# EN2533 Robot Design and Competition
# Team AGNI
# Overview

## Overall Strategy

### Line Following:
We will use 10 analog IR sensors to detect the white colour line. These sensors provide analog values, and by setting a threshold value these values can be converted into digital values. Then the PID algorithm, which is implemented in a microcontroller, will set the speed of each motor.

### Wall Following:
We will use two TOF sensors to both sides of the robot. According to their input, the distance of the obstacle will be calculated and motor speed will be changed. It is important to note that for this task we will give priority to obstacle avoidance over line following.

### Bridge:
Throughout this task, the line following method will be used. If we find a small door open box, the arm will grab the box, then the robot will move backward until it reaches the junction. then it turns right and moves forward until it reaches checkpoint 4 again.

### Colour line:
Firstly, to detect the colour of the box we will use an RGB colour sensor. Then we will use 10 IR sensors which are already used for line following. But for this task we will change the threshold values for red and blue. We are also going to use the PID algorithm, but here we will use a search method to reach checkpoint 6.

## Mechanical Design
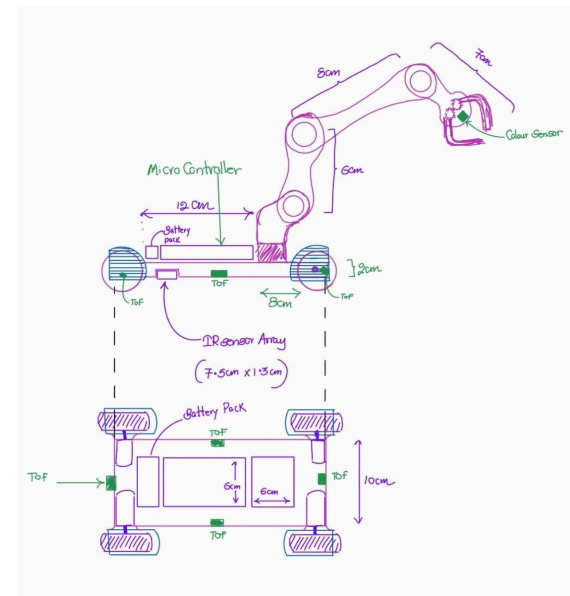


## Sensors

### Obstacle Detection & Guard Bot part:
Selected Sensor: TOF VL6180V1 Proximity Sensor
Reasons for Selection:
- High accuracy in measuring distances
- Unaffected by ambient light
- Small physical size for flexible integration
- Extended range from 0 to 60cm

### Line Following:
Selected Sensor: IR Array
Reasons for Selection:
- Provides wider coverage area for efficient line following
- Simplifies sensor setup with multiple IR sensors in one package

### Colour Detection:
Selected Sensor: TCS230 Color Sensor
Reasons for Selection:
- High accuracy in colour detection

- Versatile in distinguishing a wide range of colours

### Sound Detection:
Selected Sensor: MD0220 Voice Sound Detection Mic Sensor
Reasons for Selection:
- Designed specifically for voice and sound detection
- Optimised for voice detection, suitable for reacting to voice commands or environmental sounds

## Actuators

We plan to use two N20 motors for rear wheels.
Options - N20 motors, plastic motors
Reasons for Selection:
- higher efficiency
- low power consumption,
- It has the required rpm value to carry the robot on the ramp.

## Algorithms

### Line Following
get input from IR and A2D Conversion
calculate Speed using PID (Proportional integral derivative Algorithm)
set speed

### Obstacle Detection
get input from TOF sensor
calculate distance (D)
if D <2cm
    set new speed according the TOF sensor side

### Red/Blue Line Following
get input from IR and A2D Conversion
if all (IR) = 0
  turn 180°
    forward

  until All (IR) != 0
else
  calculate speed using PID [Priority Left, Forward, Right]
 set speed

### Box Detection
get TOF input [ Front TOF]
calculate distance
    forward until distance = d cm
    //d will be determined

### Sound Detection
get input from sound sensor
if input = 1
  follow line
else
  break

### Guard Bot
get input from TOF sensors
if right TOF detects before left TOF
  turn right
    forward
  until find checkpoint 8
else
  wait

## Task Delegation

- Thamirawaran - Line following, obstacle avoiding
- Ruchira Abeywardane -PCB design, arm coding part.
- Lasitha Amarasinghe -Guard bot part, Adjust the overall code for task wise functioning
- Rajitha Niroshan -Solidwork design, Ramp Task
- Sahan Abeyrathna -Colour detection and sound detection part