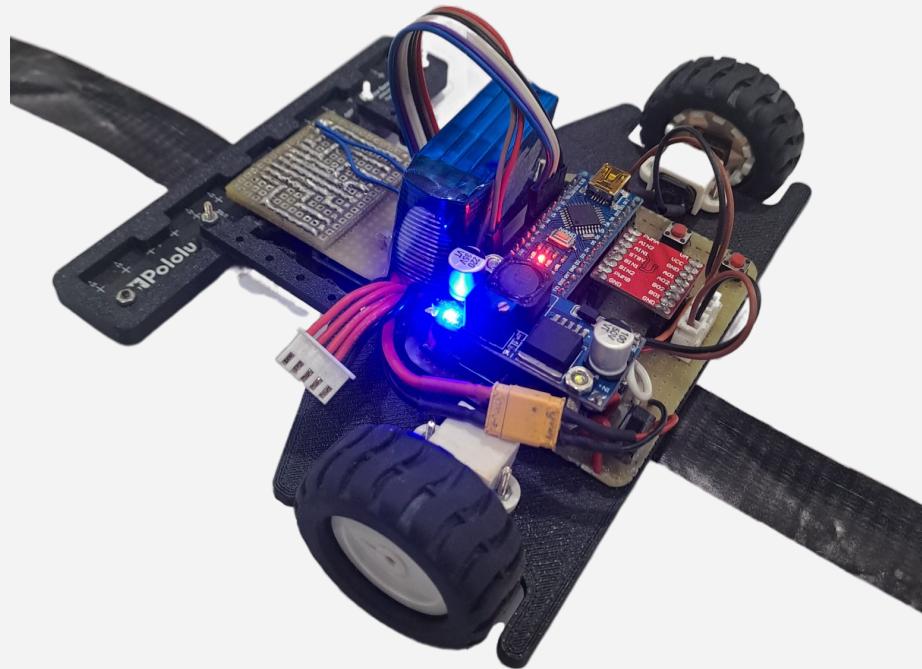
## Stepwise Procedure

- Select a Chassis for to place all the electronics.
- Connect electronics according to circuit diagram
- Select a gripper arm suitable for your operation
- Create a suitable code according to your circuit and connections



02

# Meshmerize







Autonomous Bot



But How ???

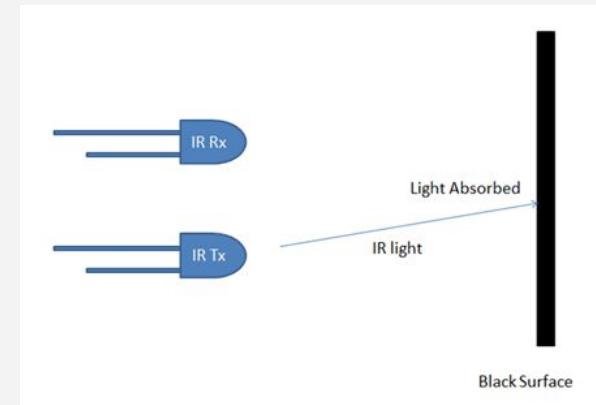
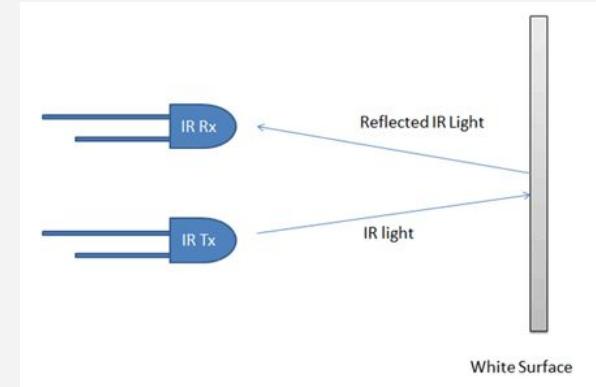


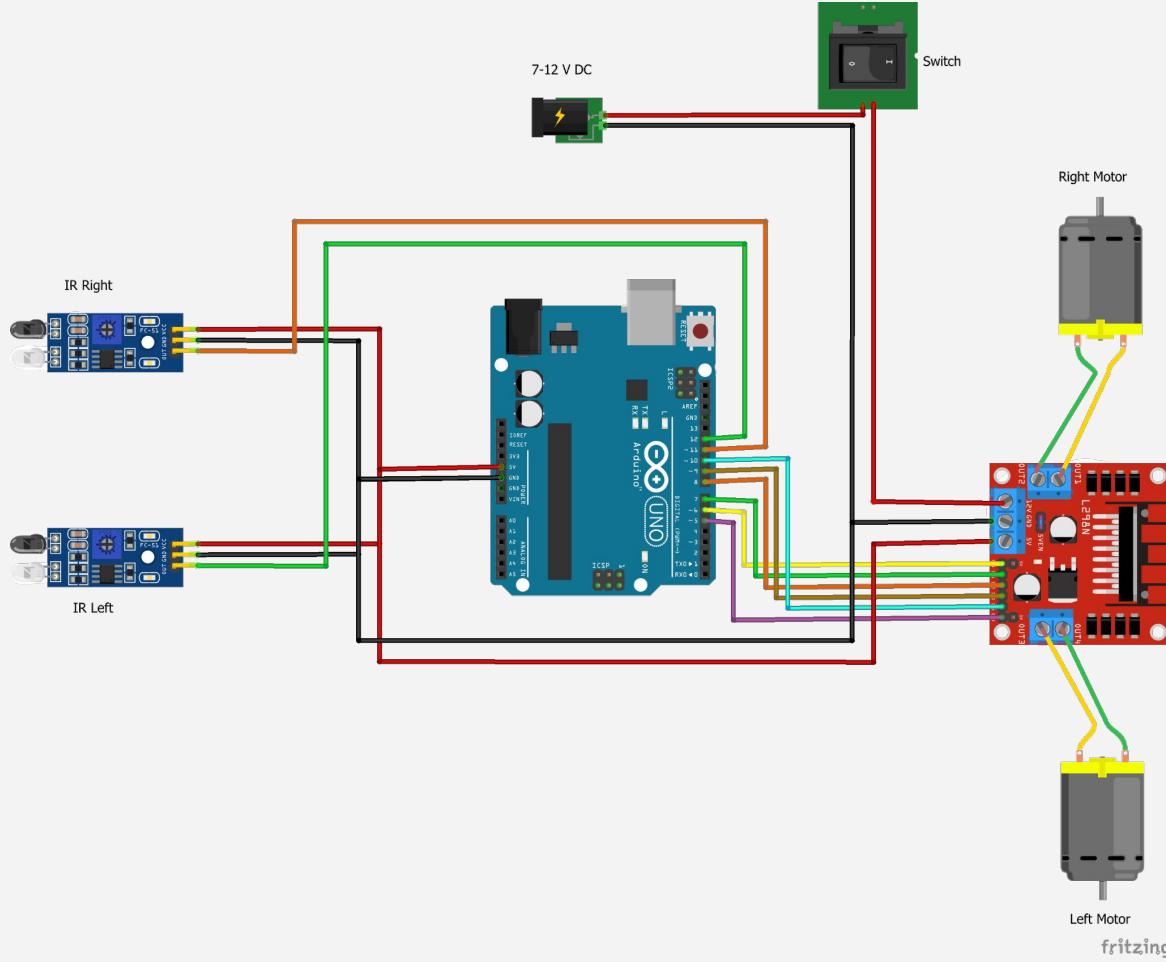
Using IR Sensors



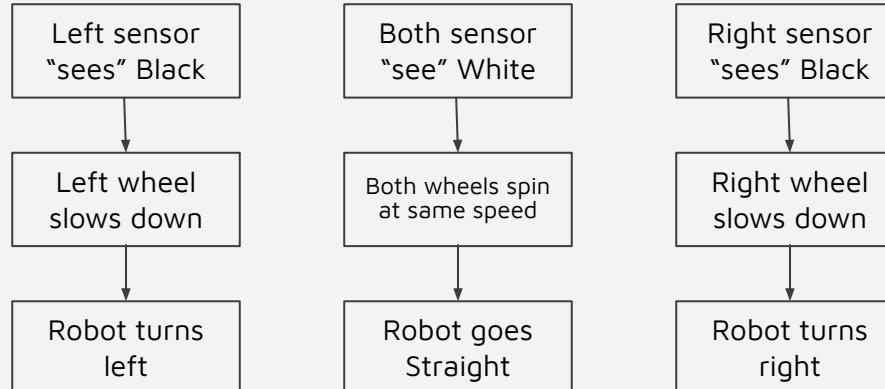
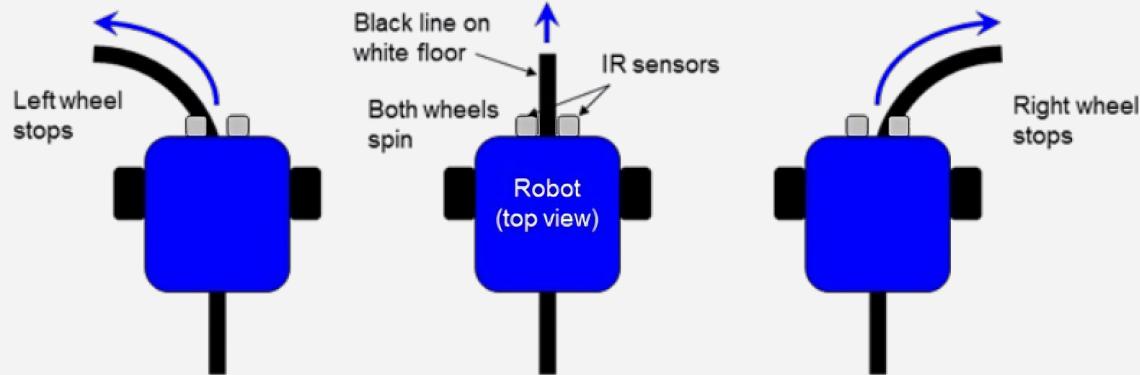
# IR Sensors

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment

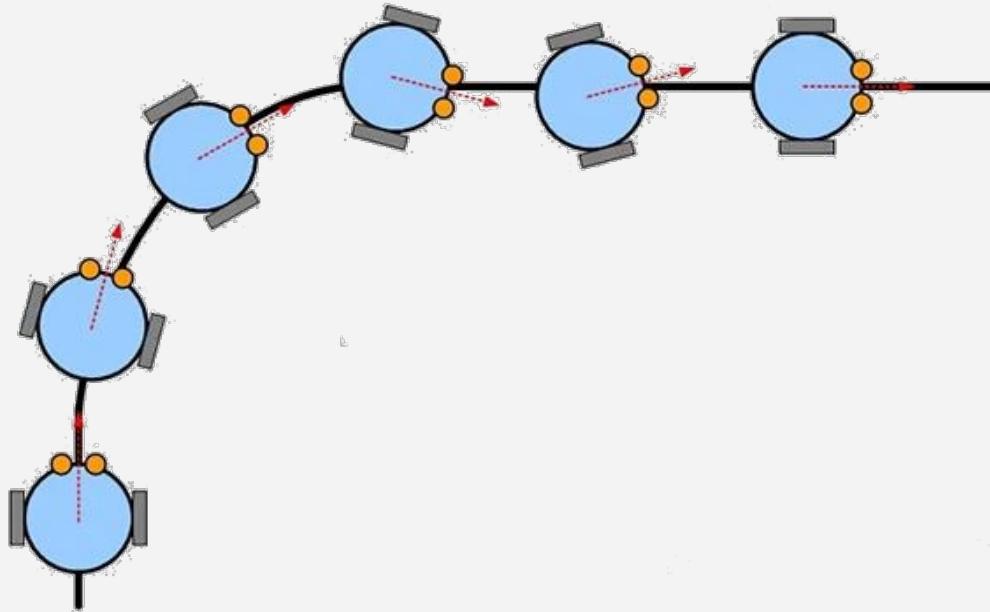




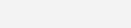
# Line Following



# Line Following



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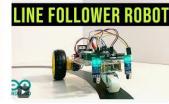


Instructables

Very Simple Line Follower f...

YouTube

How To Make Simple Line Follo...



Tutorials on PlayWithRobots

Simple Line Follower robot

Instructables

SIMPLE LINE FOLLOWER...

YouTube

Line Follower Robot using Arduin...



Sumoza - In stock

LineCraft Fast Line Foll...



YouTube

FAST Line Follower Robot Using PID ...



YouTube

Speed Line Follower Robot V4 (On Trac...



IndiaMART

Fastest Line Follower Two Abira Fl...



YouTube

How to make a fast line follower robot ...



Pololu Forum

Fast Line Follower Build ...



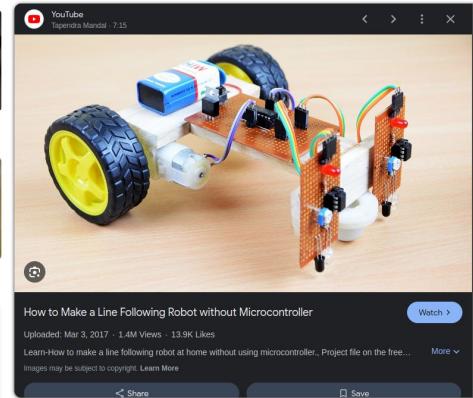
Robojunkies - Out of stock

LF-2 Line Follower Kit - R...



JSUMO

STORM PID Controlled Fast Line F...

<https://www.google.com/imgres?q=fast%20line%20follower&imurl=https%3A%2F%2Fiytimg.co...>

YouTube Shyam Ravi - 10:02

**FASTESt Line Follower?**

I made a SUPER FAST Line Follower Robot Using PID!

Uploaded: Jul 13, 2023 · 323K Views · 7.26K Likes

I'll show you how to make a line follower robot using a PID controller on arduino!, JLCPCB 1-8 Layer PCB a...

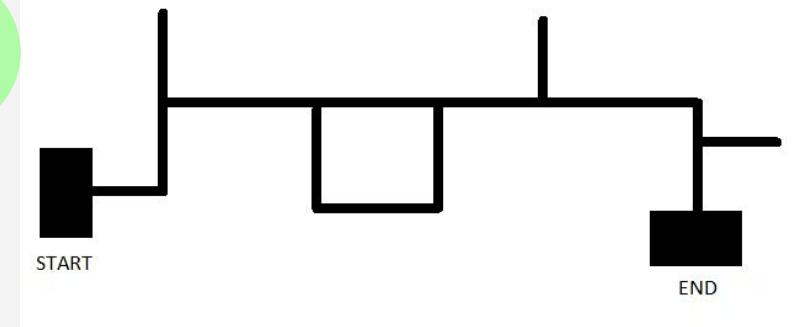
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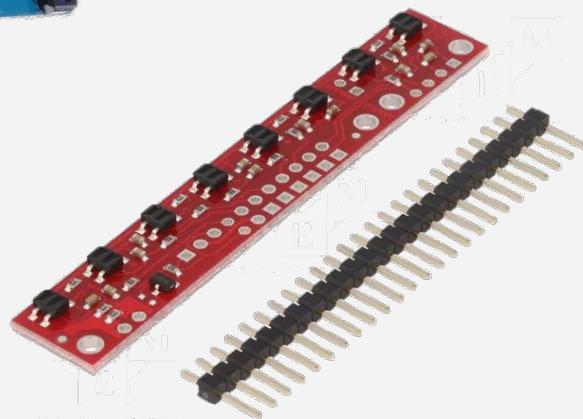
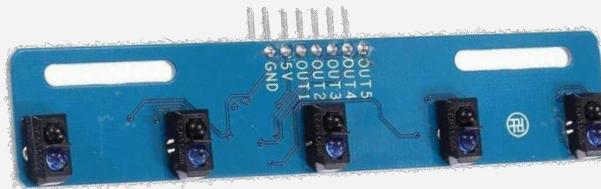
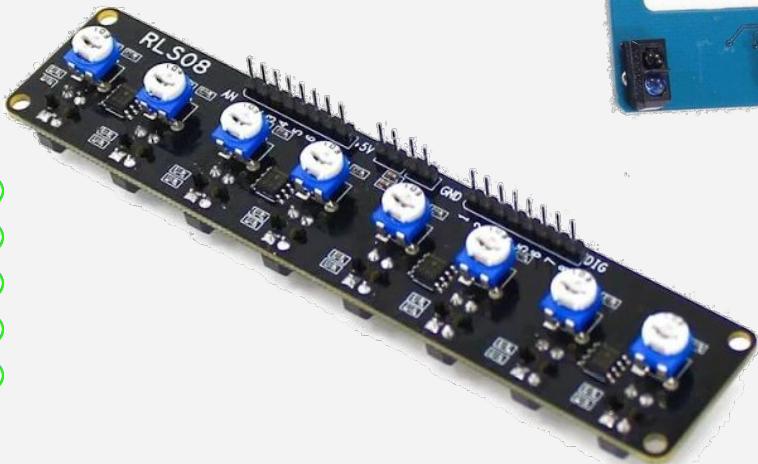
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Save

# Need of Sensor Array



Easily available Sensor Array:



# Recommended Improvements

Explore PID Control and how it is used for line follower  
(resources shared in readme file)

## What is PID Control?

PID stands for Proportional-Integral-Derivative. It is a control algorithm used to maintain a desired path or behavior for a system, especially useful in robotic applications like line-following.

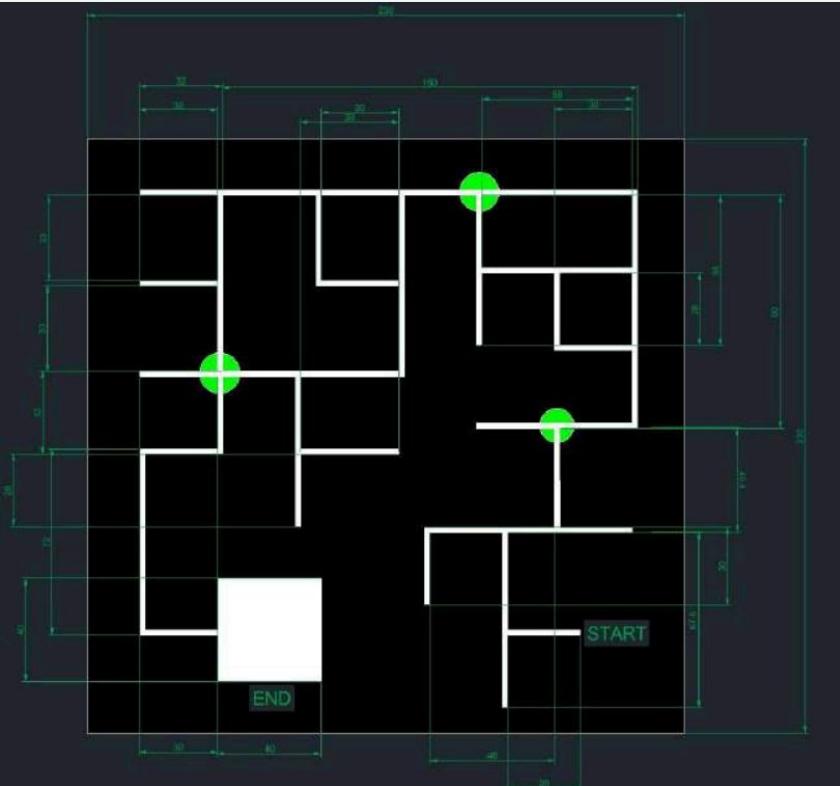
**Proportional (P):** Adjusts motor speed based on the current error.

**Integral (I):** Corrects repeated drifting by adding more correction over time.

**Derivative (D):** Predicts system behavior and thus improves settling time and stability of the system.

# Problem Statement

- Follow line to navigate mazes
  - Track directions
  - Analyze path in Dry Run
  - Max 3 dry runs
  - Optimize route in Actual Run
  - Minimize completion time

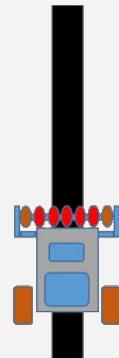




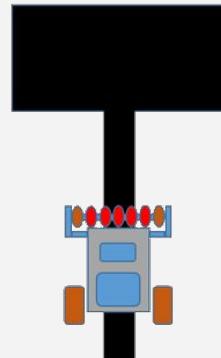
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Credits : RoboJunkies

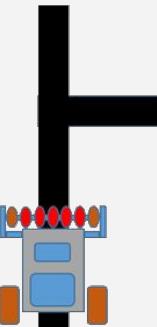
# Types Of Intersections



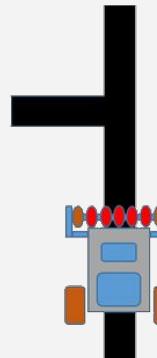
Dead End



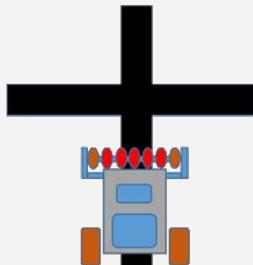
End of Maze



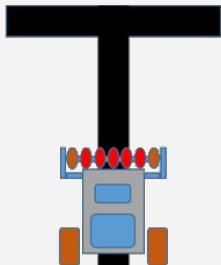
Straight or Right



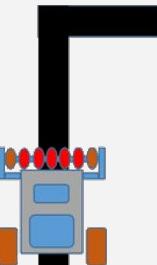
Straight or Left



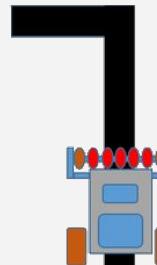
Cross



"T"



Right Only

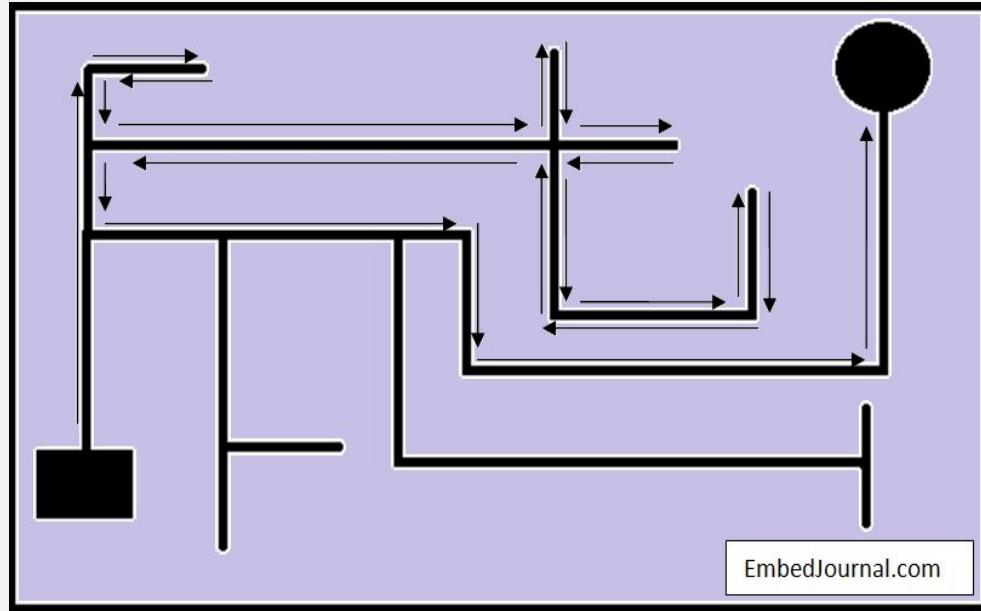


Left Only

## LSRB Priority Algorithm



- If you can turn left then go ahead and turn left
- else if you can continue driving straight then drive straight,
- else if you can turn right then turn right.
- If you are at a dead end then turn around.



EmbedJournal.com



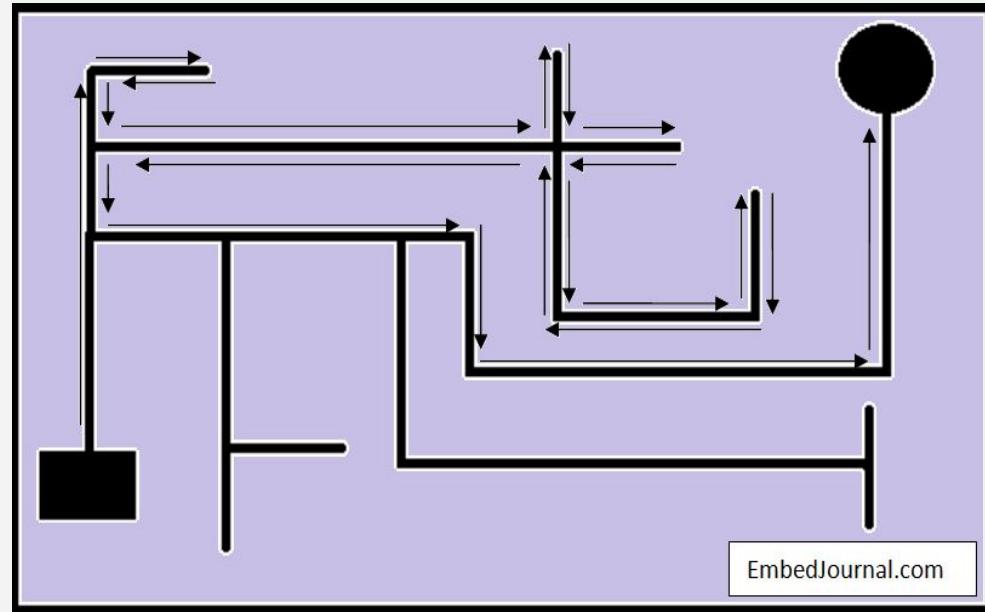
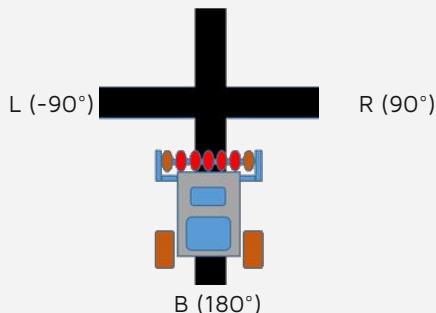
L - Left    S - Straight    R - Right    B - Back

# How To solve the path?

## Key Steps :

- Keep track of the turns taken on intersections only
- Always check last three turns
- If the last three turns are in the form X-'B'-Y simplify the path.
- Simplify : Add X + B + Y

S (0°)



**S-S-R-B-L-L-L-B-L-B-L-L-L-B-R-R-L-L-L-R-L-L**

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# Techfest™

17th - 19th December, 2024

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Prize INR  
80,000

## ZONALS

**Meshmerize**  
Prize INR  
80,000

## ZONALS

**Codecode**  
Prize INR  
40,000  
Test Your Coding Skills By Answering Coding Question Efficiently And Solve Real Life Problems Through Coding.

## ZONALS

**TechFest Olympiad**  
Prize INR  
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## About TechFest



The image displays two promotional cards for the IDEATES competition, set against a dark background with a futuristic, glowing green border.

**IDEATES** (Top Left):  
This card features a central silhouette of a person walking towards a bright light. The background is filled with various icons related to innovation, sustainability, and women's empowerment. The title "IDEATES" is at the top, and the subtitle "INNOVATION & SUSTAINABILITY" is below it. The word "Sanrakshan" is prominently displayed in green. The prize amount "Prize INR 80,000" is shown in white text. At the bottom, there are "Register" and "Explore" buttons.

**IDEATES** (Top Right):  
This card has a similar design but focuses on supply chain management. It features icons of a factory, a truck, and a reindeer. The title "IDEATES" is at the top, and the subtitle "SUPPLY CHAIN MANAGEMENT" is below it. The word "Supply Connect" is prominently displayed in green. The prize amount "Prize INR 80,000" is shown in white text. At the bottom, there are "Register" and "Explore" buttons.

**Bottom Navigation:**  
At the very bottom of the slide, there is a decorative footer consisting of five small green circular icons.



## HACKATHON



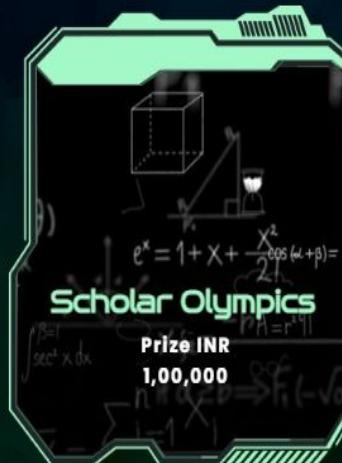
## ROBOTICS



## FINANCE



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