# 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 provides analog values, and by setting a threshold value these values can be converted into digital values. Then the PID algorithm, which is implemented in microcontroller will set the speed of each motor.

### Wall Following:
we will use two TOF sensors to both side of the robot. According to their input, 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, line following method will be used. If we find small door open box, arm will grab the box, then robot will move backward until reach the junction. then it turns right and move forward until reach the checkpoint 4 again.

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

## Mechanical Design
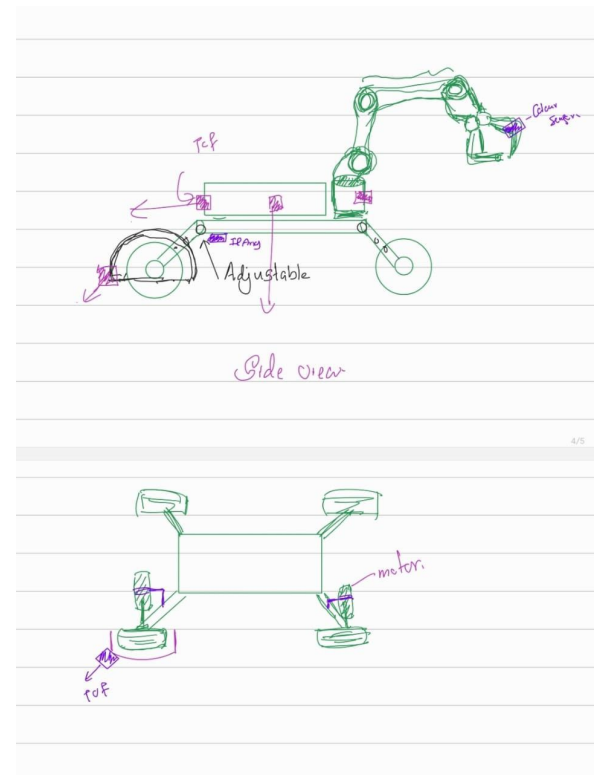


## Sensors

### 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 color detection
- Versatile in distinguishing a wide range of colors

***Sound Detection:***
Selected Sensor: MD0220 Voice Sound Detection Mic Sensor
Reasons for Selection:
- Designed specifically for voice and sound detection
- Optimized 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 and obstacle avoiding, arm coding part
- Ruchira Abeywardane -PCB design
- Lasitha Amarasinghe -Guard bot part
- Rajitha Niroshan -Solidwork design
- Sahan Abeyrathna -Colour detection and sound detection part