SNOOOPY

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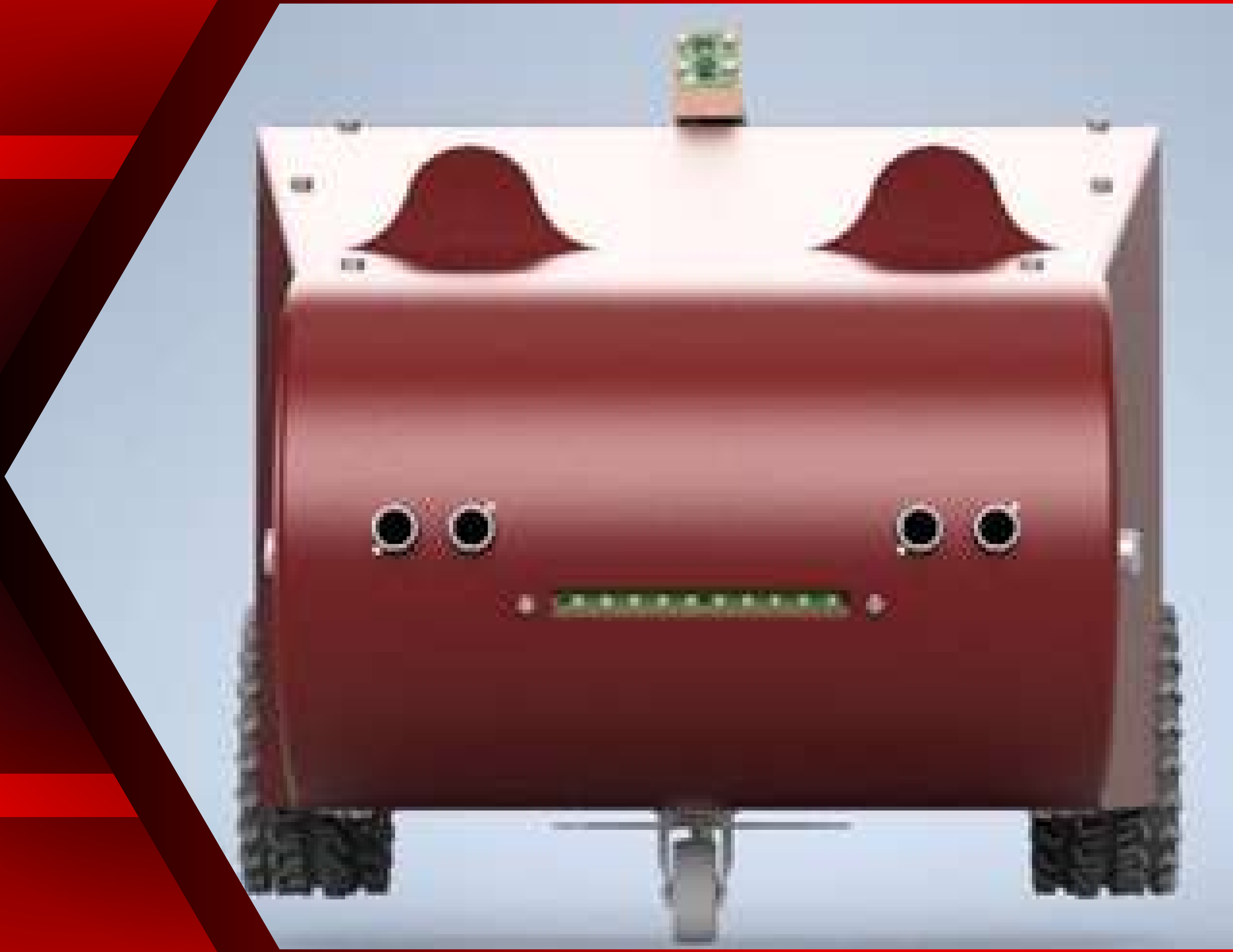
MOBILE ROBOT



MEET OUR TEAM

1	2	3	4	5	6
Habiba Tamer	Omar Mohamed	Mahmoud Fouad	Zeyad Mohamed	Mohamed Mahmoud	Bishoy Girgis
20P4355	20P4257	20P4355	20P4913	20P4202	20P5707

LAWN MOWER ROBOT

type of robot designed to mow lawns automatically without human intervention. These robots typically use a combination of sensors, navigation systems, and algorithms to navigate around the lawn, detect obstacles, and efficiently mow the grass.

Residential Robotic Lawn Mowers

AUTOMOWER® 430X

4.6 (40)

Lawn Size (±20)

0.8 acre

Maximum slope performance inside installation

45 %

From $2,499.99

MSRP

Residential Robotic Lawn Mowers

AUTOMOWER® 430XH

4.5 (100)

Lawn Size (±20)

0.8 acre

Maximum slope performance inside installation

45 %

From $2,499.99

MSRP

Residential Robotic Lawn Mowers

AUTOMOWER® 450X

4.4 (53)

Lawn Size (±20)

1.25 acre

Maximum slope performance inside installation

45 %

From $3,299.99

MSRP

Residential Robotic Lawn Mowers

AUTOMOWER® 450XH EPOS™

4.8 (4)

Lawn Size (±20)
2.5 acre

Maximum slope performance inside installation
45 %

From $5,899.99

Commercial Robotic Lawn Mowers

AUTOMOWER® 520

(No reviews)

Lawn Size (±20)
0.6 acre

Maximum slope performance inside installation
45 %

From $2,099.99

Commercial Robotic Lawn Mowers

AUTOMOWER® 520H

5.0 (1)

Lawn Size (±20)
0.6 acre

Maximum slope performance inside installation
45 %

From $2,099.99

ROBOT BOUNDARY

Roll over image to zoom in

2000 ft Universal Heavy Duty Automatic Lawnmower Boundary Wire -Professional G Robotic Lawnmower Perimeter Wire for Lav mower Works with All Brands

Brand: SHS-Yard

4.1 ★★★★☆ 12 ratings

$249.95

SNOOPY

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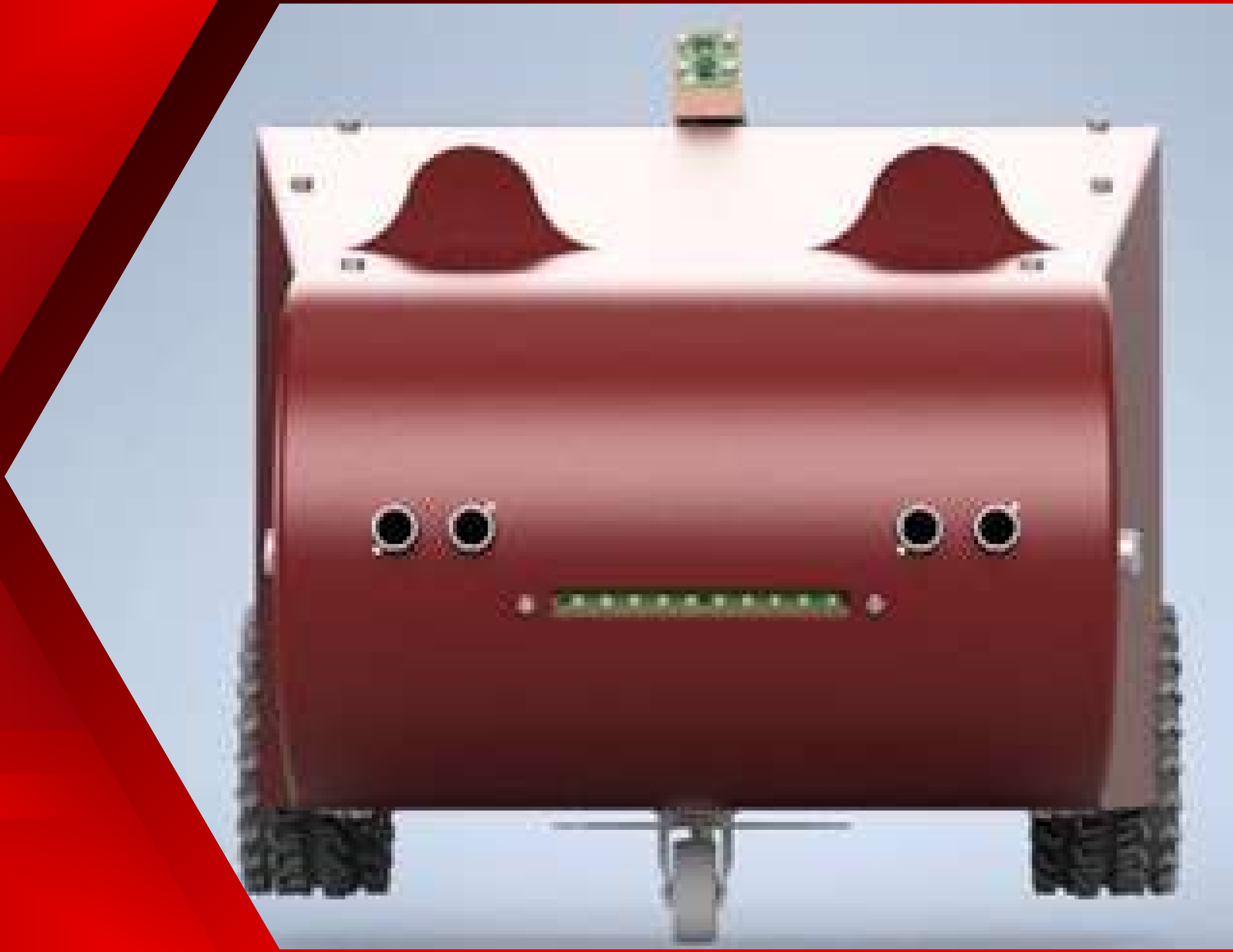
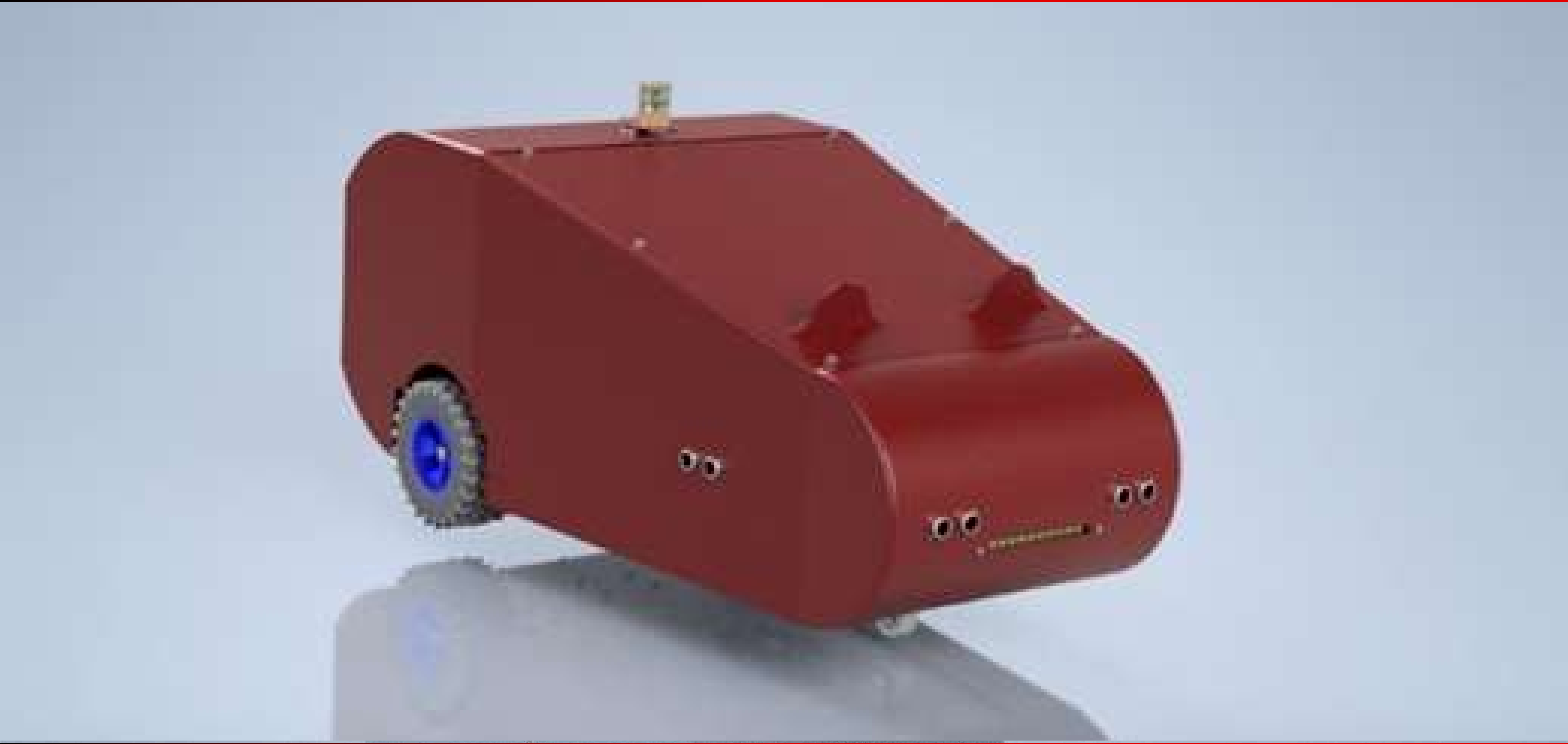
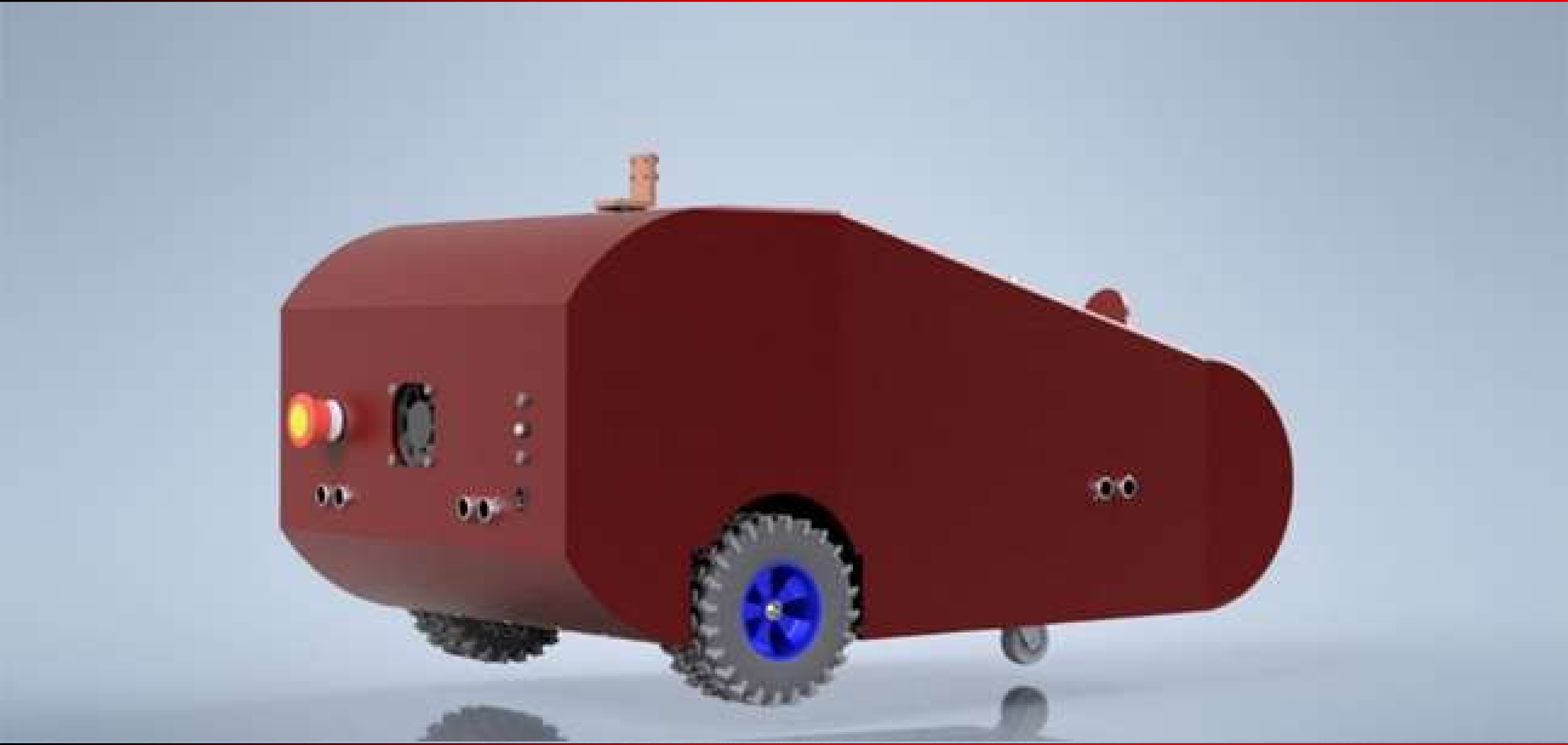
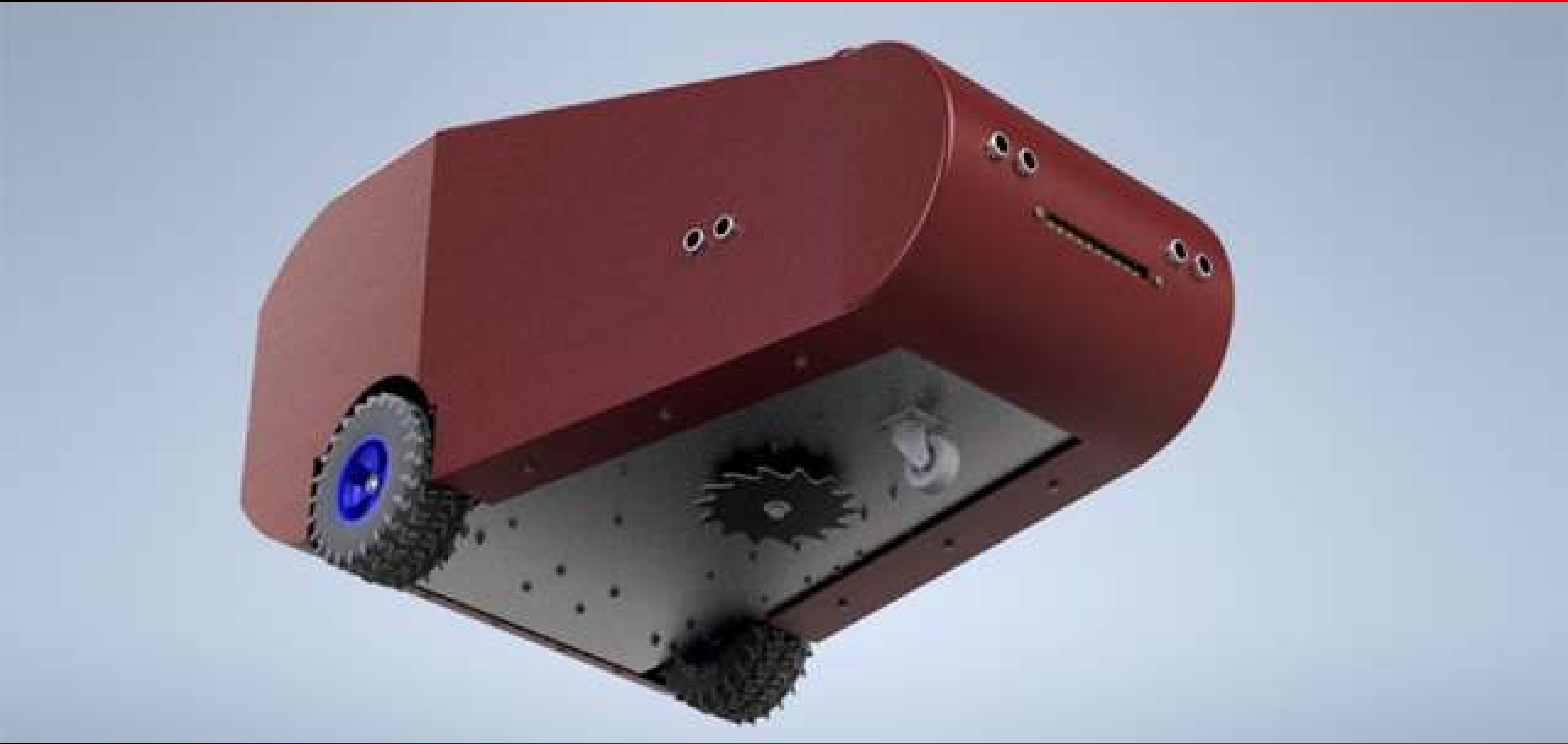
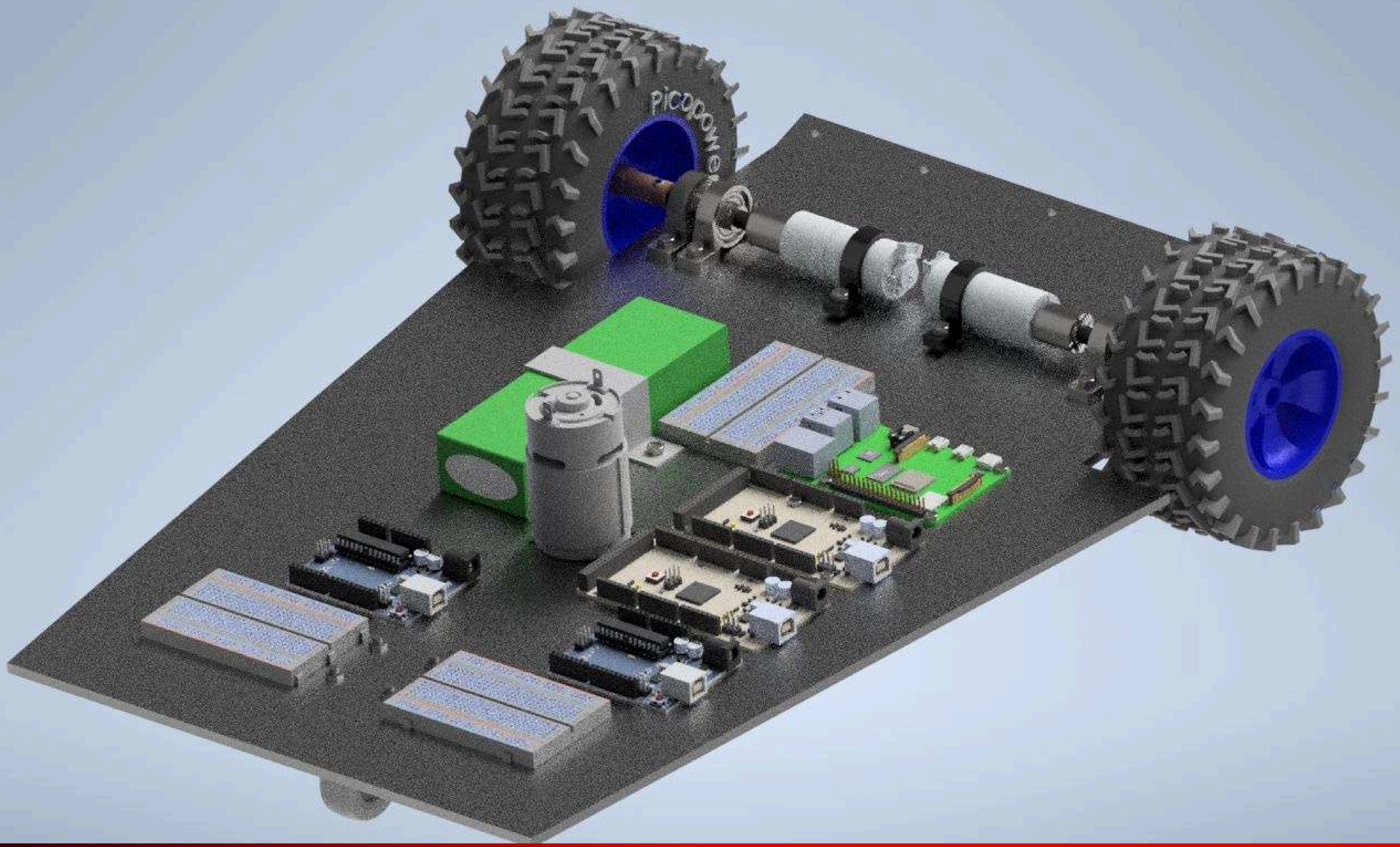
CAD
DESIGN











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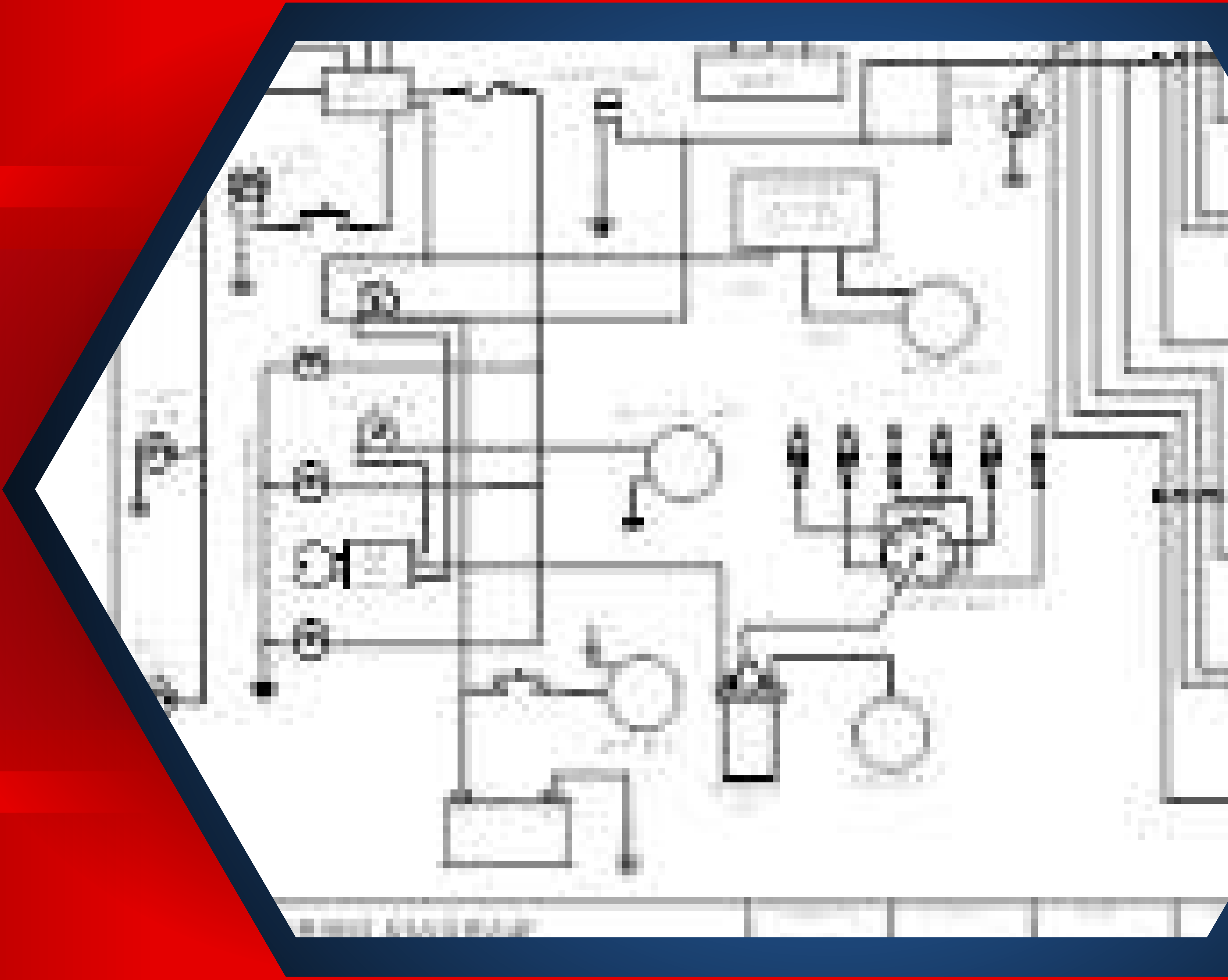
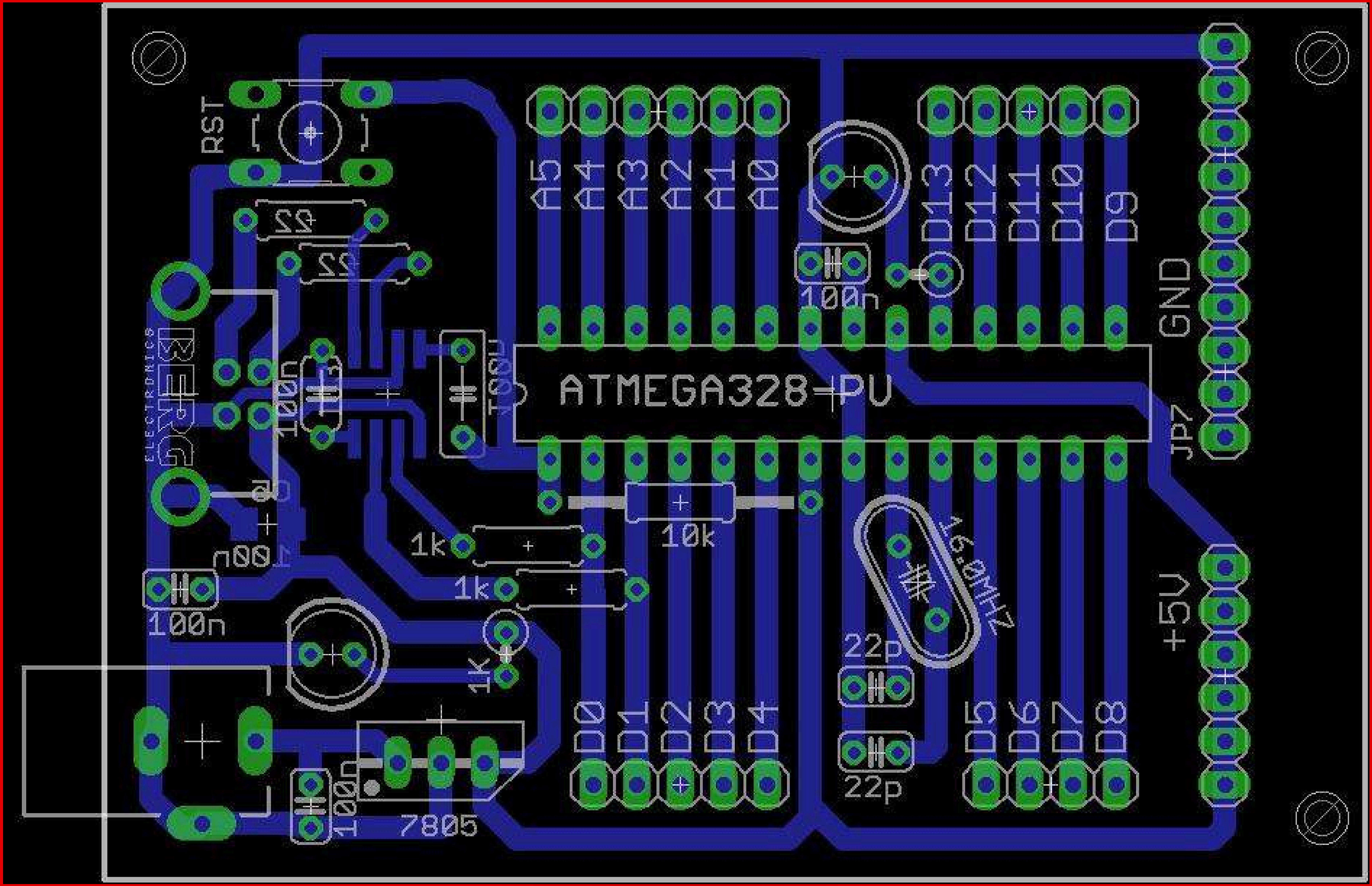
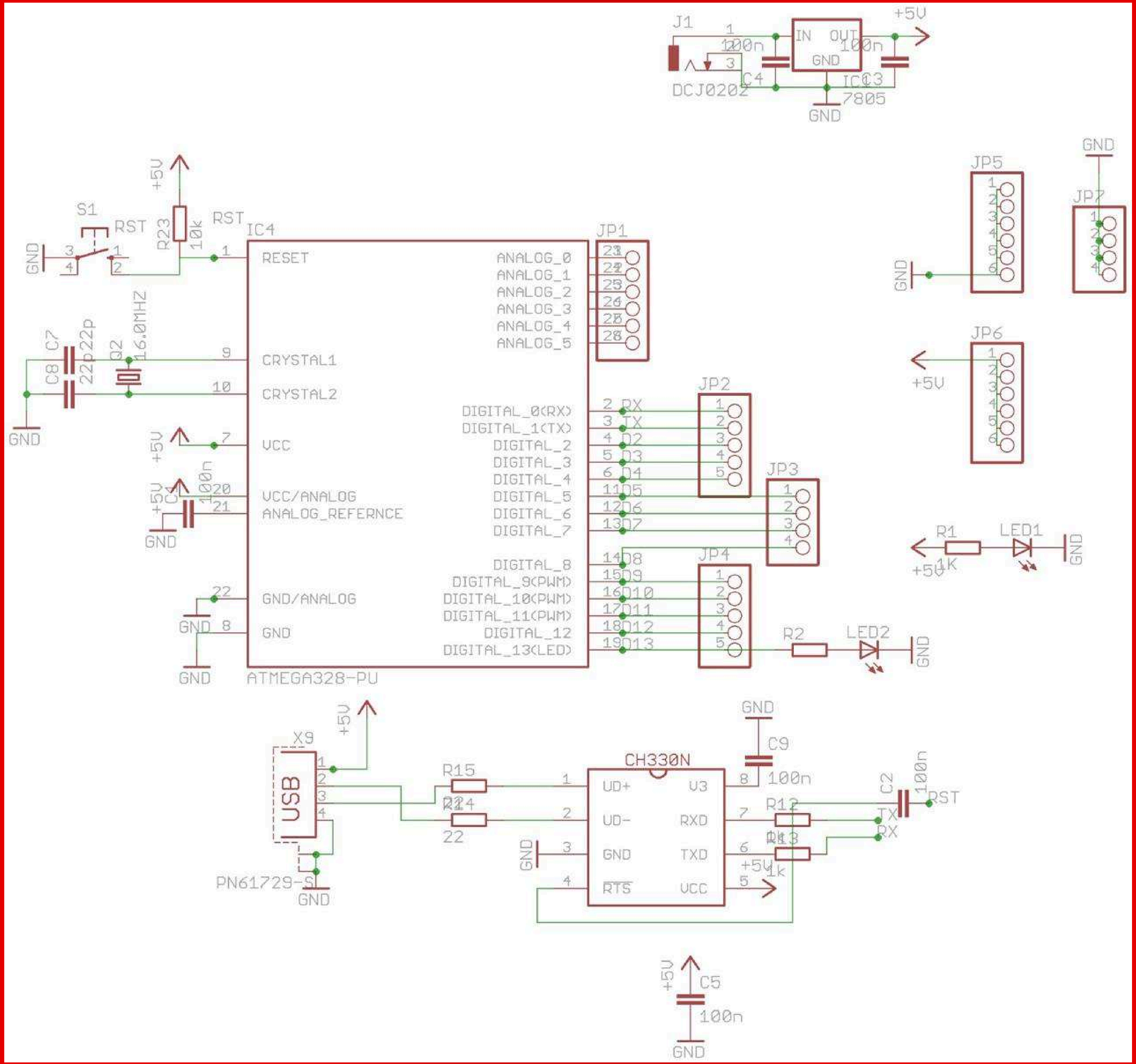
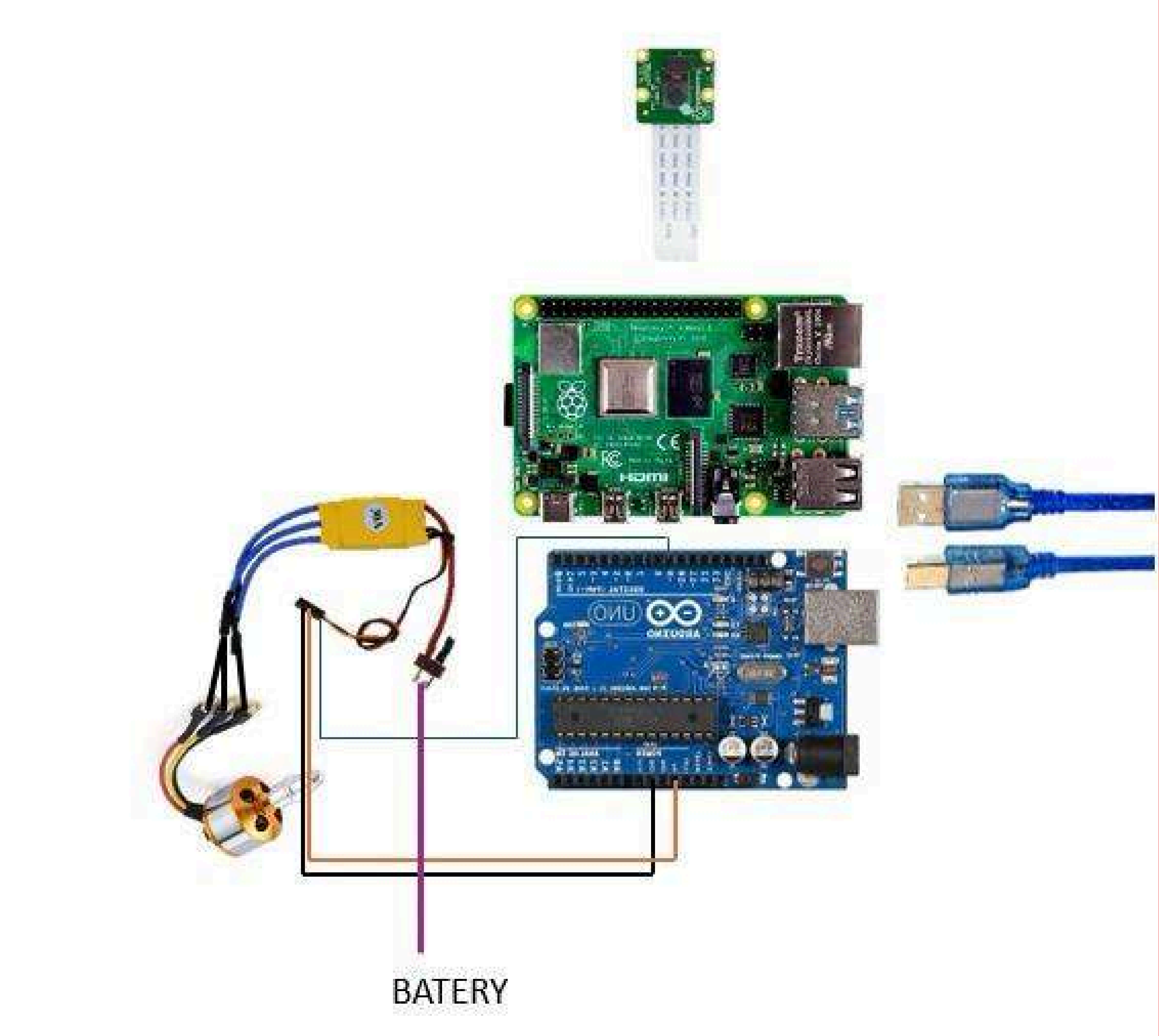
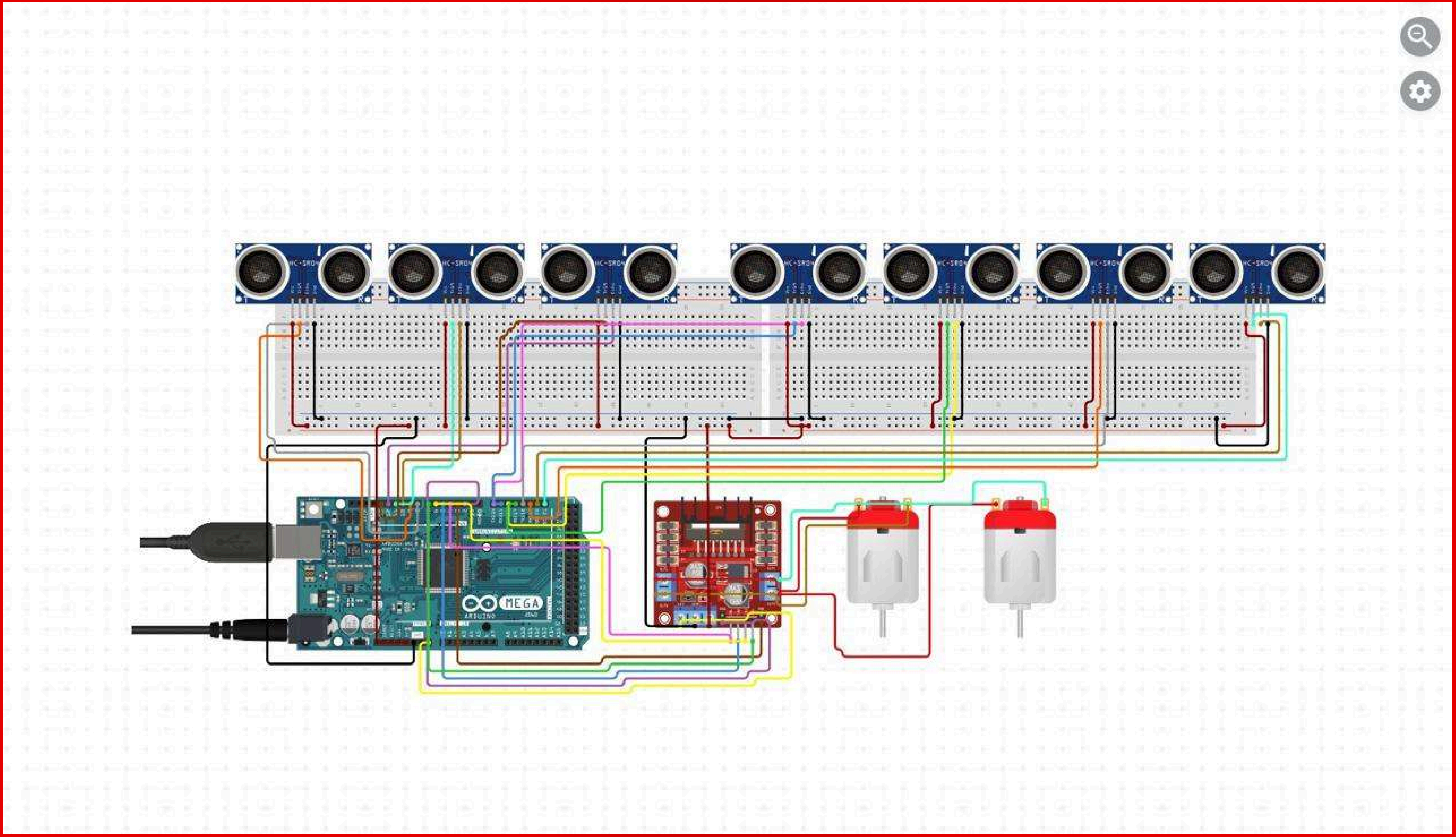
WIRING



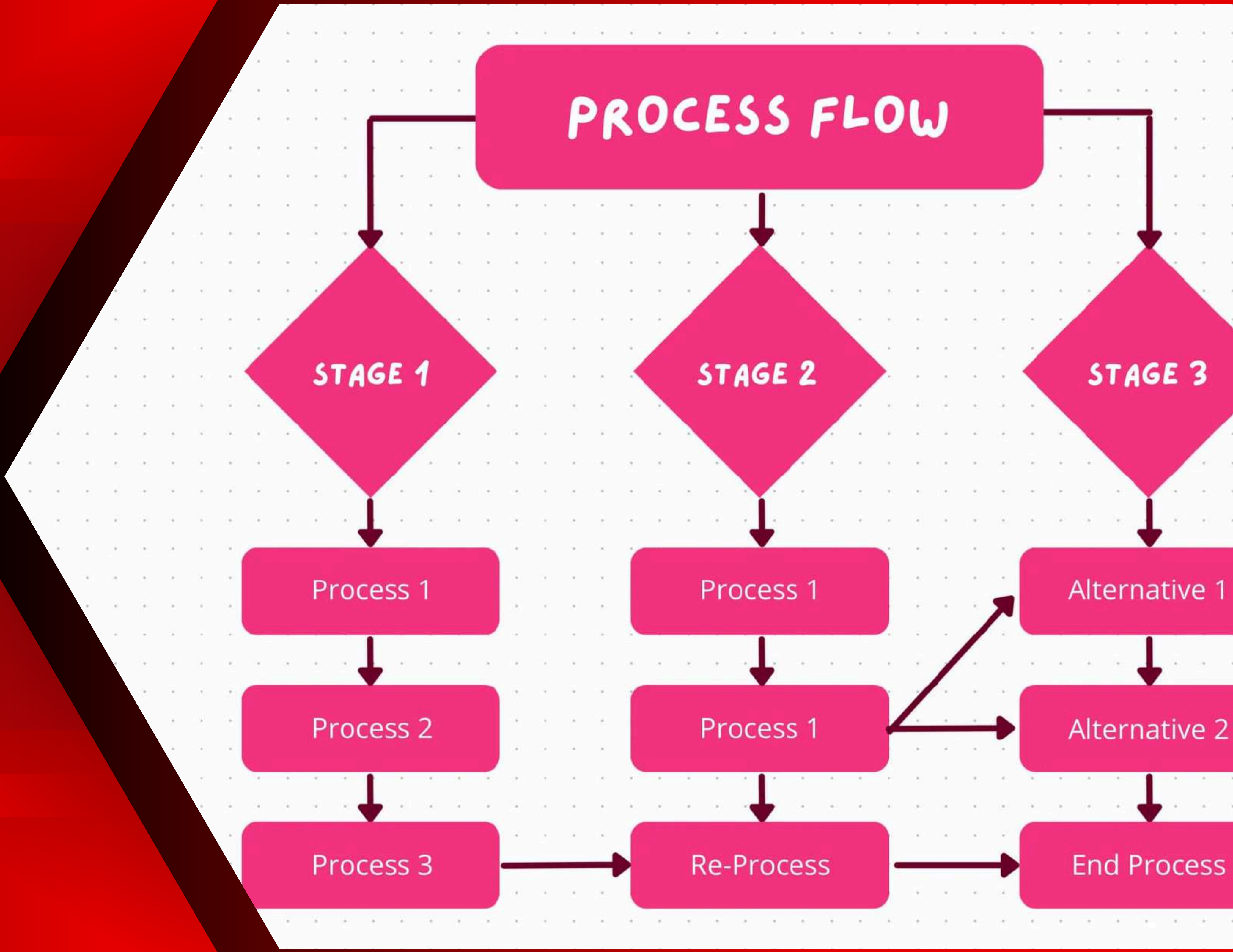

RST
22
22
100n
100n
ATMEGA328-PU
A5
A4
A3
A2
A1
A0
D13
D12
D11
D10
D9
GND
JP7
100n
10k
1k
1k
1k
16.0MHZ
22p
22p
+5V
100n
100n
7805
D0
D1
D2
D3
D4
D5
D6
D7
D8
ELECTRONICS


J1
DCJ0202
IN
OUT
GND
IC1
7805
C4
C3
100n
+5V
GND
S1
RST
R23
10k
RST
IC4
RESET
CRYSTAL1
CRYSTAL2
VCC
VCC/ANALOG
ANALOG_REFERNCE
GND/ANALOG
GND
ATMEGA328-PU
ANALOG_0
ANALOG_1
ANALOG_2
ANALOG_3
ANALOG_4
ANALOG_5
DIGITAL_0(RX)
DIGITAL_1(TX)
DIGITAL_2
DIGITAL_3
DIGITAL_4
DIGITAL_5
DIGITAL_6
DIGITAL_7
DIGITAL_8
DIGITAL_9(PWM)
DIGITAL_10(PWM)
DIGITAL_11(PWM)
DIGITAL_12
DIGITAL_13(LED)
C7
C8
22p
Q2
16.0MHZ
JP1
JP2
JP3
JP4
JP5
JP6
JP7
R1
1K
LED1
R2
LED2
X9
USB
PN61729-S
R15
R14
22
CH330N
UD+
UD-
GND
RTS
V3
RXD
TXD
VCC
C9
C2
R12
R13
1k
TX
RX
C5

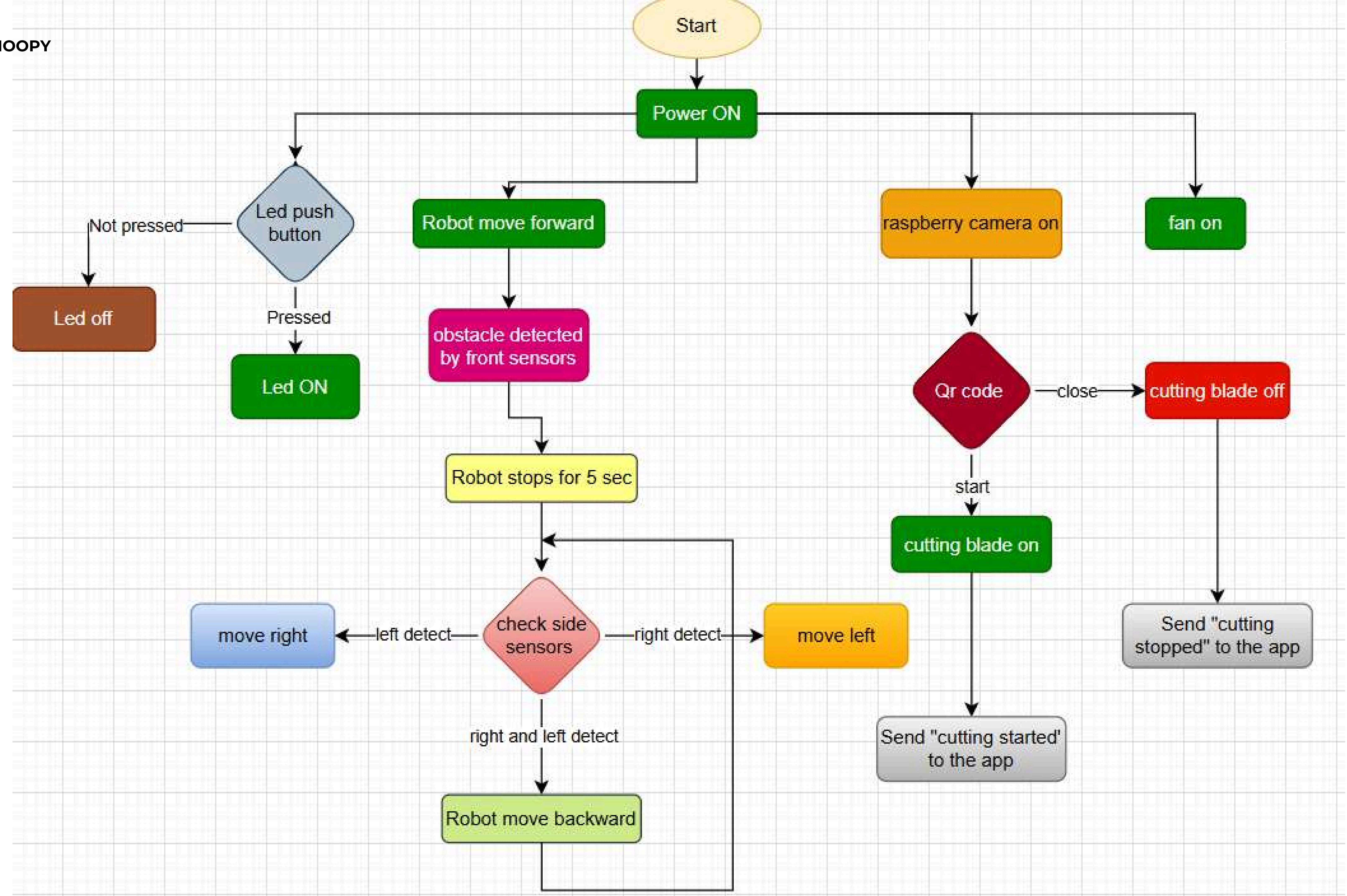

BATERY


MEGA

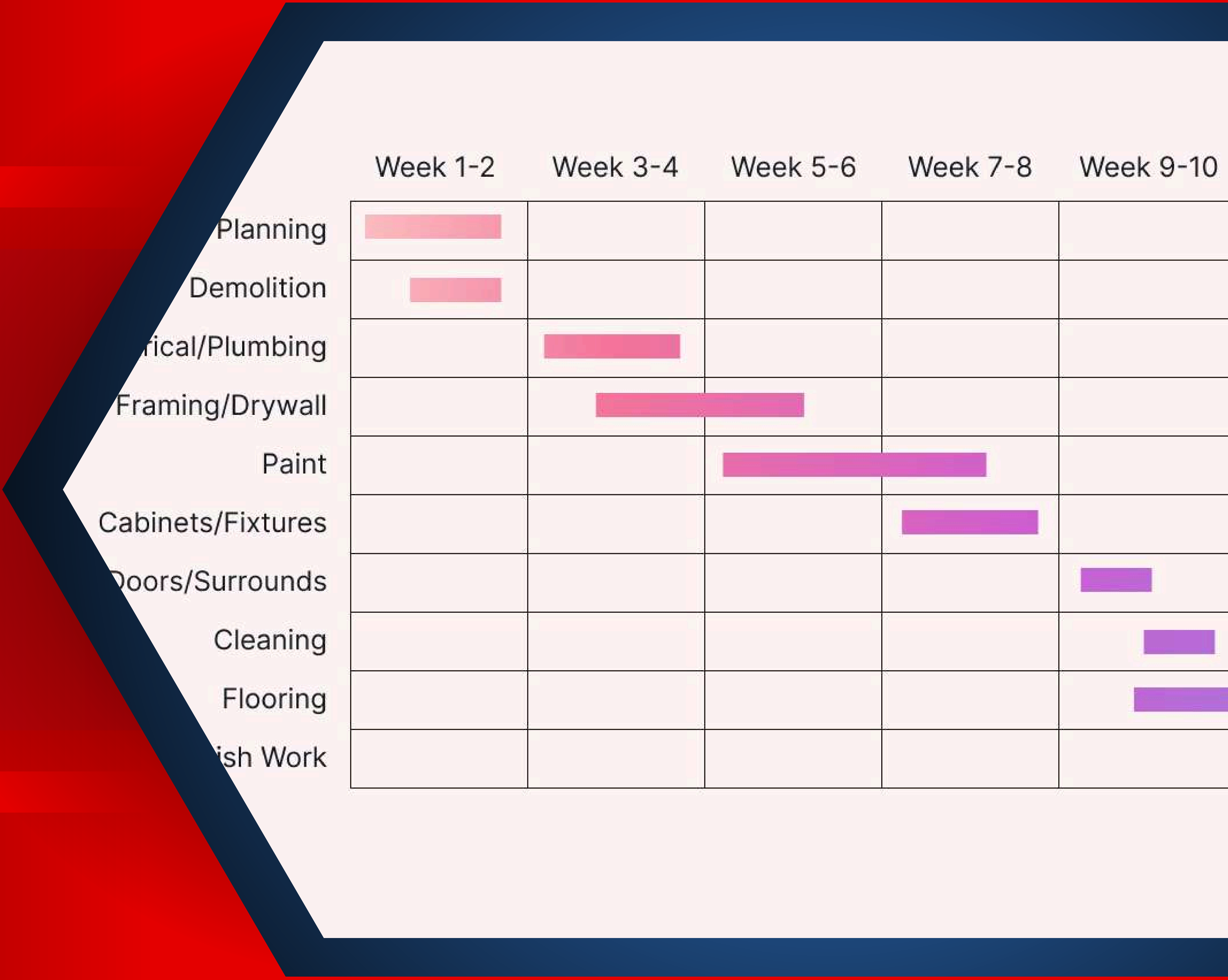
FLOW
CHART


PROCESS FLOW
STAGE 1
STAGE 2
STAGE 3
Process 1
Process 2
Process 3
Process 1
Process 1
Re-Process
Alternative 1
Alternative 2
End Process

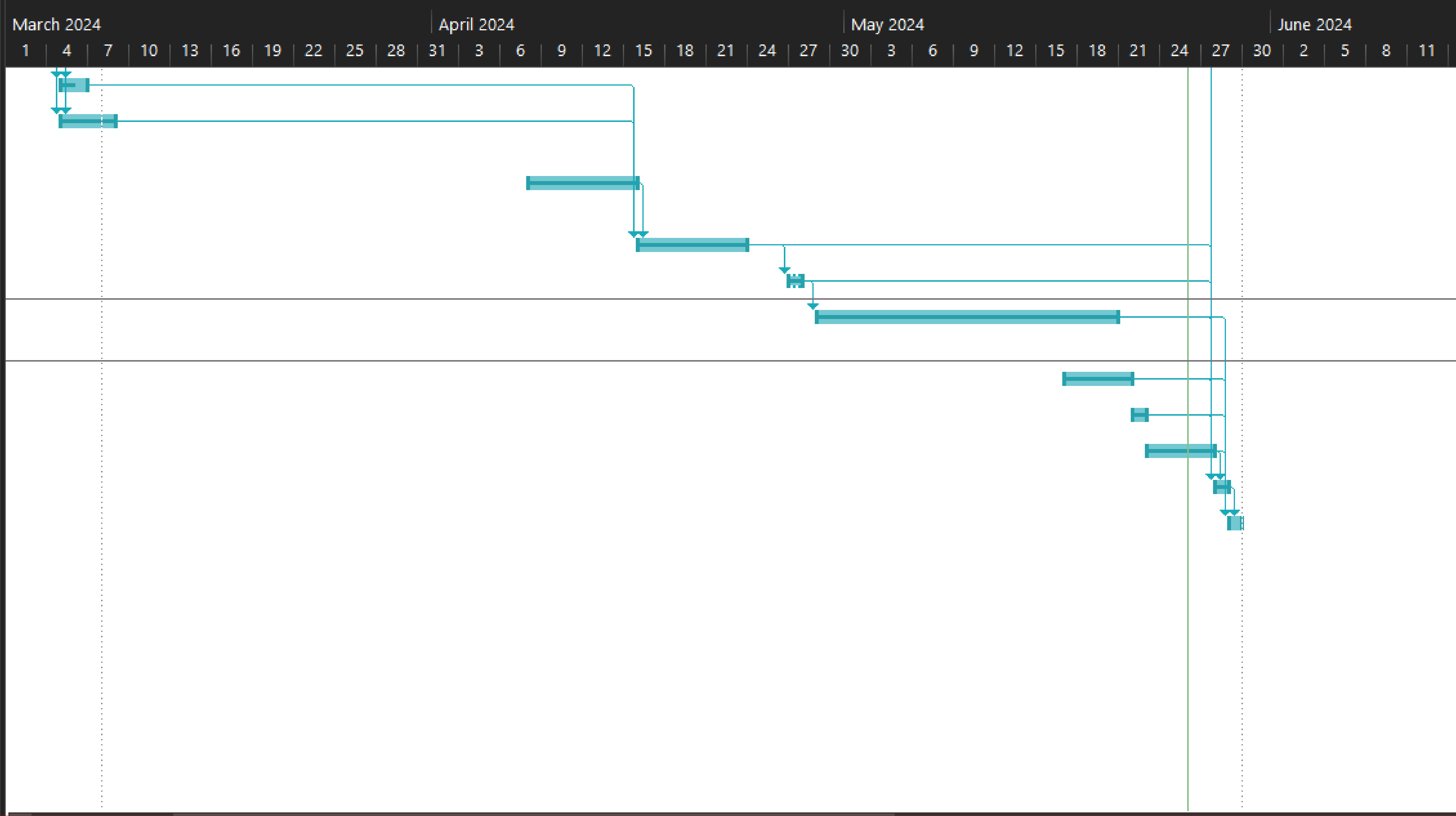
SNOOPY


Start
Power ON
Led push button
Not pressed
Led off
Pressed
Led ON
Robot move forward
obstacle detected by front sensors
Robot stops for 5 sec
check side sensors
left detect
move right
right detect
move left
right and left detect
Robot move backward
raspberry camera on
Qr code
close
cutting blade off
start
cutting blade on
Send "cutting started" to the app
Send "cutting stopped" to the app
fan on

GANTT CHART


Week 1-2
Week 3-4
Week 5-6
Week 7-8
Week 9-10
Planning
Demolition
ical/Plumbing
Framing/Drywall
Paint
Cabinets/Fixtures
oors/Surrounds
Cleaning
Flooring
ish Work

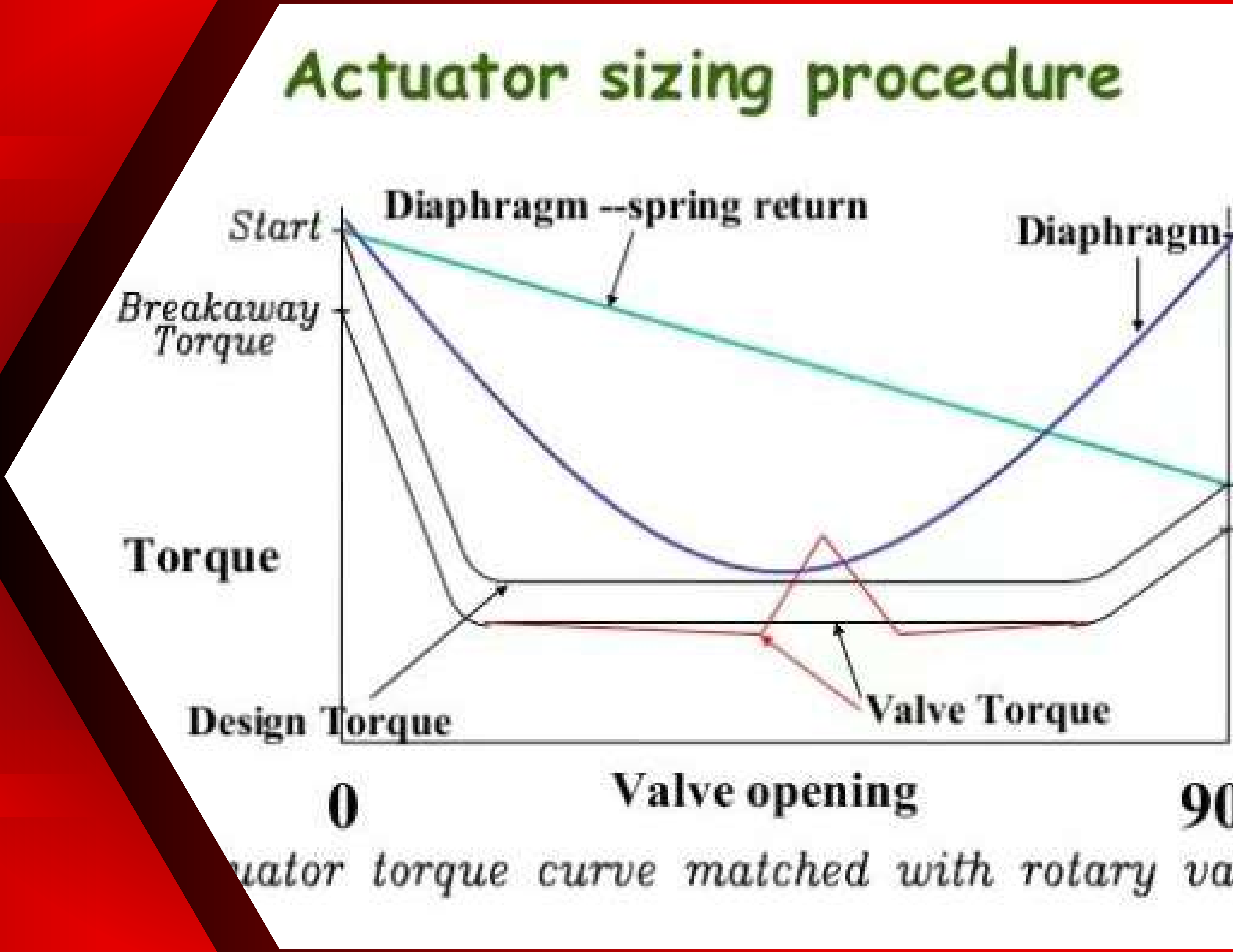
		Task Name	Duration	Start	Finish	Predecesso
		Chassis manufacturing	2 days	Tue 3/5/24	Wed 3/6/24	3,4
✓		body frame manufacturing	4 days	Tue 3/5/24	Fri 3/8/24	3,4
✓		buy electrical components	6 days	Mon 4/8/24	Mon 4/15/24	
✓		integration	6 days	Tue 4/16/24	Tue 4/23/24	10,11,12
✓		Major task submission	1 day	Sat 4/27/24	Sat 4/27/24	13
✓		PID controller with sensors	16 days	Mon 4/29/24	Mon 5/20/24	14
✓		vision	3 days	Fri 5/17/24	Tue 5/21/24	
✓		microcontroller pcb	1 day	Wed 5/22/24	Wed 5/22/24	
✓		GUI	3 days	Thu 5/23/24	Mon 5/27/24	
✓		poster	1 day	Tue 5/28/24	Tue 5/28/24	3,7,8,13,14,
		final submission	1 day	Wed 5/29/24	Wed 5/29/24	15,16,17,18

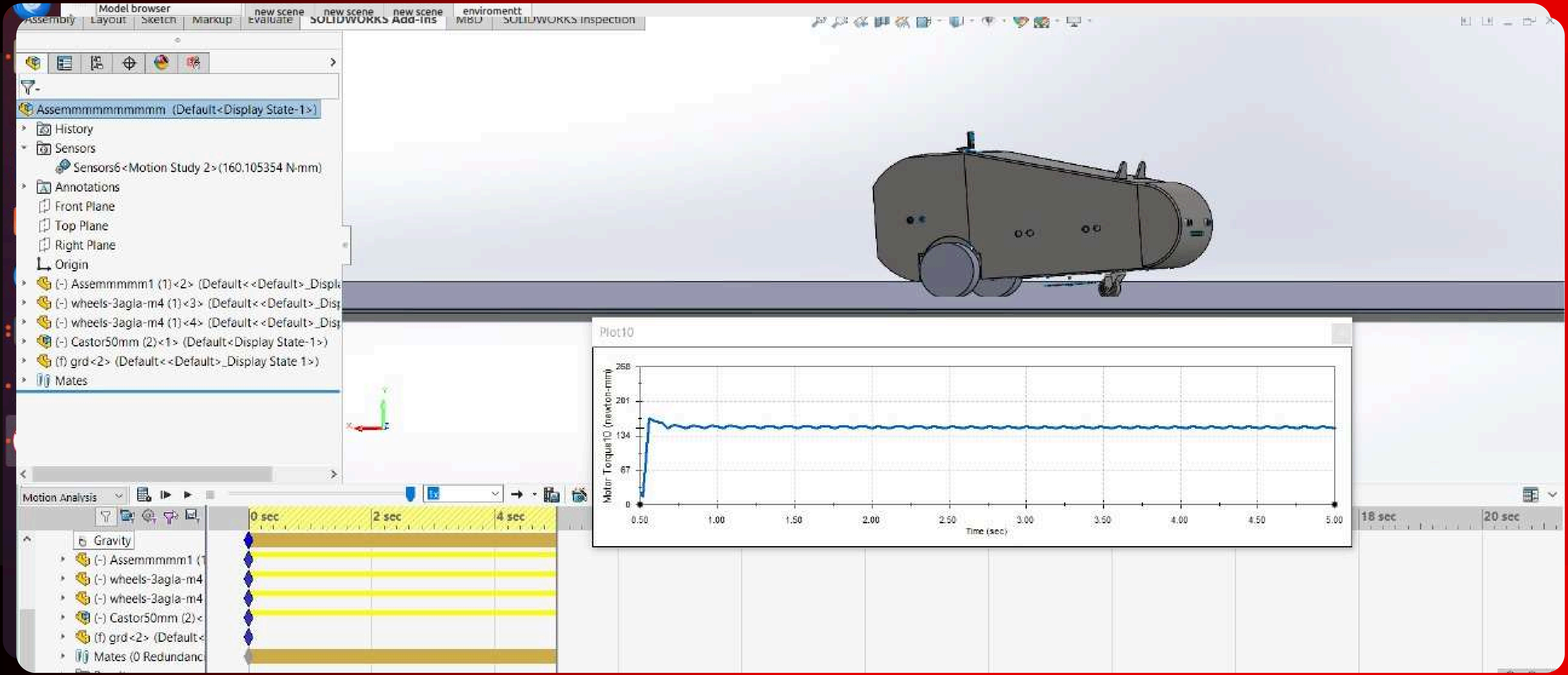


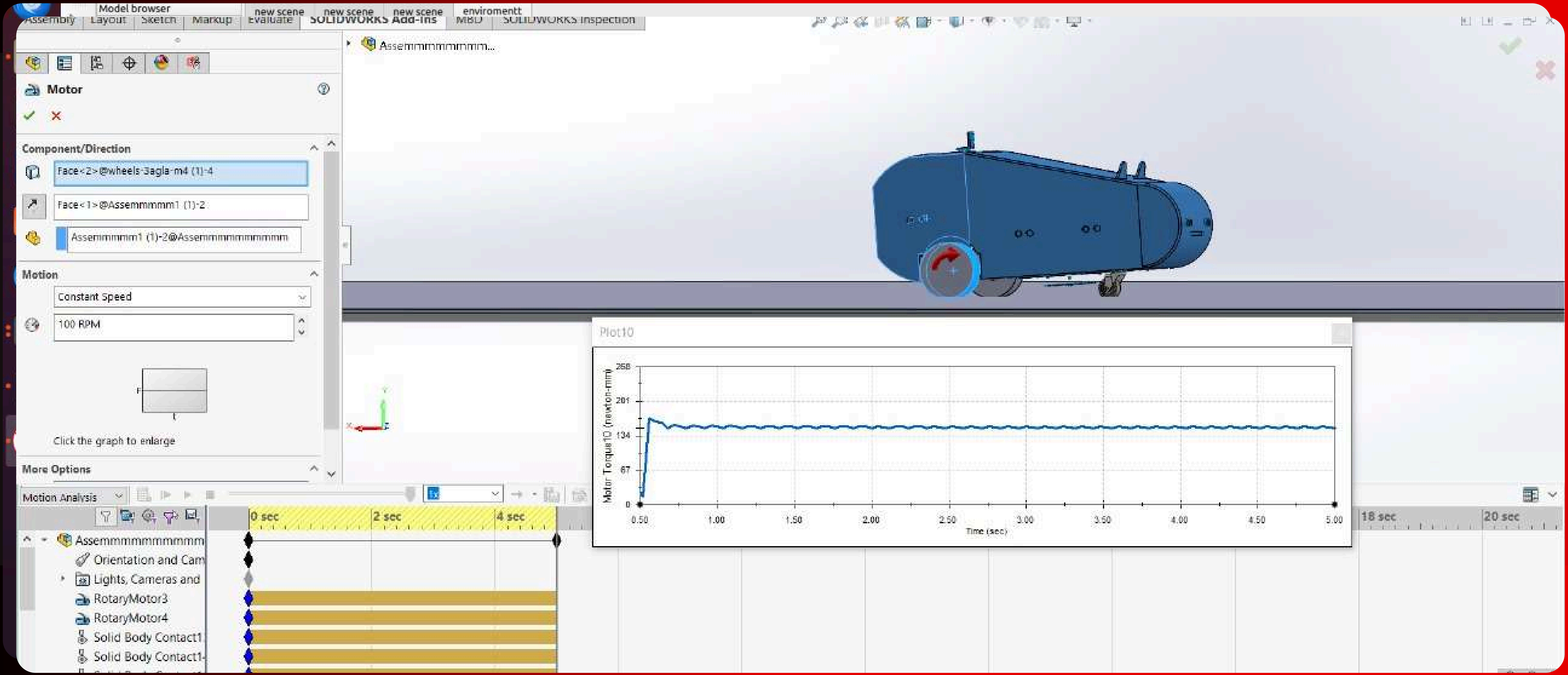
COST CHART

Components	Cost
Bolts	50 EGP
On/Off Switch	50 EGP
Cooling Fan	60 EGP
H Bridge	85 EGP
Emergency Switch	100 EGP
Couplers	120 EGP
Bearings	200 EGP
Raspberry Pi Camera	200 EGP
Chassis	280 EGP
Wheels	300 EGP
ESC Driver	300 EGP
Ultrasonic Sensors	300 EGP
Microcontroller PCB	500 EGP
Brushless DC Motor	560 EGP
Battery	600 EGP
Arduino Mega	600 EGP
Dc Motors	1400 EGP
Body Frame	2000 EGP
Raspberry pi 4 8GB	6,500 EGP
Total Cost	**14,205 EGP**

ACTUATOR SIZING




Model browser
new scene
new scene
new scene
enviromentt
Assembly
Layout
Sketch
Markup
Evaluate
SOLIDWORKS Add-Ins
MBD
SOLIDWORKS Inspection
Assemmmmmmmmm (Default<Display State-1>)
History
Sensors
Sensors6<Motion Study 2>(160.105354 N-mm)
Annotations
Front Plane
Top Plane
Right Plane
Origin
(-) Assemmmmm1 (1)<2> (Default<<Default>_Displa
(-) wheels-3agla-m4 (1)<3> (Default<<Default>_Disp
(-) wheels-3agla-m4 (1)<4> (Default<<Default>_Disp
(-) Castor50mm (2)<1> (Default<Display State-1>)
(f) grd<2> (Default<<Default>_Display State 1>)
Mates
Plot10
Motor Torque10 (newton-mm)
Time (sec)
Motion Analysis
0 sec
2 sec
4 sec
18 sec
20 sec
Gravity
(-) Assemmmmm1 (1
(-) wheels-3agla-m4
(-) wheels-3agla-m4
(-) Castor50mm (2)<
(f) grd<2> (Default<
Mates (0 Redundanc


Model browser
new scene
new scene
new scene
enviromentt
Assembly
Layout
Sketch
Markup
Evaluate
SOLIDWORKS Add-Ins
MBD
SOLIDWORKS Inspection
Motor
Component/Direction
Face<2>@wheels-3agla-m4 (1)-4
Face<1>@Assemmmmm1 (1)-2
Motion
Constant Speed
100 RPM
Click the graph to enlarge
More Options
Motion Analysis
Plot10
Motor Torque10 (newton-mm)
Time (sec)
RotaryMotor3
RotaryMotor4
Solid Body Contact1
Orientation and Cam
Lights, Cameras and

➢ Our Parameters:

- R_w=0.065
- μ_r=0.05
- μ_f=0.35
- C_d=0.1
- A_f=0.089
- V= 0.25 m/s
- T=0.3 s
- G=9.81
- $M_{total/wheel}$=2.7 kg
- η=0.9
- P=1.2

F_{air}= 1/2 * C_d * P * A_f * V^2

= ½ (0.1)(1.2)(0.089)(0.3)^2 = 3.3 x 10^{-4} N

F_R= μ_r *M g

= (0.05)(2.7)(9.81) = 1.324 N

$$J_{Motor} = J_{LoadEff} = \frac{JeqWheel + Jeqlinermass}{\eta}$$

$$J_{eqWheels} = 0.5M_{wheel} * R_w^2 = 3.65x10^{-4}$$

$$J_{eqlinearMass} = M * R_w^2$$

$$= 2.7(0.065)^2 = 0.0114$$

$$J_{loadEff} = \frac{0.0114 + 3.65x10^{-4}}{0.9} = 0.013$$

$$J_{total} = J_{eqWheels} + J_{eqlinearMass} + J_{loadEff}$$

$$= 0.013 + 0.0114 + 3.65x10^{-4} = 0.025$$

$$\dot{\alpha} = \frac{\frac{V}{Rw}}{T} = \frac{\frac{0.25}{0.065}}{0.3} = 12.8$$

$$T_R = (F_{air} + F_r) R_w$$

$$= (3.3x10^{-4} + 1.324)0.065 = 0.086 \text{ N.m}$$

$$J_{total} = J_{eqWheels} + J_{eqlinearMass} + J_{loadEff}$$

$$= 0.013 + 0.0114 + 3.65\times10^{-4} = 0.025$$

$$\dot{\alpha} = \frac{\frac{V}{Rw}}{T} = \frac{\frac{0.25}{0.065}}{0.3} = 12.8$$

$$T_R = (\,F_{air} + F_r\,)\,R_w$$

$$=(3.3\times10^{-4} + 1.324)0.065 = 0.086\ \text{N.m}$$

$$J_{total} = J_{eqWheels} + J_{eqlinearMass} + J_{loadEff}$$

$$= 0.013 + 0.0114 + 3.65x10^{-4} = 0.025$$

$$\dot{\alpha} = \frac{\frac{V}{Rw}}{T} = \frac{\frac{0.25}{0.065}}{0.3} = 12.8$$

$$T_R = (F_{air} + F_r) R_w$$

$$=(3.3x10^{-4} + 1.324)0.065 = 0.086 \text{ N.m}$$

$T_{motor} = T_{R} + J_{total} * \dot{\alpha}$

At +acc = 0.086 +12.8(0.025) = 0.406 N.m

At 0 acc = 0.086+0(0.025) = 0.086 N.m

At -acc = 0.086 +12.8(-0.025) = -0.234

$$T_{rms} = \sqrt{\frac{(0.406)^2 * 0.3 + (0.086)^2 * 0.6 + (-0.234)^2 * 0.3}{1.2}}$$

=0.265 N.m = 2.65 Kg.cm

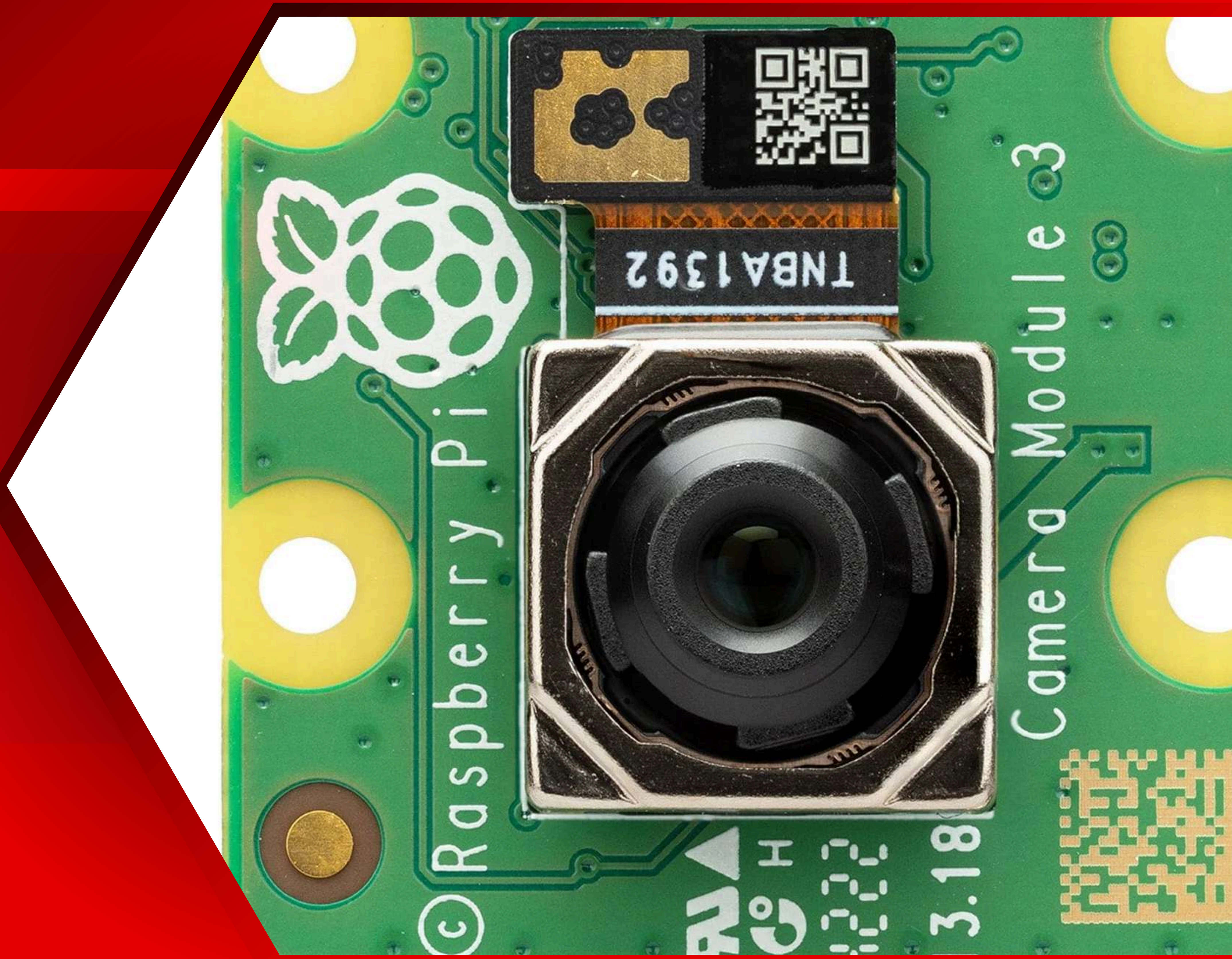
$$\text{Teffort} = \frac{0.406}{0.065} = 6.24 \text{ N}$$

TeddortMax = 2.7(9.81)(0.35) = 9.27 N

- ✓ Teffort < TeffortMax [design is valid]

Motor selection → DC 12v , 100 rpm , 0.34N.m

VISION
MISSION



The whole purpose of the camera in the lawn mower robot project is to control the operation of the cutting blade by scanning QR codes. The Raspberry Pi camera scans these QR codes to activate or deactivate the cutting blade, providing a user-friendly and secure method for managing the blade's operation.

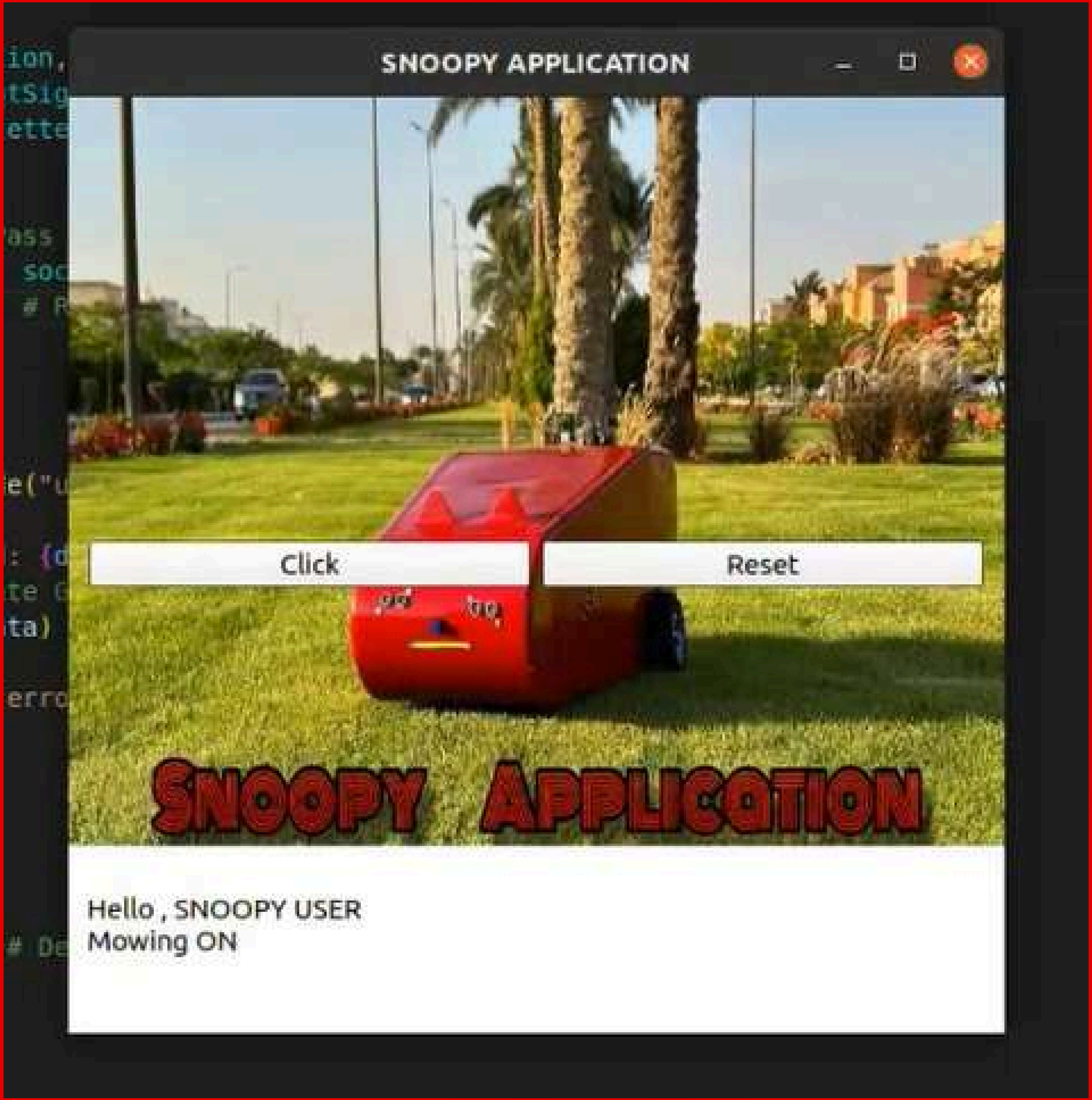
ON QR CODE

OFF QR CODE

GUI
APP


login
Username:
snoopy
Password:
••••
Remember me
Login
Cancel

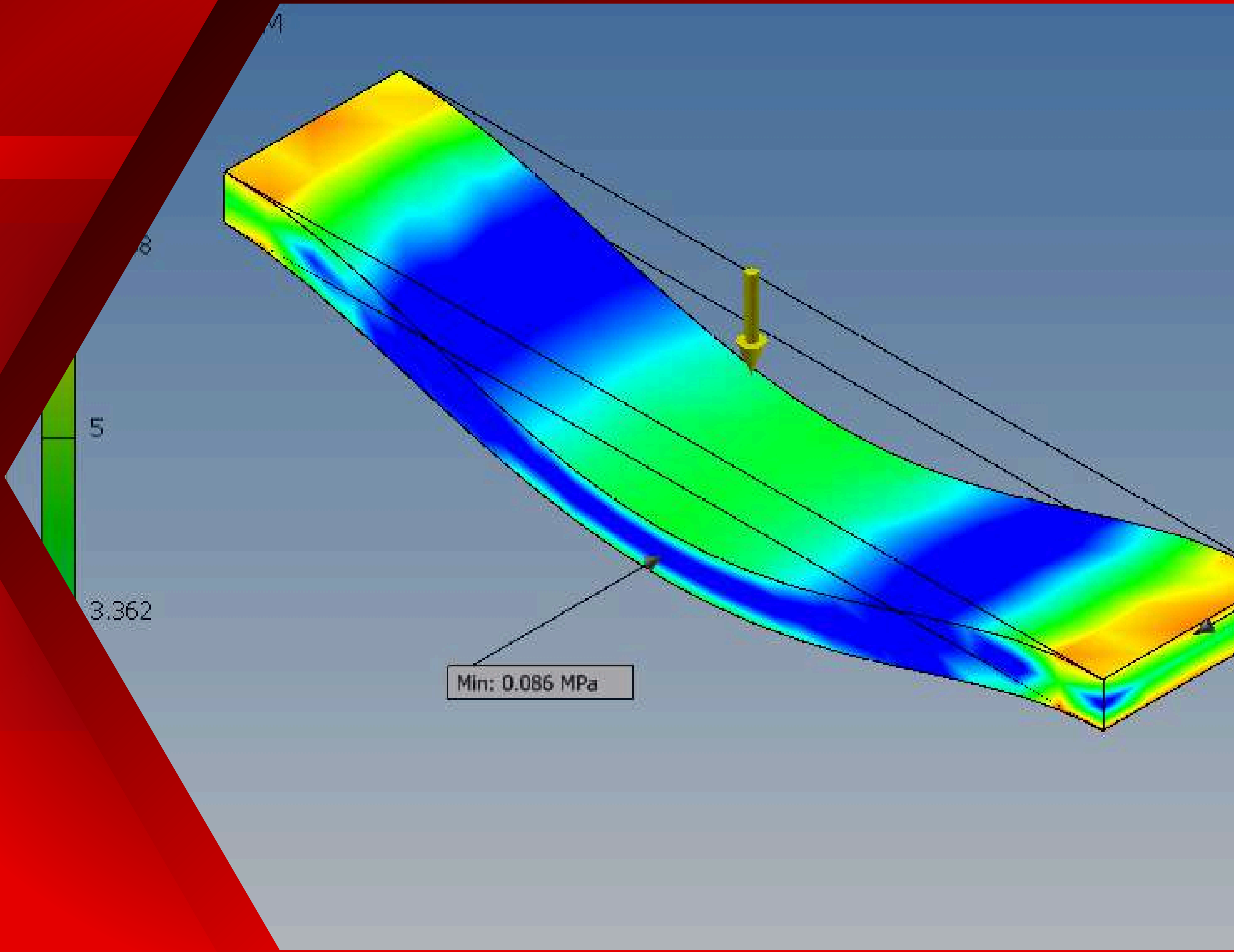

SNOOPY APPLICATION
Click
Reset
SNOOPY APPLICATION
Hello , SNOOPY USER

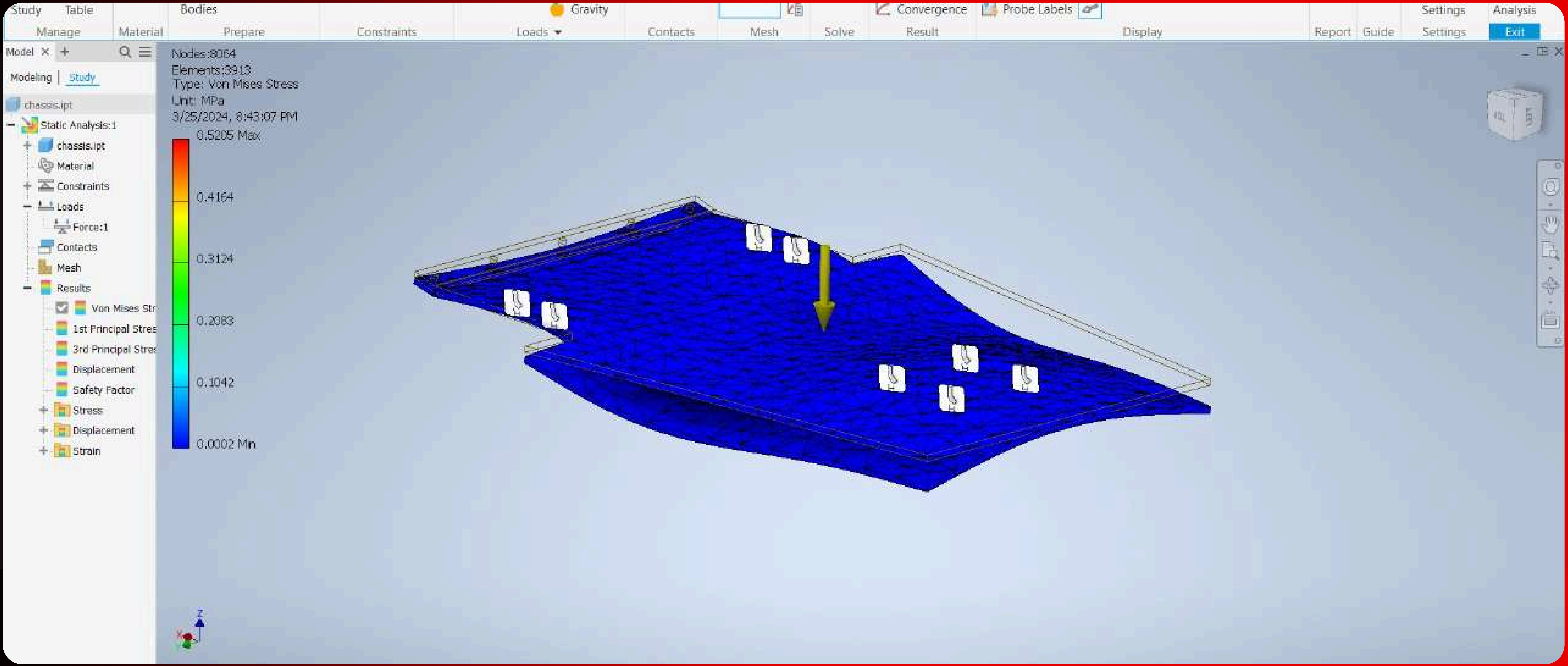

SNOOPY APPLICATION
Click
Reset
SNOOPY APPLICATION
Hello , SNOOPY USER
Mowing ON

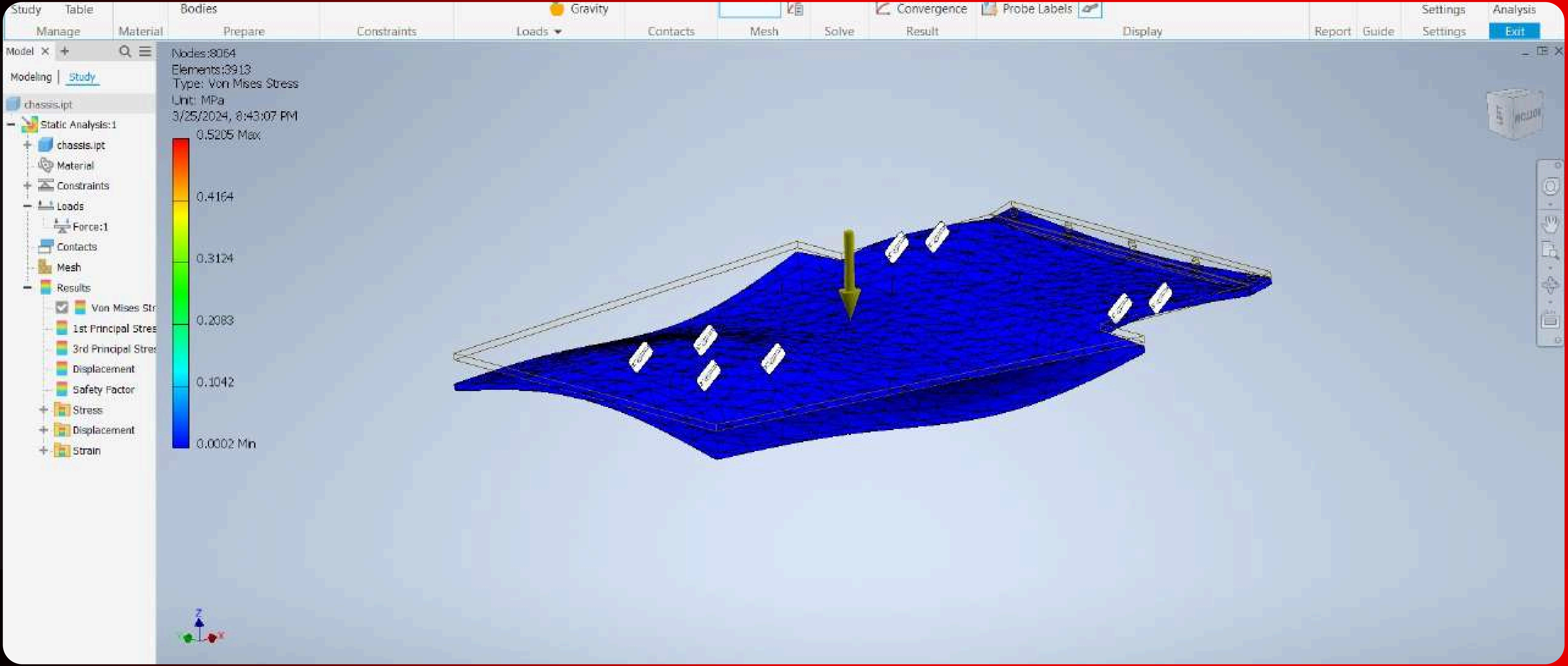

SNOOPY APPLICATION
Click
Reset
SNOOPY APPLICATION
Hello , SNOOPY USER
Mowing ON
Mowing OFF

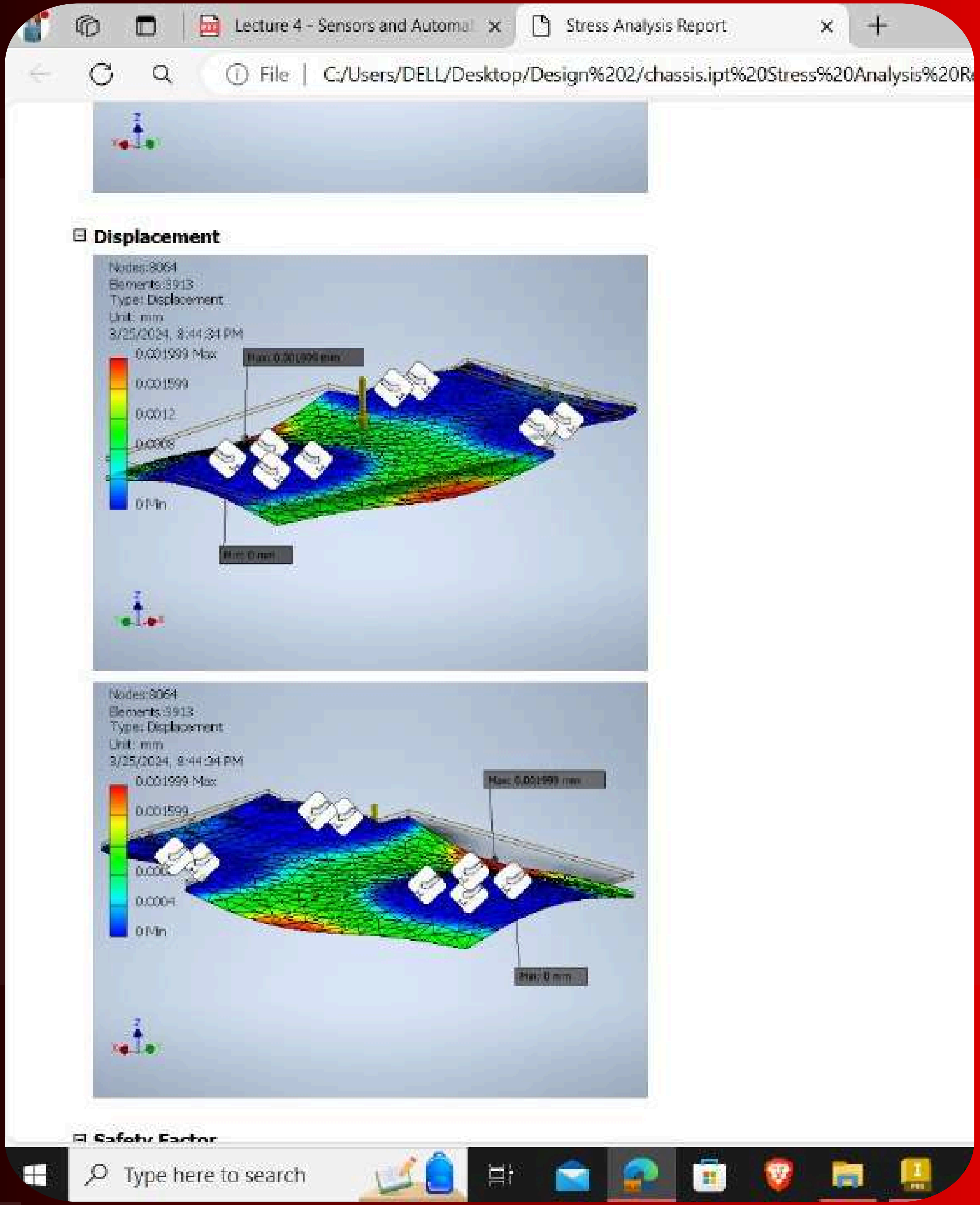

SNOOPY APPLICATION
Click
Reset
Snoopy Application

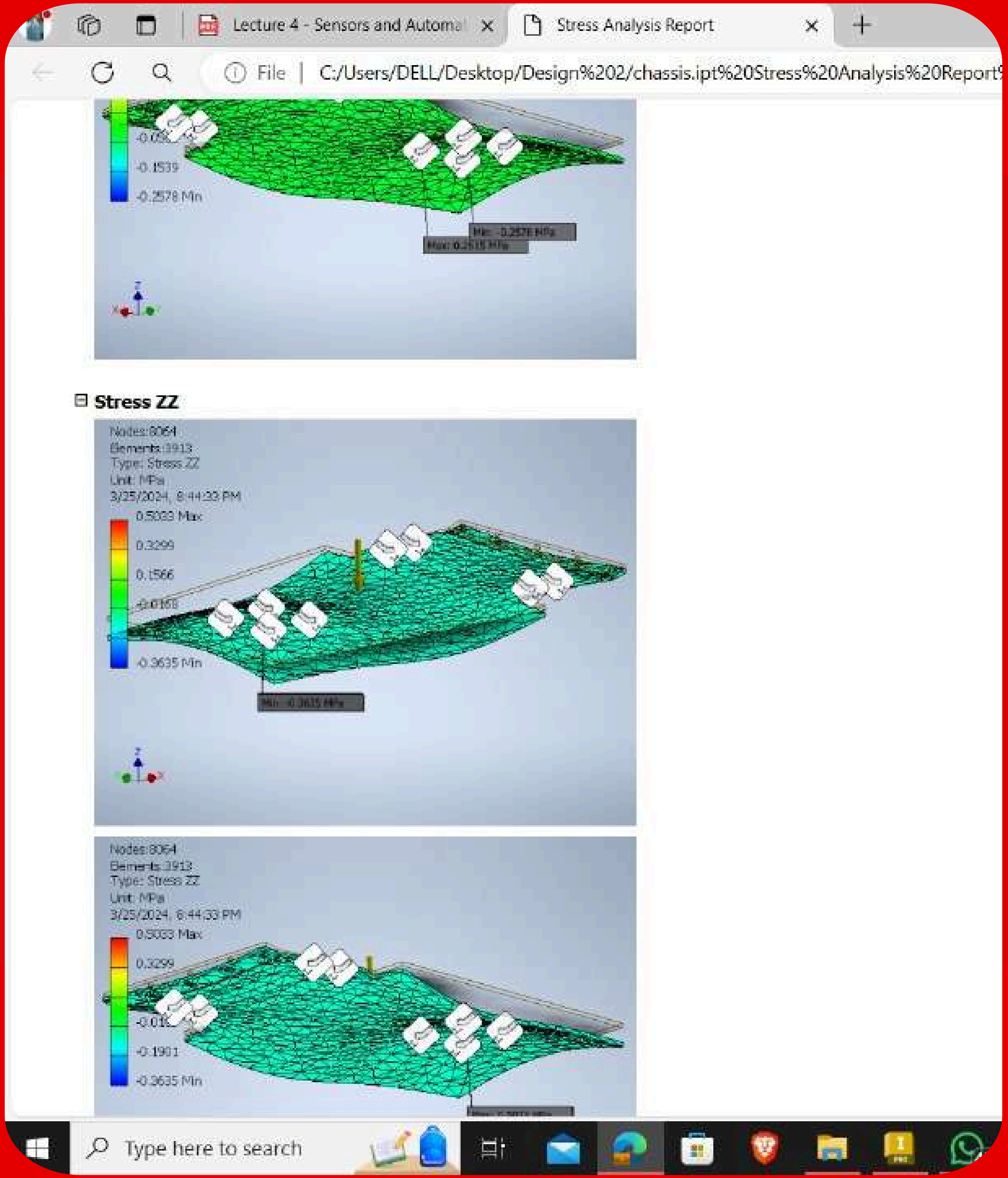
STRESS ANALYSIS




Study
Table
Manage
Material
Bodies
Prepare
Constraints
Gravity
Loads
Contacts
Mesh
Solve
Convergence
Result
Probe Labels
Display
Report
Guide
Settings
Settings
Analysis
Exit
Model
Modeling
Study
chassis.ipt
Static Analysis:1
chassis.ipt
Material
Constraints
Loads
Force:1
Contacts
Mesh
Results
Von Mises Str
1st Principal Stres
3rd Principal Stres
Displacement
Safety Factor
Stress
Displacement
Strain
Nodes:8064
Elements:3913
Type: Von Mises Stress
Unit: MPa
3/25/2024, 8:43:07 PM
0.5205 Max
0.4164
0.3124
0.2083
0.1042
0.0002 Min

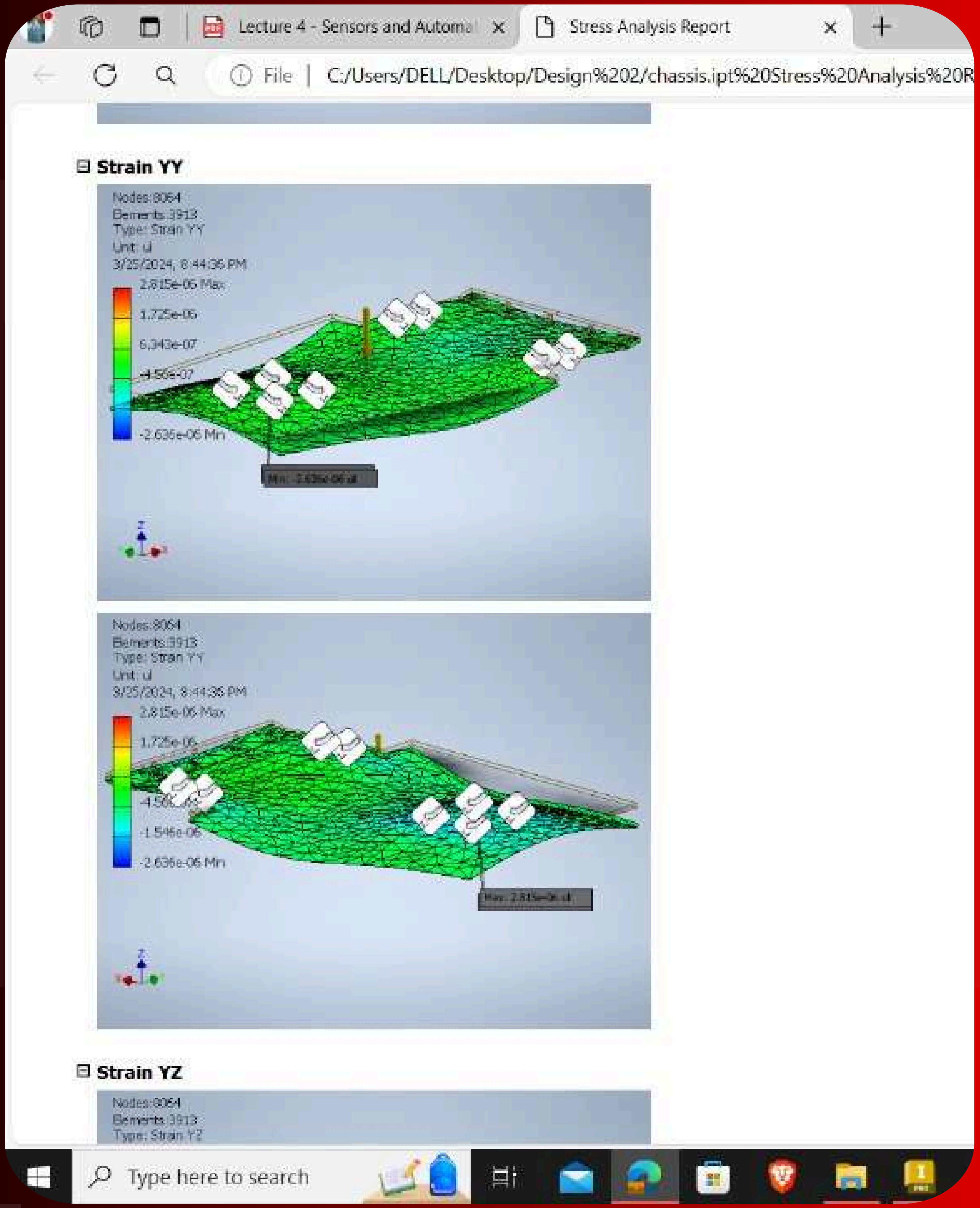

Study
Table
Manage
Material
Bodies
Prepare
Constraints
Gravity
Loads
Contacts
Mesh
Solve
Convergence
Result
Probe Labels
Display
Report
Guide
Settings
Settings
Analysis
Exit
Model
Modeling | Study
chassis.ipt
Static Analysis:1
chassis.ipt
Material
Constraints
Loads
Force:1
Contacts
Mesh
Results
Von Mises Str
1st Principal Stres
3rd Principal Stres
Displacement
Safety Factor
Stress
Displacement
Strain
Nodes:8064
Elements:3913
Type: Von Mises Stress
Unit: MPa
3/25/2024, 8:43:07 PM
0.5205 Max
0.4164
0.3124
0.2083
0.1042
0.0002 Min

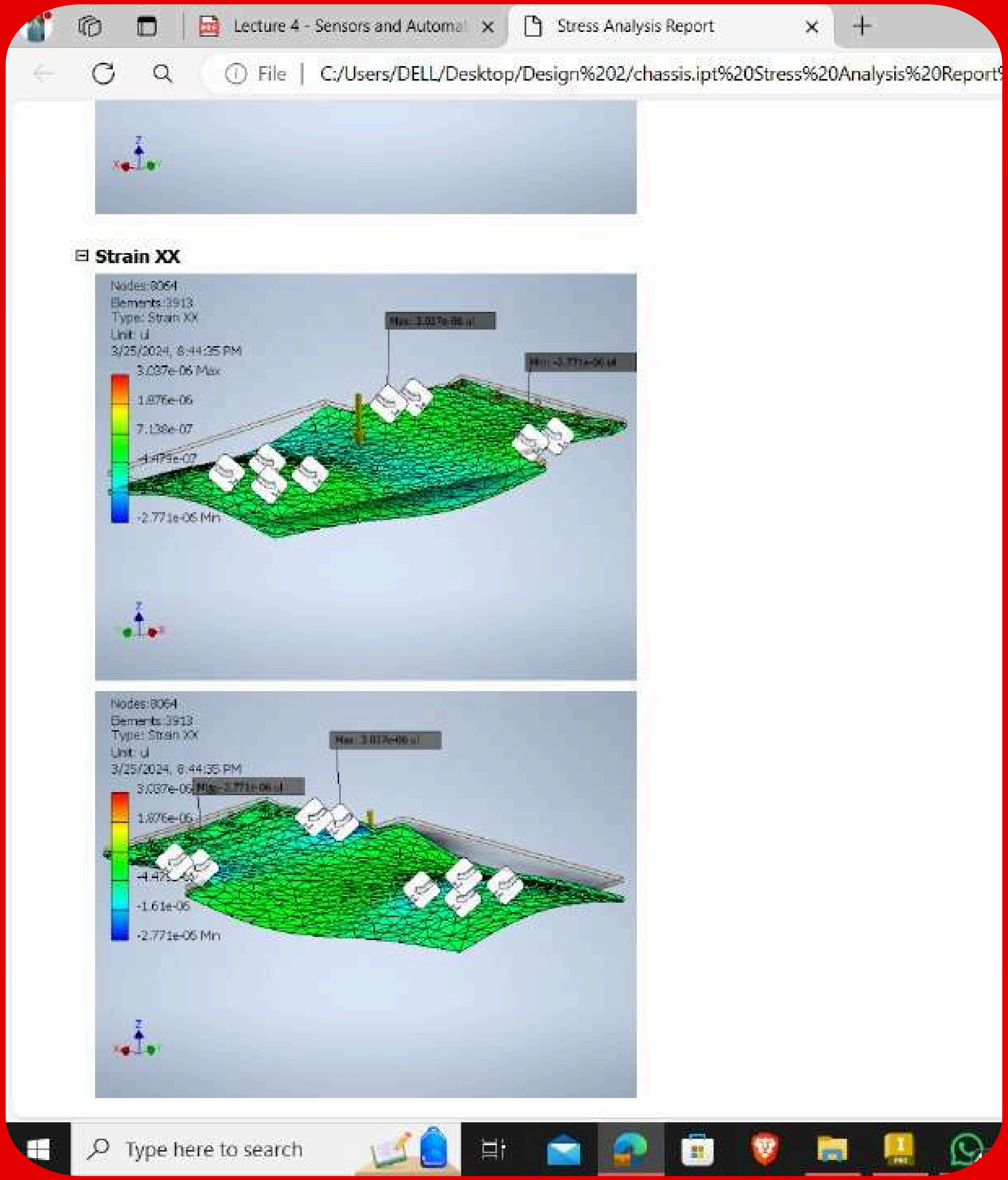

Lecture 4 - Sensors and Automat
Stress Analysis Report
File
C:/Users/DELL/Desktop/Design%202/chassis.ipt%20Stress%20Analysis%20R
Displacement
Nodes:8064
Elements:3913
Type: Displacement
Unit: mm
3/25/2024, 8:44:34 PM
0.001999 Max
0.001599
0.0012
0.0004
0 Min
Safety Factor
Type here to search


Lecture 4 - Sensors and Automat
Stress Analysis Report
File
C:/Users/DELL/Desktop/Design%202/chassis.ipt%20Stress%20Analysis%20Report
-0.1539
-0.2578 Min
Stress ZZ
Nodes:8064
Elements:3913
Type: Stress ZZ
Unit: MPa
3/25/2024, 8:44:33 PM
0.5033 Max
0.3299
0.1566
-0.3635 Min
-0.1901
Type here to search

SNOOPY

Home Photo About Us Contact





⊟ Reaction Force and Moment on Constraints

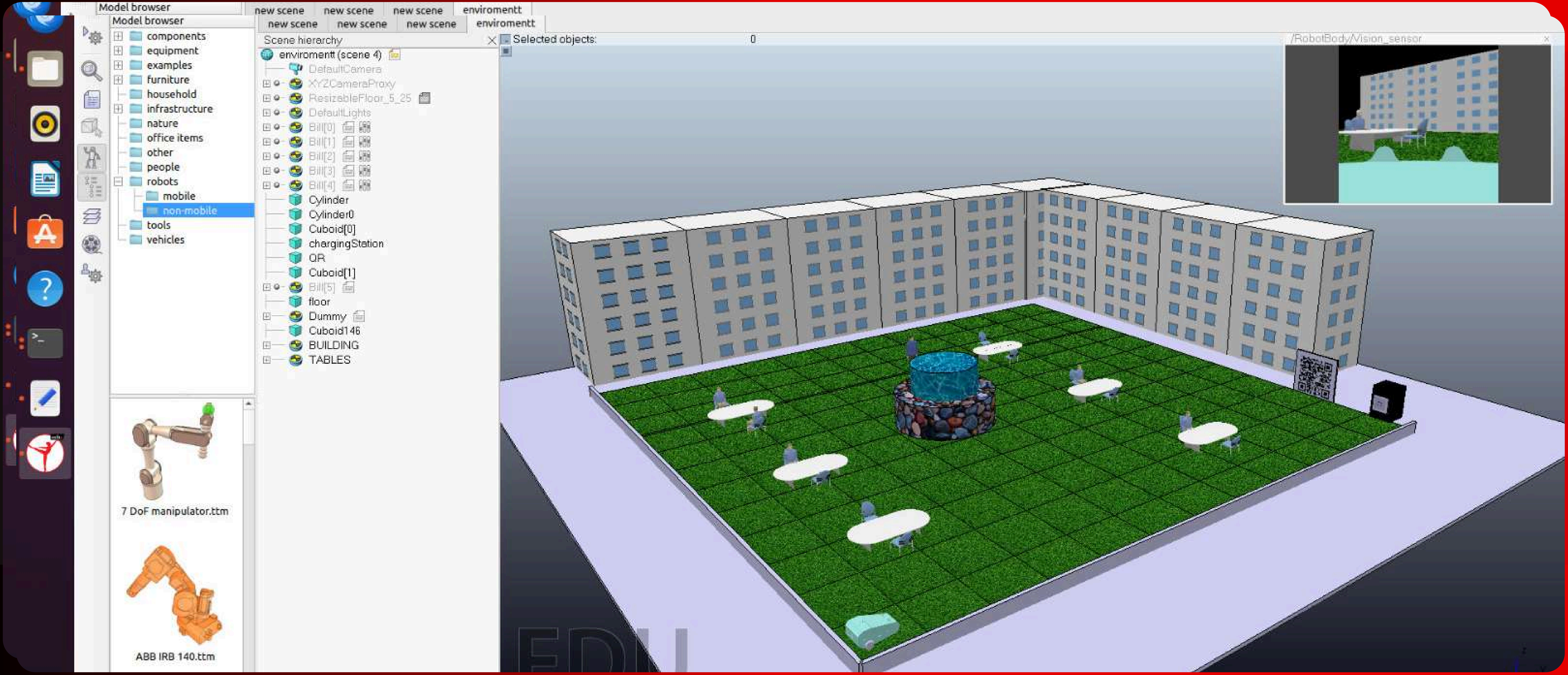
Constraint Name	Reaction Force		Reaction Moment	
	Magnitude	Component (X,Y,Z)	Magnitude	Component (X,Y,Z)
Fixed Constraint:1	5 N	0 N	0.0746982 N m	0 N m
		0 N		0.0746982 N m
		5 N		0 N m

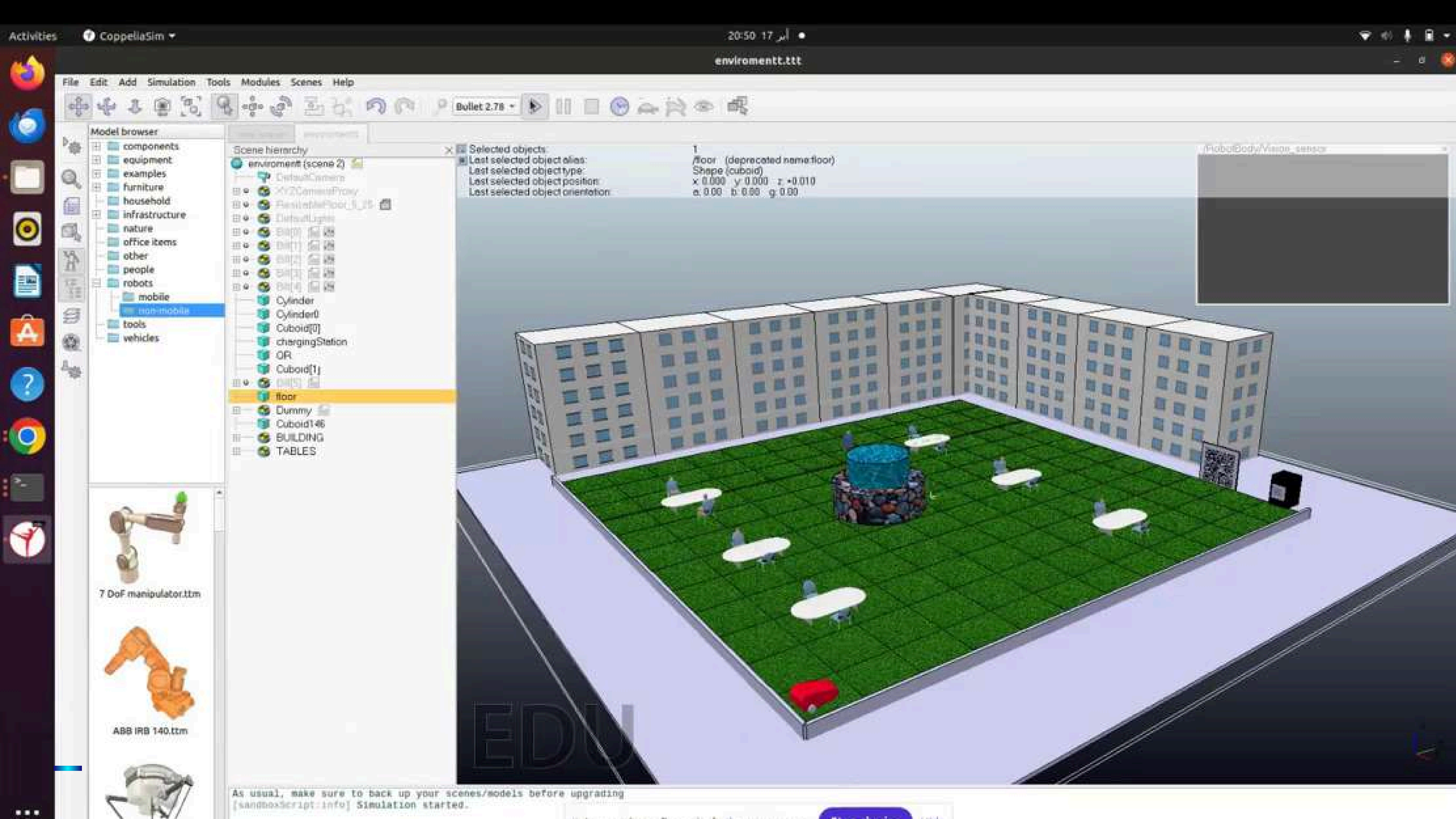
⊟ Result Summary

Name	Minimum	Maximum
Volume	888041 mm^3	
Mass	2.39771 kg	
Von Mises Stress	0.000175332 MPa	0.520499 MPa
1st Principal Stress	-0.152471 MPa	0.801515 MPa
3rd Principal Stress	-0.48252 MPa	0.246943 MPa
Displacement	0 mm	0.00199927 mm
Safety Factor	15 ul	15 ul
Stress XX	-0.231975 MPa	0.431312 MPa
Stress XY	-0.0895619 MPa	0.0934501 MPa
Stress XZ	-0.210782 MPa	0.223358 MPa
Stress YY	-0.247615 MPa	0.448662 MPa
Stress YZ	-0.257751 MPa	0.261457 MPa
Stress ZZ	-0.36348 MPa	0.503283 MPa
X Displacement	-0.0000440889 mm	0.0000419778 mm
Y Displacement	-0.0000405771 mm	0.0000385611 mm
Z Displacement	-0.00199919 mm	0.00011212 mm
Equivalent Strain	0.00000000230201 ul	0.00000743106 ul
1st Principal Strain	0.00000000108414 ul	0.00000884673 ul
3rd Principal Strain	-0.00000535604 ul	-0.00000000119452 ul
Strain XX	-0.0000027714 ul	0.00000303727 ul
Strain XY	-0.00000172884 ul	0.0000018039 ul
Strain XZ	-0.00000406879 ul	0.00000431155 ul
Strain YY	-0.00000263648 ul	0.00000281483 ul

ENVIROMENT

USING COPPELIASIM


Model browser
components
equipment
examples
furniture
household
infrastructure
nature
office items
other
people
robots
mobile
non-mobile
tools
vehicles
7 DoF manipulator.ttm
ABB IRB 140.ttm
new scene
enviromentt
Scene hierarchy
enviromentt (scene 4)
DefaultCamera
XYZCameraProxy
ResizableFloor_5_25
DefaultLights
Bill[0]
Bill[1]
Bill[2]
Bill[3]
Bill[4]
Cylinder
Cylinder0
Cuboid[0]
chargingStation
QR
Cuboid[1]
Bill[5]
floor
Dummy
Cuboid146
BUILDING
TABLES
Selected objects:
0
/RobotBody/Vision_sensor


Activities
CoppeliaSim
20:50 17 آذر
enviromentt.ttt
File Edit Add Simulation Tools Modules Scenes Help
Bullet 2.78
Model browser
components
equipment
examples
furniture
household
infrastructure
nature
office items
other
people
robots
mobile
non-mobile
tools
vehicles
7 DoF manipulator.ttm
ABB IRB 140.ttm
Scene hierarchy
enviromentt (scene 2)
Cylinder
Cylinder0
Cuboid[0]
chargingStation
QR
Cuboid[1]
floor
Dummy
Cuboid146
BUILDING
TABLES
Selected objects: 1
Last selected object alias: /floor (deprecated name:floor)
Last selected object type: Shape (cuboid)
Last selected object position: x: 0.000 y: 0.000 z: +0.010
Last selected object orientation: a: 0.00 b: 0.00 g: 0.00
EDU
As usual, make sure to back up your scenes/models before upgrading
[sandboxScript:info] Simulation started.

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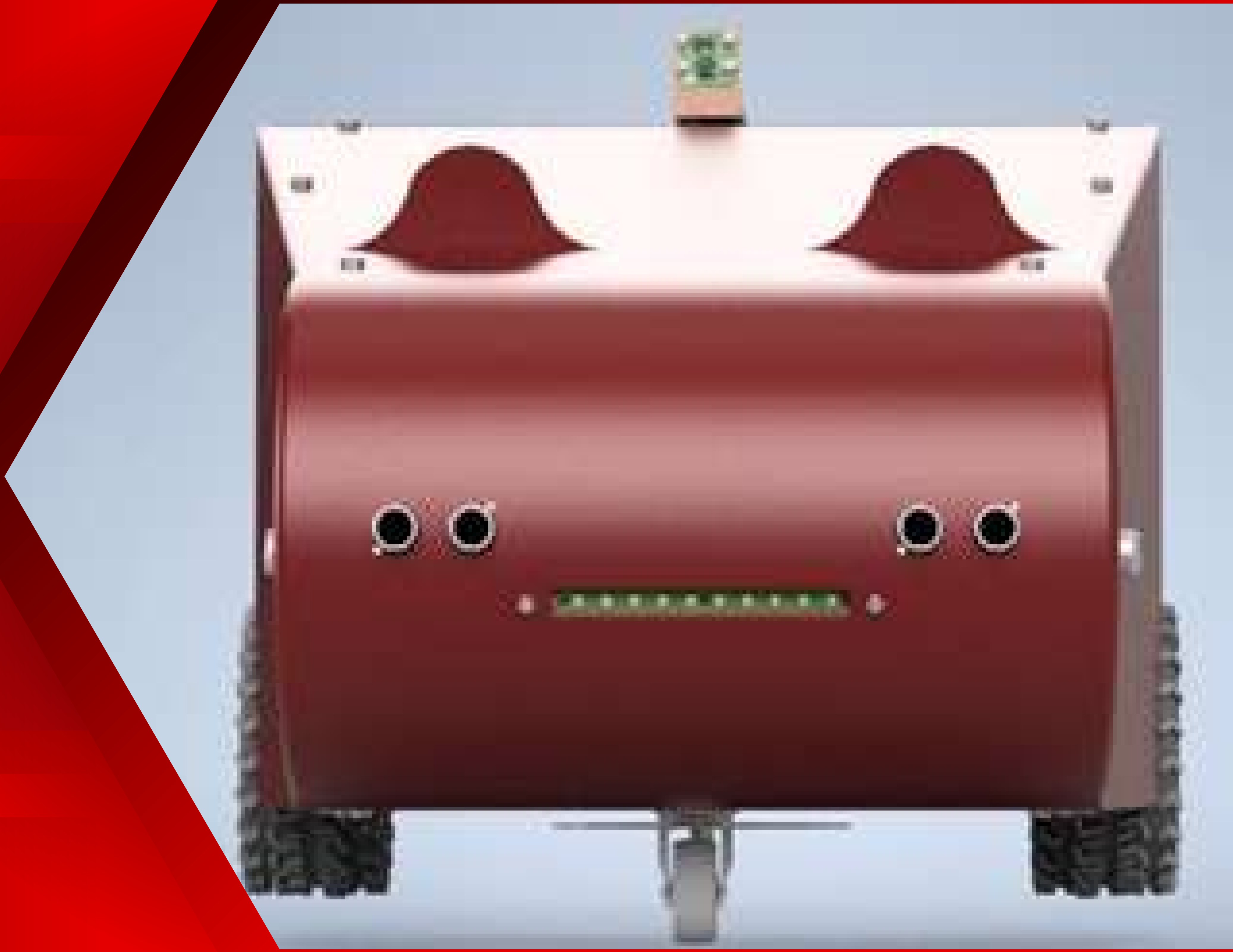
MANUFACTURING



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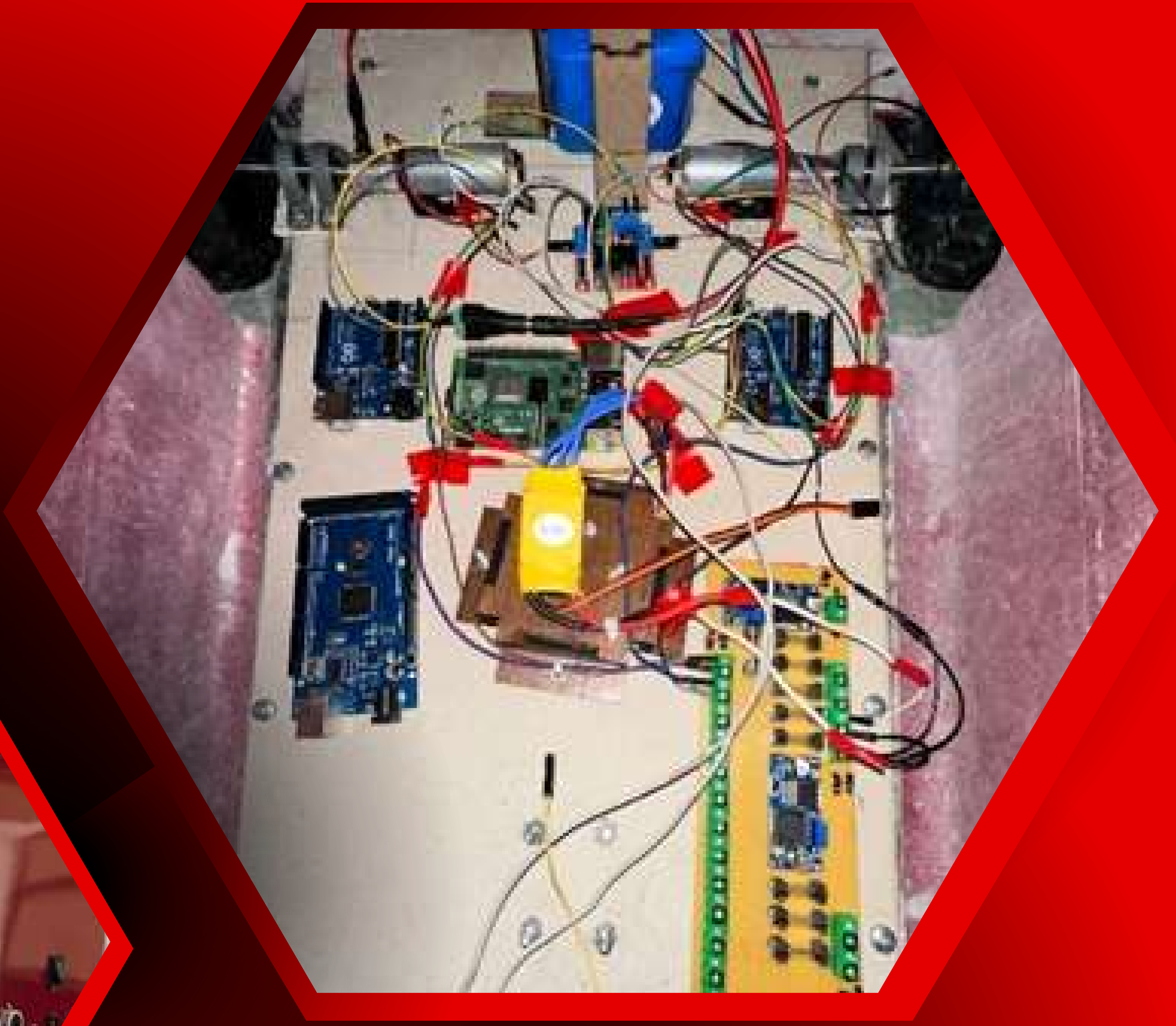
COMPONENTS



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ROBOT

THANK YOU