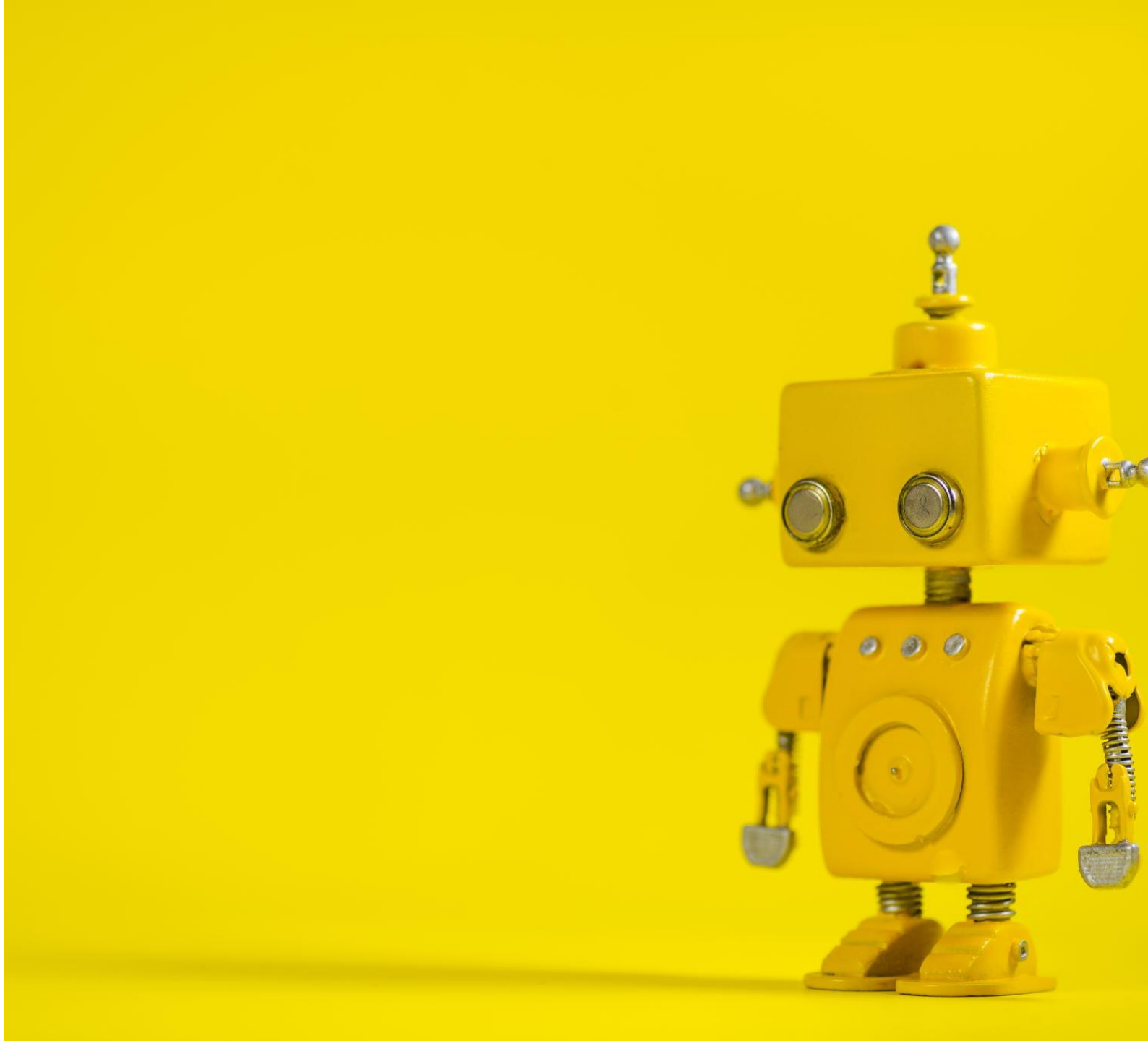
MR. ROBOT

- Overall strategy
- Robot mechanical design
- Sensors
- Actuators
- Algorithms
- Power
- Processing unit
- Task delegation

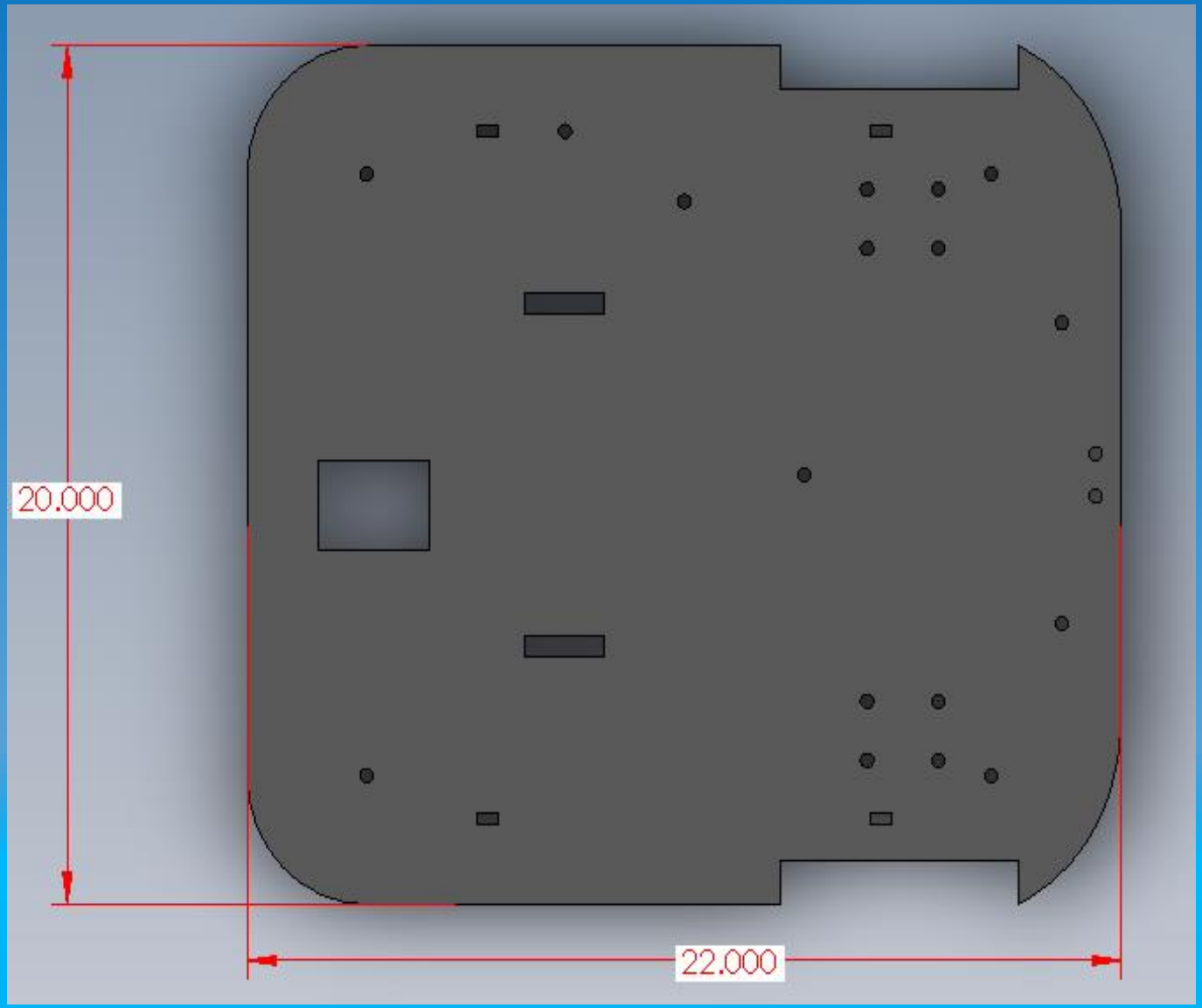


1. OVERALL STRATEGY

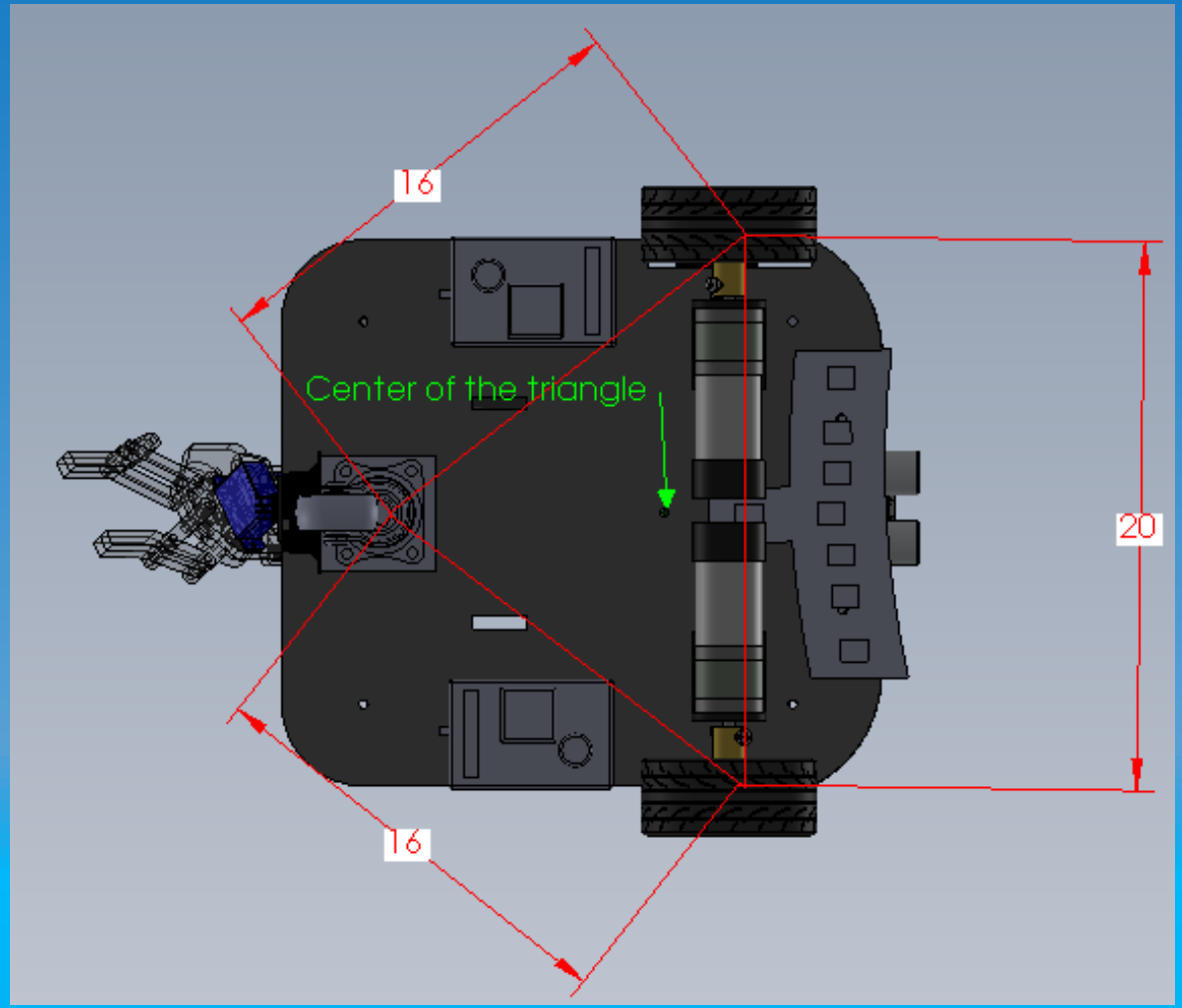
2. ROBOT MECHANICAL DESIGN

- Robot Platform
- Wheels
- Mechanisms
- Computer Aided Design

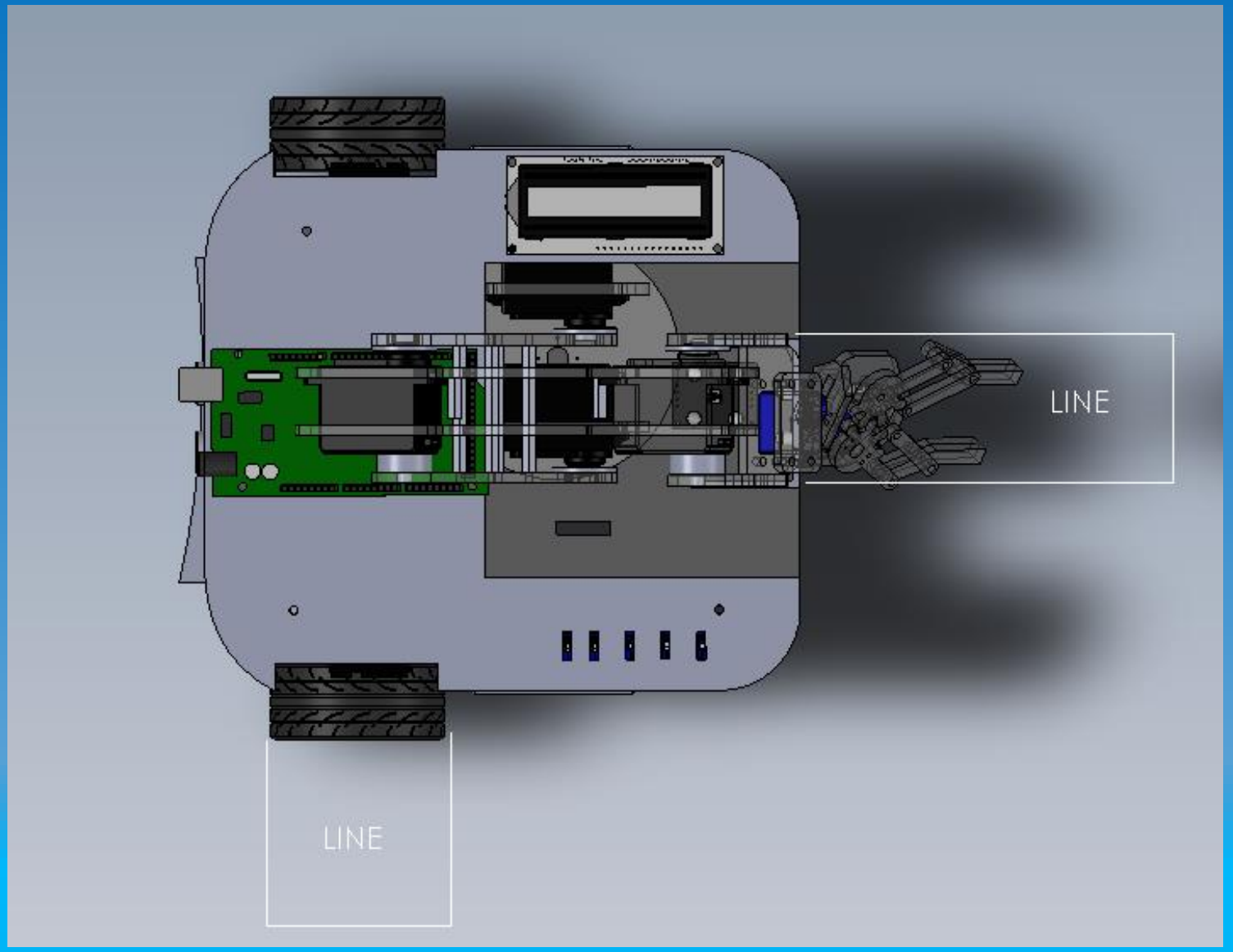
BLUEPRINT



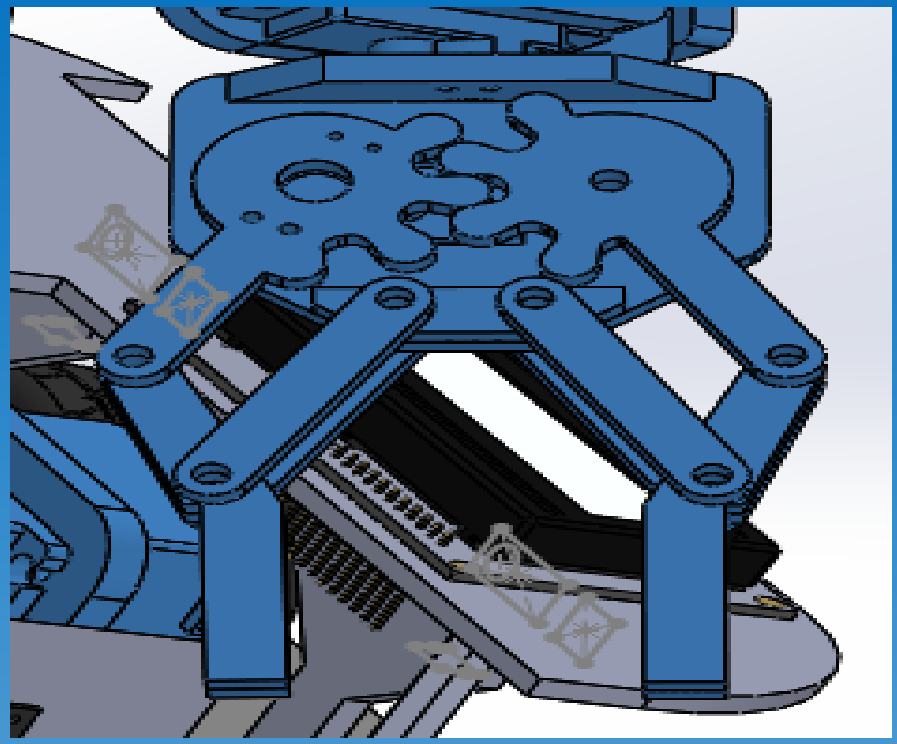
SUPPORT POLYGON & WHEELS

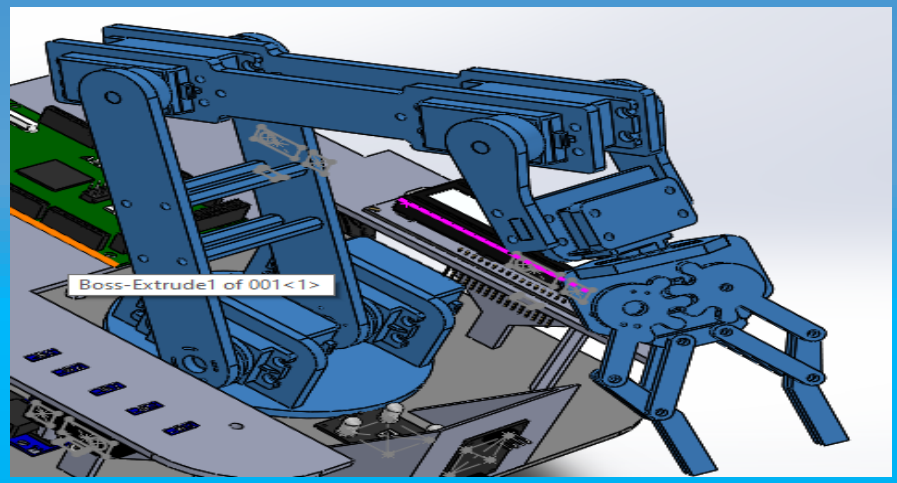


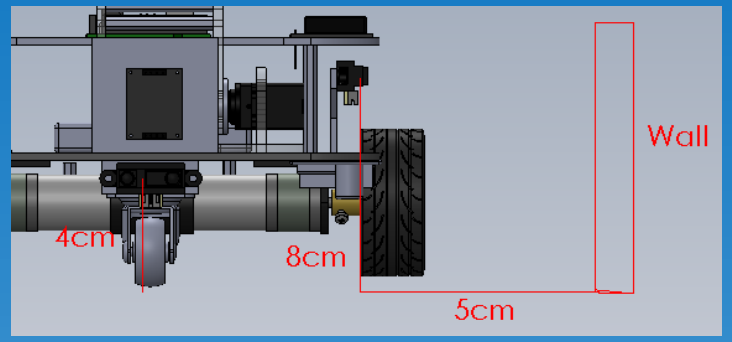
DRIVE MECHANISM

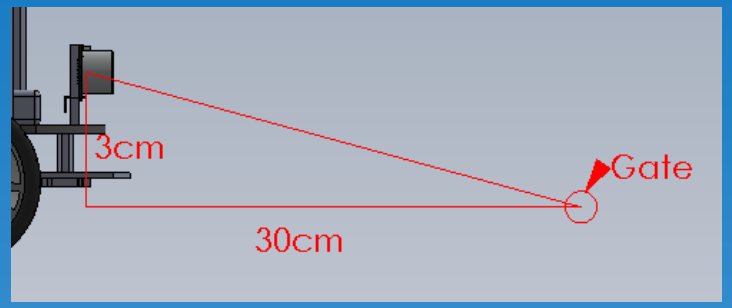


ARM MECHANISM



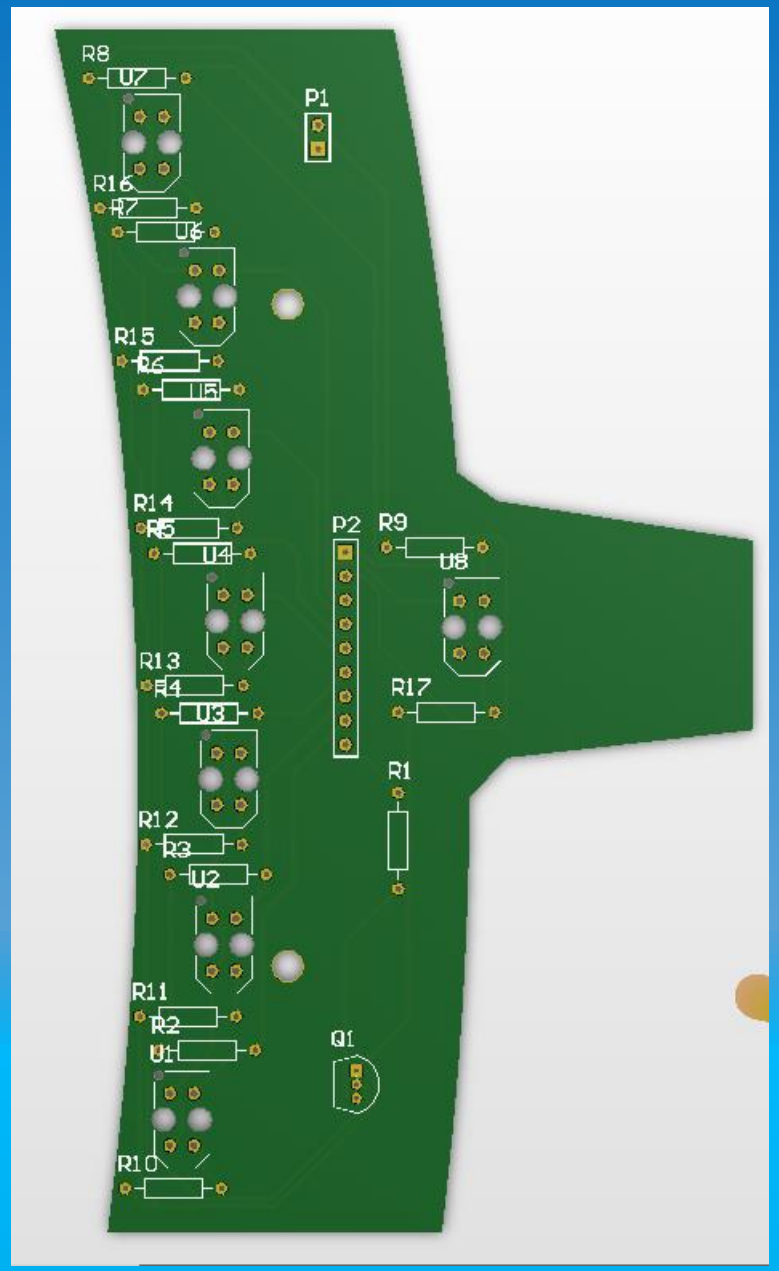


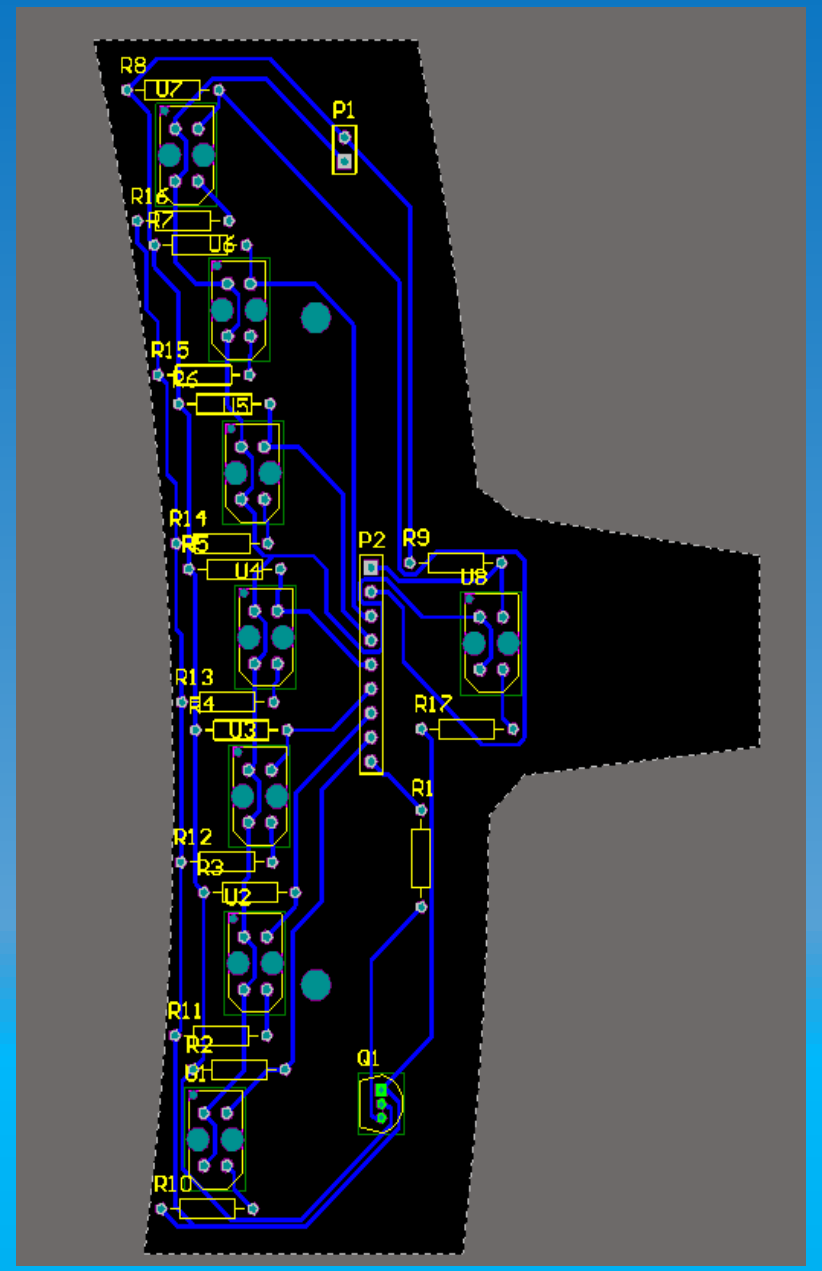




SENSOR PLACEMENT

SENSOR ARAY


R8
U7
P1
R16
R7
U6
R15
R6
U5
R14
R5
U4
P2
R9
U8
R13
R4
U3
R17
R1
R12
R3
U2
R11
R2
U1
Q1
R10


R8
U7
P1
R16
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R15
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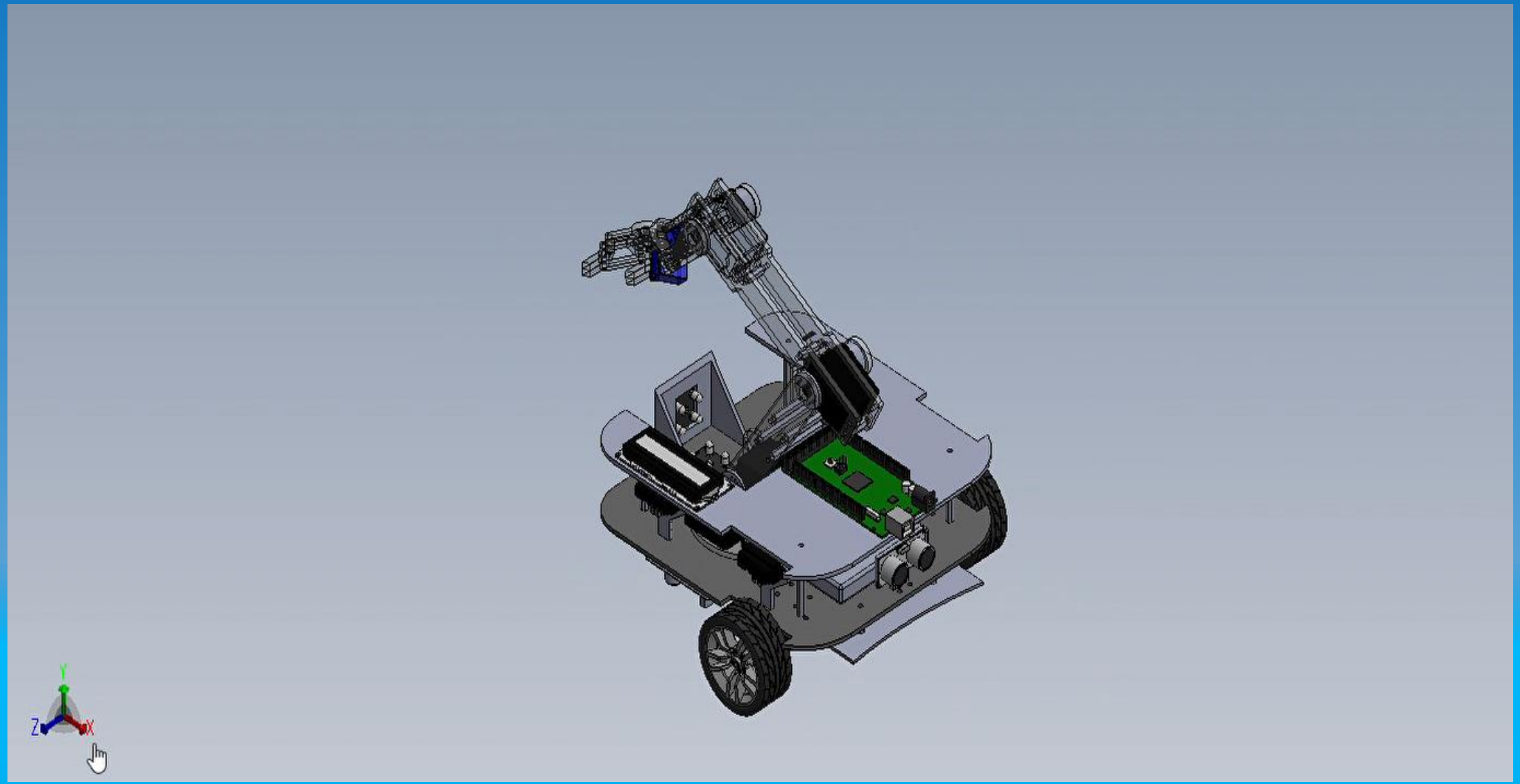
U5
R14
R5
U4
P2
R9
U8
R13
R4
U3
R17
R1
R12
R3
U2
R11
R2
U1
Q1
R10

COMPUTER AIDED



3. SENSORS

Sharp IR

Name – GP2Y0A51
Detect range – 2cm to 15cm
Number of sensors we use – 5 sensors (GP2Y0A51)
Located on- Left side 2, Right side 2 and Back side 1

we use the sharp IRs for

- Wall Following
- Pillars detecting
- Color box detecting

Why should we use that sharp IR GP2Y0A51?

- Wall is curve therefore difficult to identify using Ultrasonic sensors
- Wall and the pillars are 15cm away from the white line

Ultrasonic Sensor

Name – HC-SR04
In practically measuring distance range – 2cm to 80cm
Measuring angle covered – 15 degrees covered
Number of sensors we use – only one sensor
Located on – front side of the robot

we use the ultrasonic sensor for

- We use to detect the synchronous gate

Why should we use ultrasonic?

- It has 15 degrees measuring angle covered
- Gate is a moving object therefore we need a wider range sensor
- Before the gate we have a holding position. From holding position to gate has 30cm-40cm distance approximately

Color sensor

Name – TCS230
8x8 photo diode array
Using current to frequency converter
Light measurements should be made at about 1~3cm to get a more accurate result.

Number of sensors we use – 2 sensors
Located on – design a special box for put the color box

Why should we use TCS230 sensors?

- In our task has 3 colors(red, blue, green)
- This sensor module can easy to identify red, blue and green
- frequency directly proportional to the light intensity
- Avarage cost

4. ACTUATORS

Servo Motors

Name – MG90 and SG90
Number of servos – 6 servors (2 SG90 and 4 MG90)
Using PWM system

	MG90	SG90
Operating Voltage	4.8V- 6V	4.8V- 6V
Rotate	180 degrees	180 degrees
torque	2.2 Kg/cm	2.5Kg/cm
Gear type	Metal	Plastic

Why should we use servo motors?

34:1 12V High Power DC Motor

High Power Motor needs 5.6A stall current

We selected special motor drive
Dagaya 1.0
Maximum current -12A
Number of drives -2

5. POWER

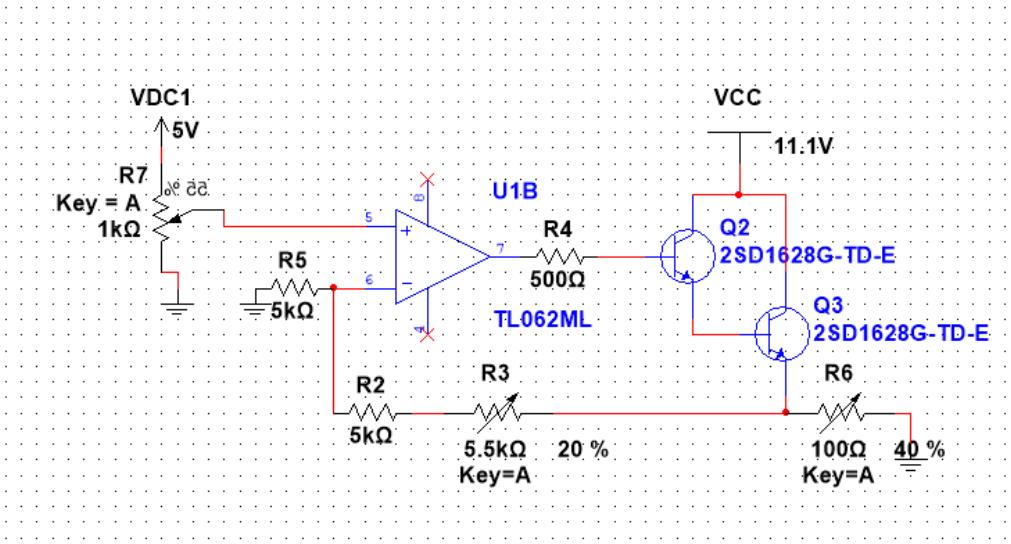
Power System

Name – Lithium Polymer Rechargeable battery
3300mAh
25C

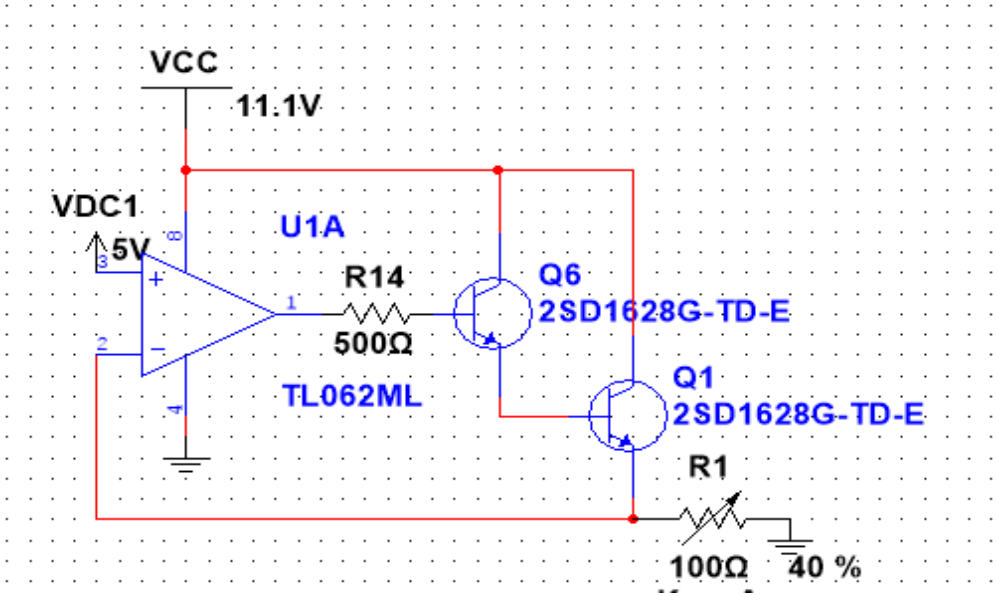
Why we use ?

We need – nearly 3000mA (maximum)
Required discharge rate – 6C

POWER SUPPLY CIRCUIT

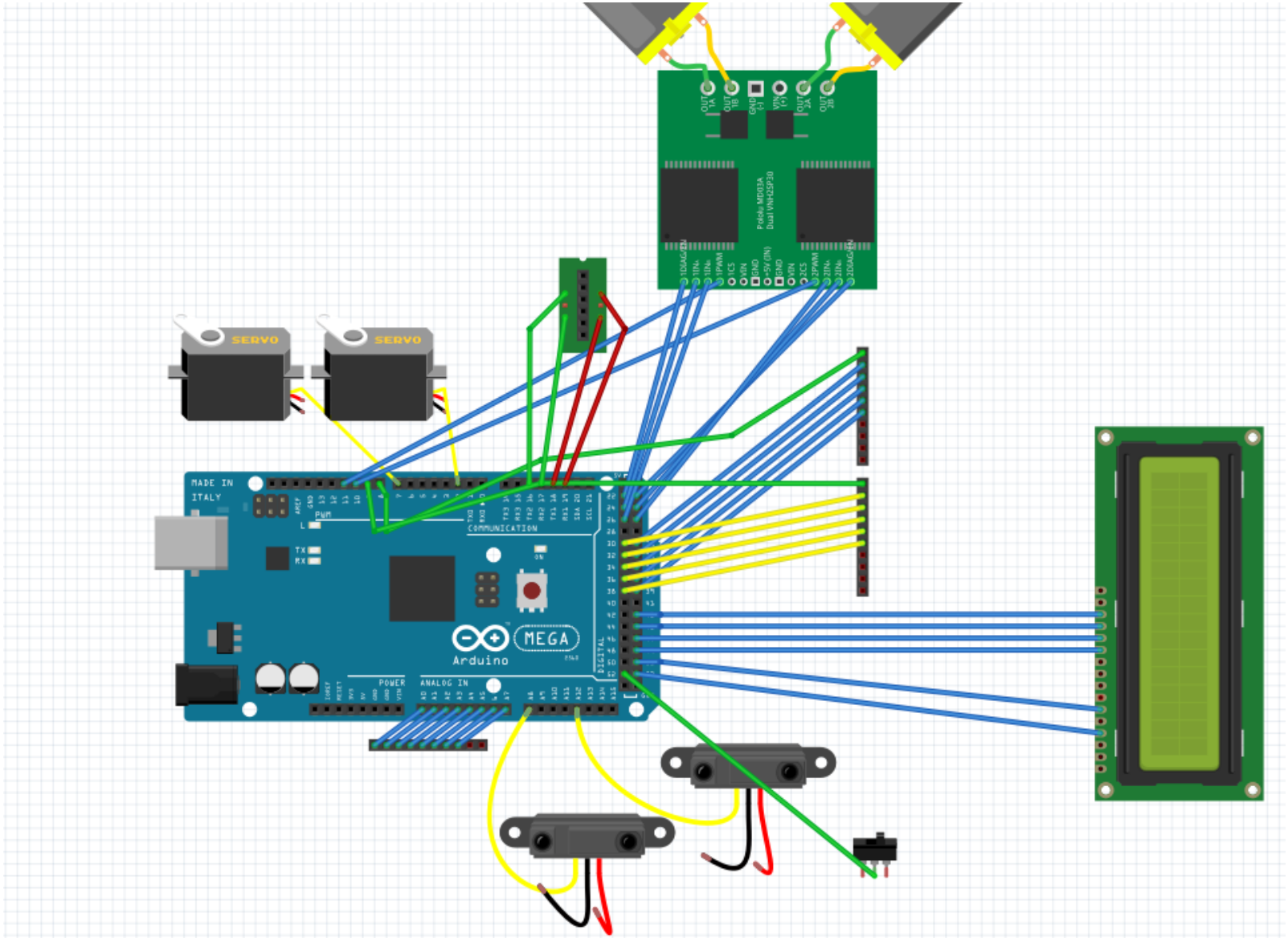


Servo motors power supply

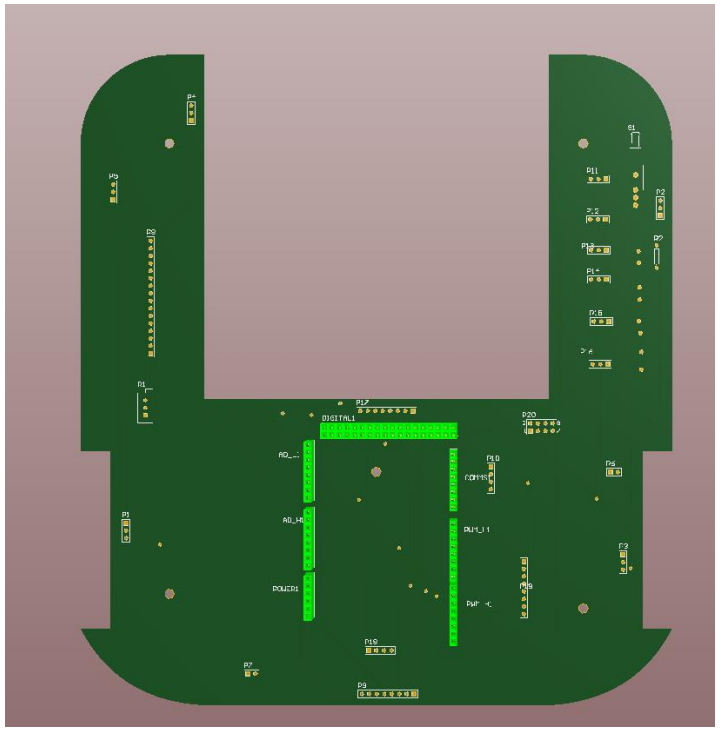


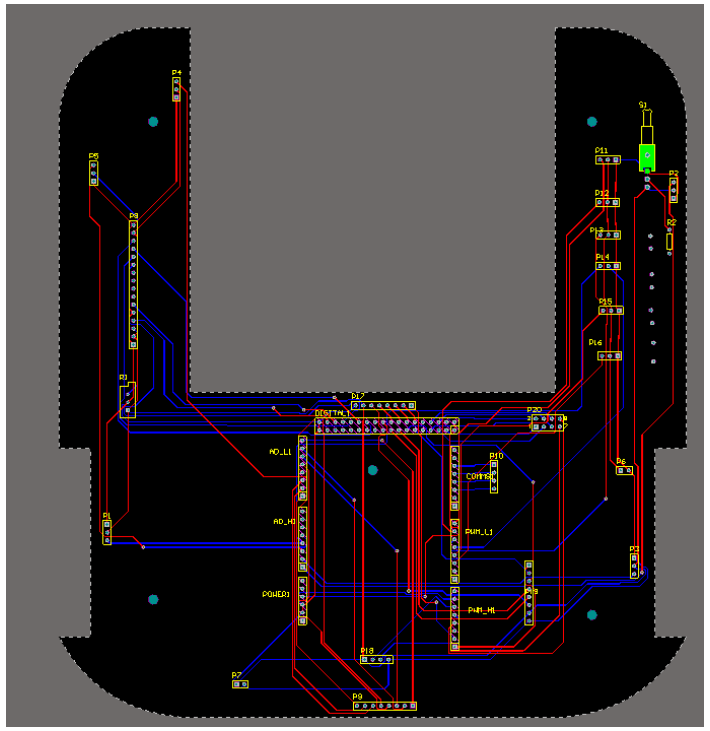
Sensor power supply

6. PROCESSING UNIT



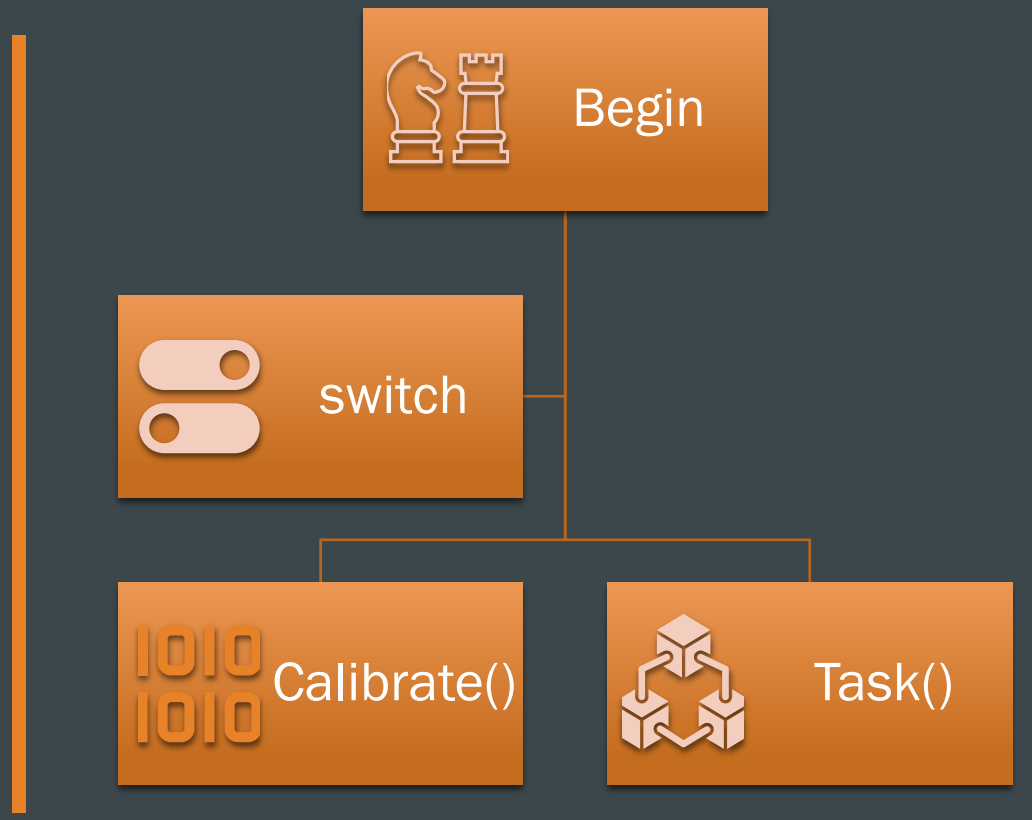
- Arduino Mega 2560 Board Is used as processing unit
- Image shows wire configuration of the Arduino borard



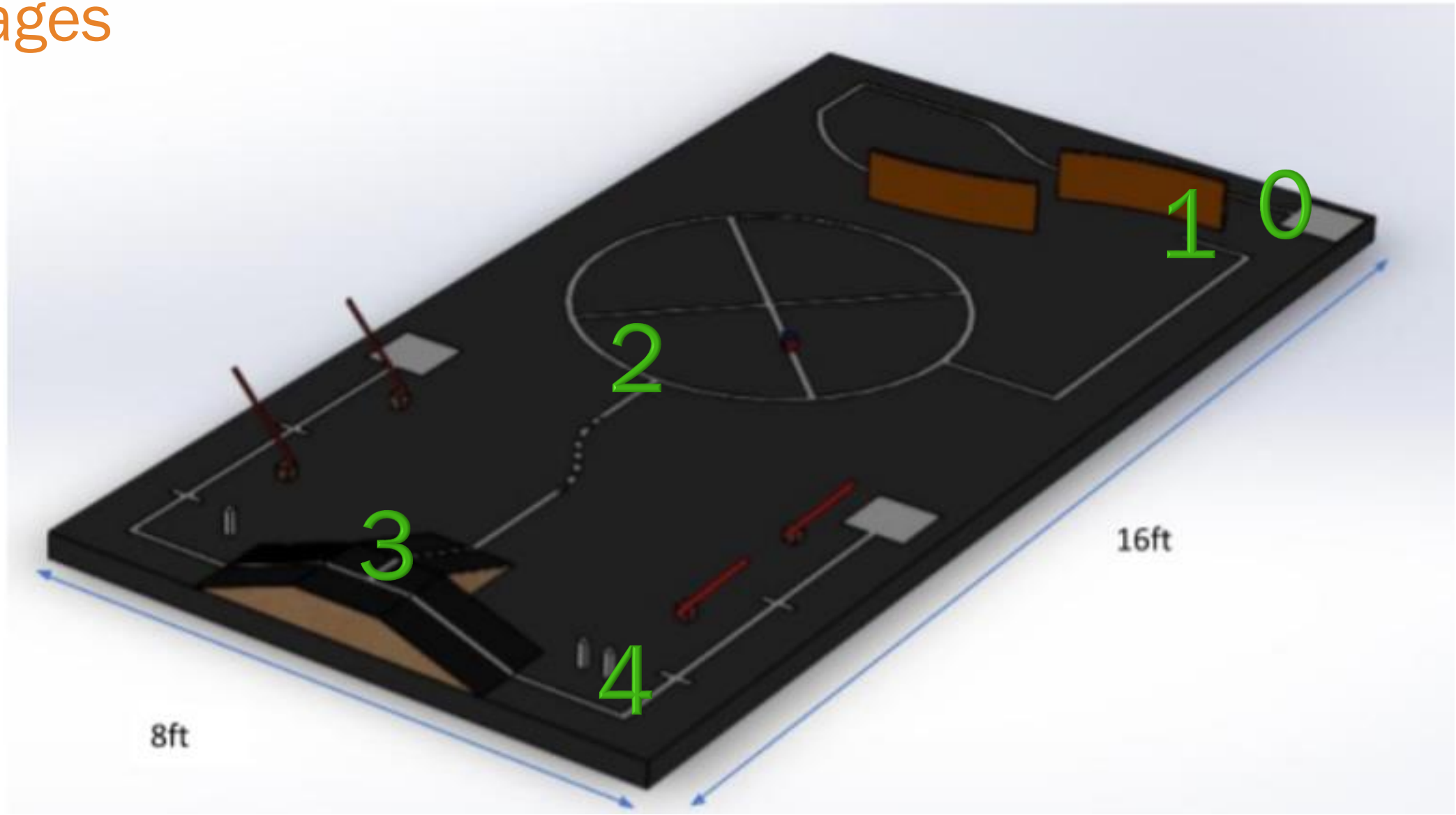


PCB DESIGNS

7. ALGORITHMS



Stages



Calibrate()

1. Get maximum values of each sensors
2. Get minimum values of each sensors
3. Calculate average maximum
4. Calculate average minimum
5. Th (Thresher hold) = (average maximum + average minimum)/2
6. Return Th

Define task ()

Pillars = 0

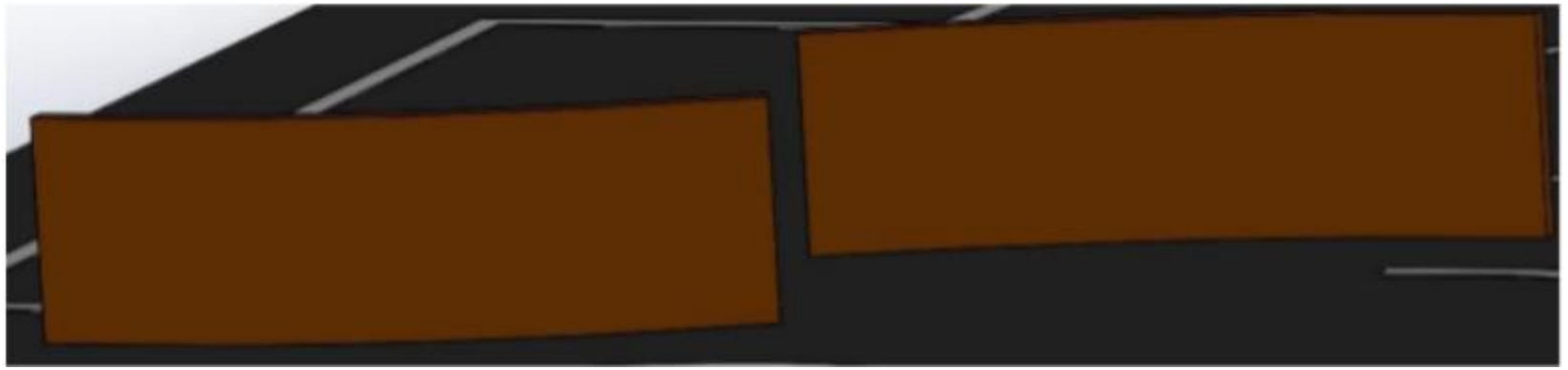
1. Motor_drive (forward)
2. Status = line_follow (max_speed = 5)
3. If (status == wall_detect)
    a. Status = wall_follow()
    b. Stage +=1
4. Else
    a. Motor_drive(reverse)
    b. Go to line 3
5. If status == line_follow
    a. Status = line_follow (max_speed = 5)
6. Else
    a. Motor_drive(reverse)
    b. If road_statu() = wall_detect
        i. Status = wall_follow()
        ii. Go to line 5
    c. Else
        i. Return 0
7. If status == circle_detect
    a. maze_solve()
    b. Stage+=1
8. else
    a. Motor_drive(reverse)
    b. Status = line_follow (max_speed = 2,)
    c. Go to line 7
9. If status == maze_solved
    a. Status = line_follow (max_speed = 5)
10. else
    a. return
11. if status == T_jn_passed
    a. stage+=1
    b. Status = pillars_count (max_speed = 2)
12. else
    a. Motor_drive(reverse)
    b. Status = line_follow (max_speed = 2)
    c. Go to line 11
13. If status = turn_back

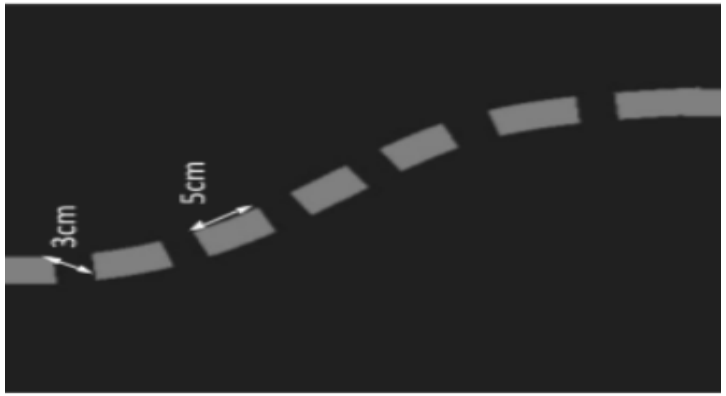
SUB ALGORITHMS

- line_follow ()
- wall_follow()
- Motor_drive ()
- road_status()
- maze_solve()
- Gate_avoid()

Sub Task

LINE FOLLOWING AND WALL FOLLOWING



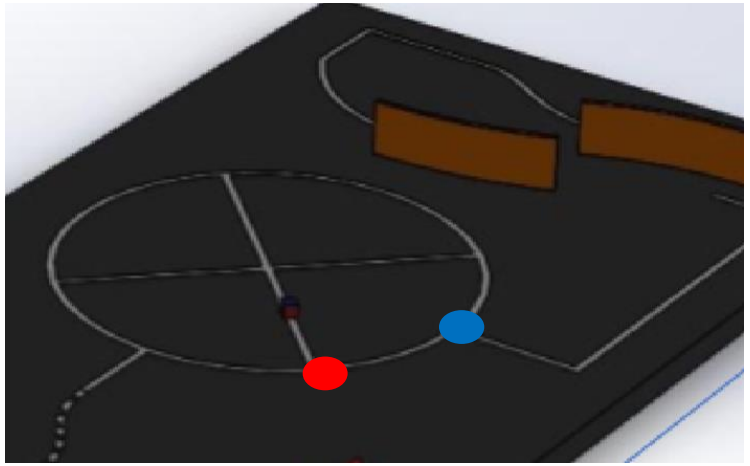


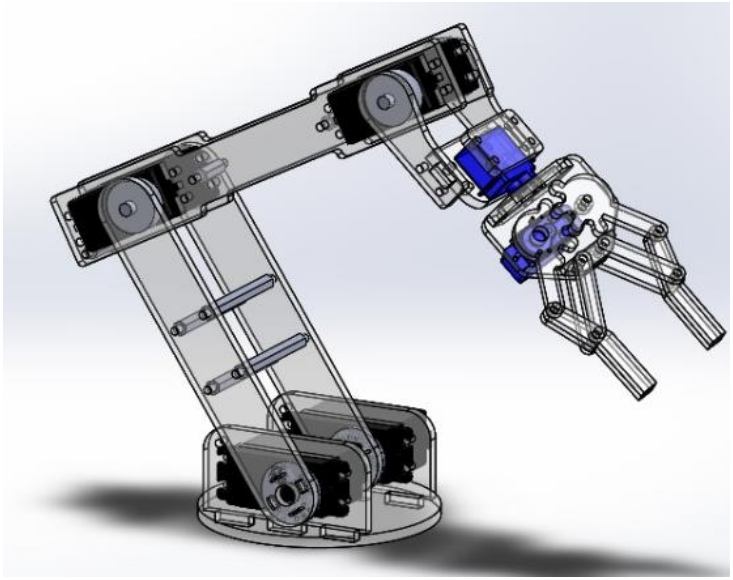
Line_follow()

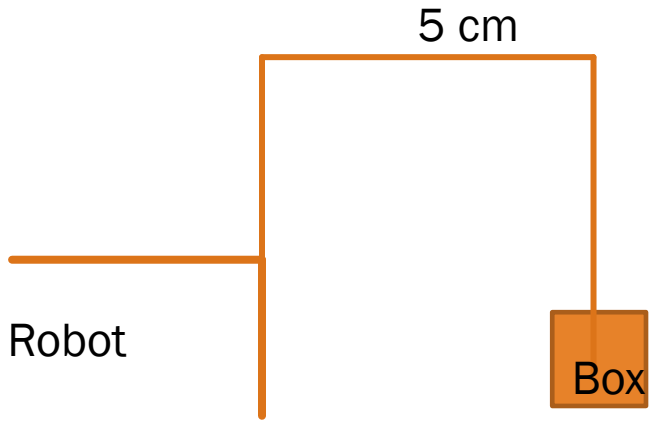
Wall_follow()

Sub Task

MAZE SOLVING



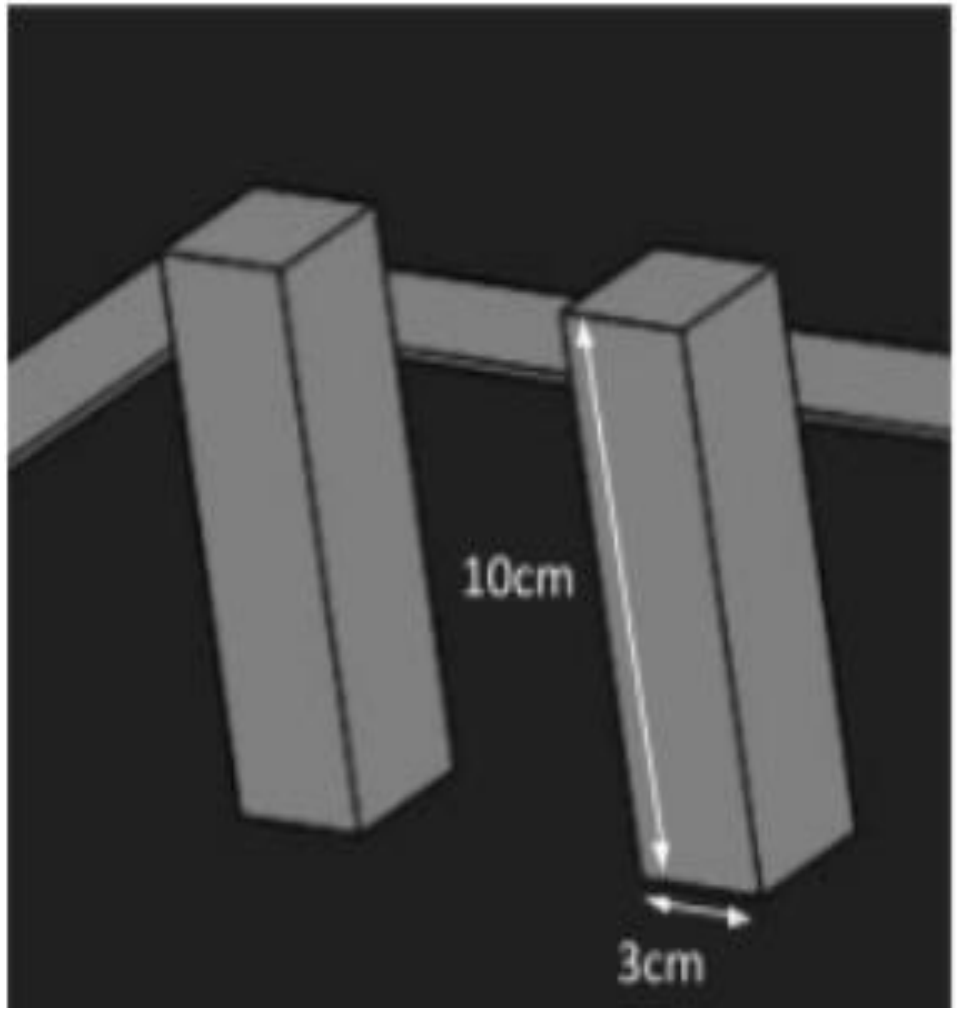


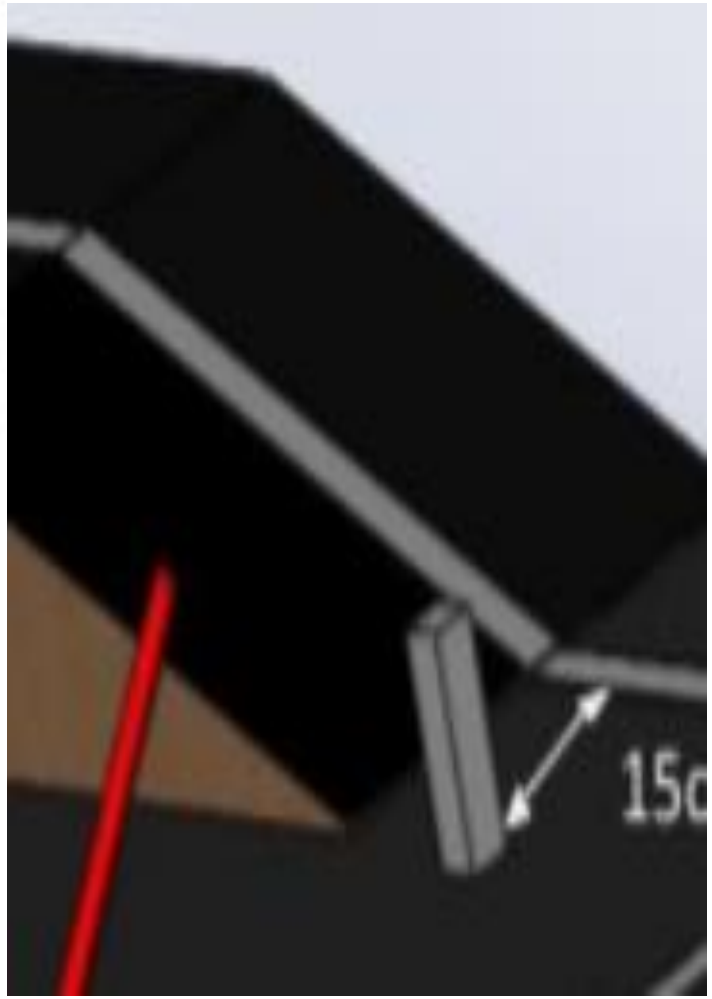


Maze_solve()

Sub Task

PILLARS COUNTING



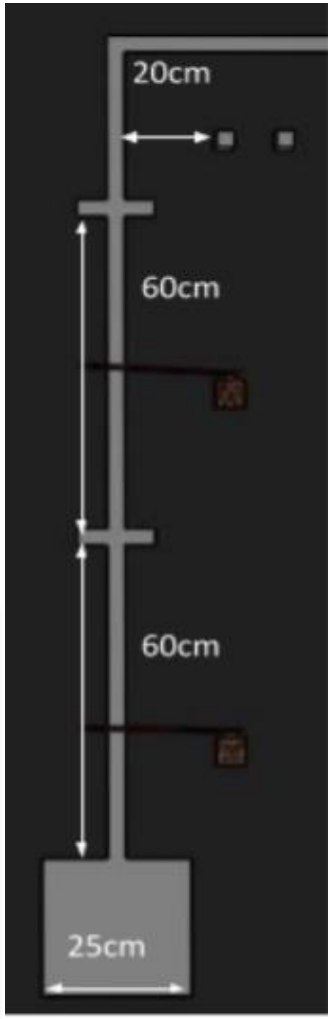


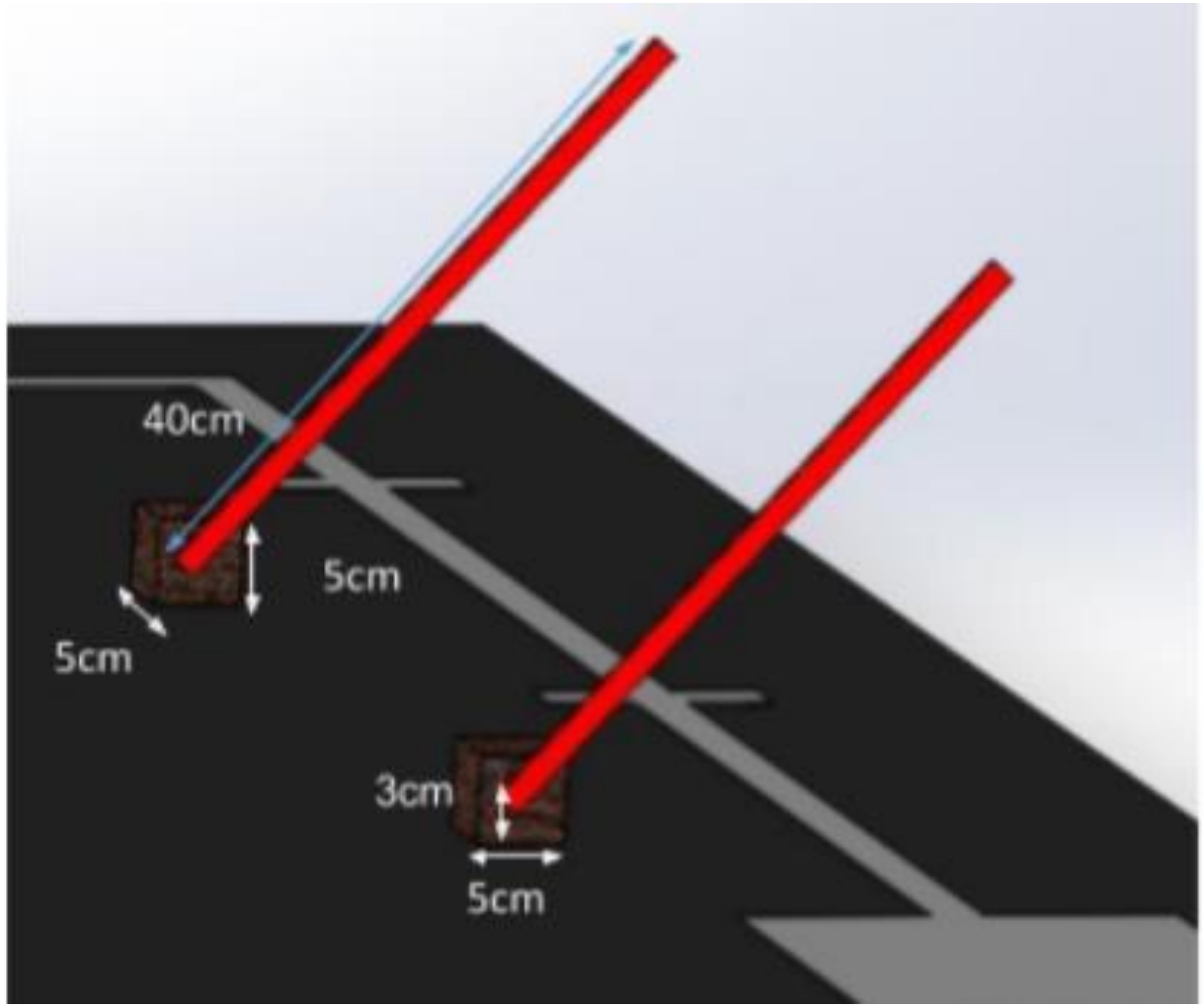
Count considering stage

Sub Task

GATE AVOID

Time	Gate 1	Gate 2
0s	open	closed
3s	open	open
10s	closed	open
13s	closed	closed
20s	open	closed
23s	open	open





Gate_avoid()

8. TASK DELEGATION

Allocated Works	Team members
Hardware design	SIRITHUNGA M.R.A. JAYAWEERA D.S.B.C.L. ARIYARATHNE H.D.M.P.
PCB design & Circuitry	KANNANGARA D.N. JAYAWEERA D.S.B.C.L. HIROSHAN H.H.R.
Algorithm	ARIYARATHNE H.D.M.P. KANNANGARA D.N. SIRITHUNGA M.R.A.
Stage 0 of the task	HIROSHAN H.H.R.
Stage 1 of the task	KANNANGARA D.N.
Stage 2 of the task	SIRITHUNGA M.R.A.
Stage 3 of the task	JAYAWEERA D.S.B.C.L.
Stage 4 of the task	ARIYARATHNE H.D.M.P.

THANKS

Submitted by

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ARIYARATHNE H.D.M.P.	180045P
JAYAWEERA D.S.B.C.L.	180288L
HIROSHAN H.H.R.	180245E