MARS PROJECT

Automated Fire Extinguishing Bot

OUR PROJECT: What You Need to Know

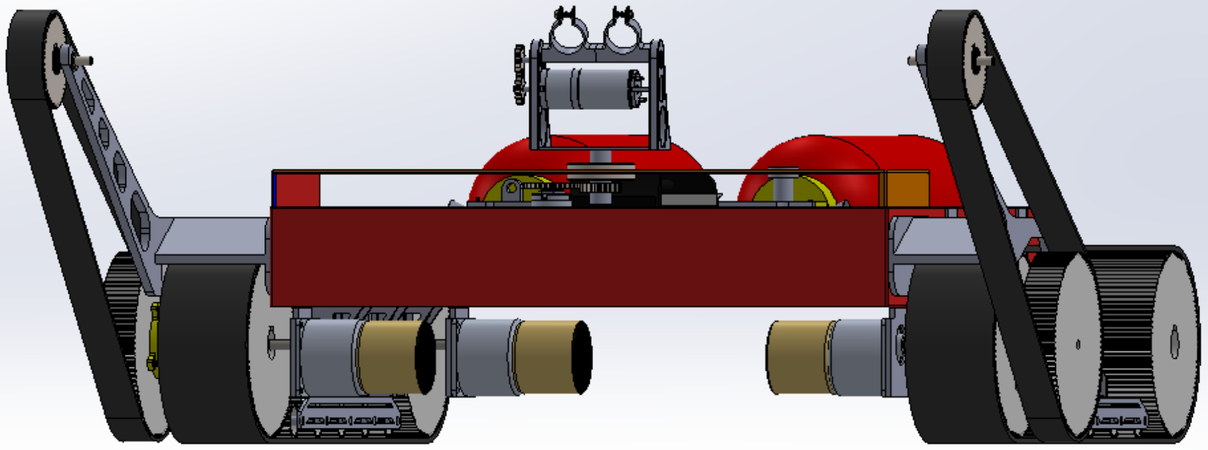
UNDERSTAND HOW THE PROJECT WORKS

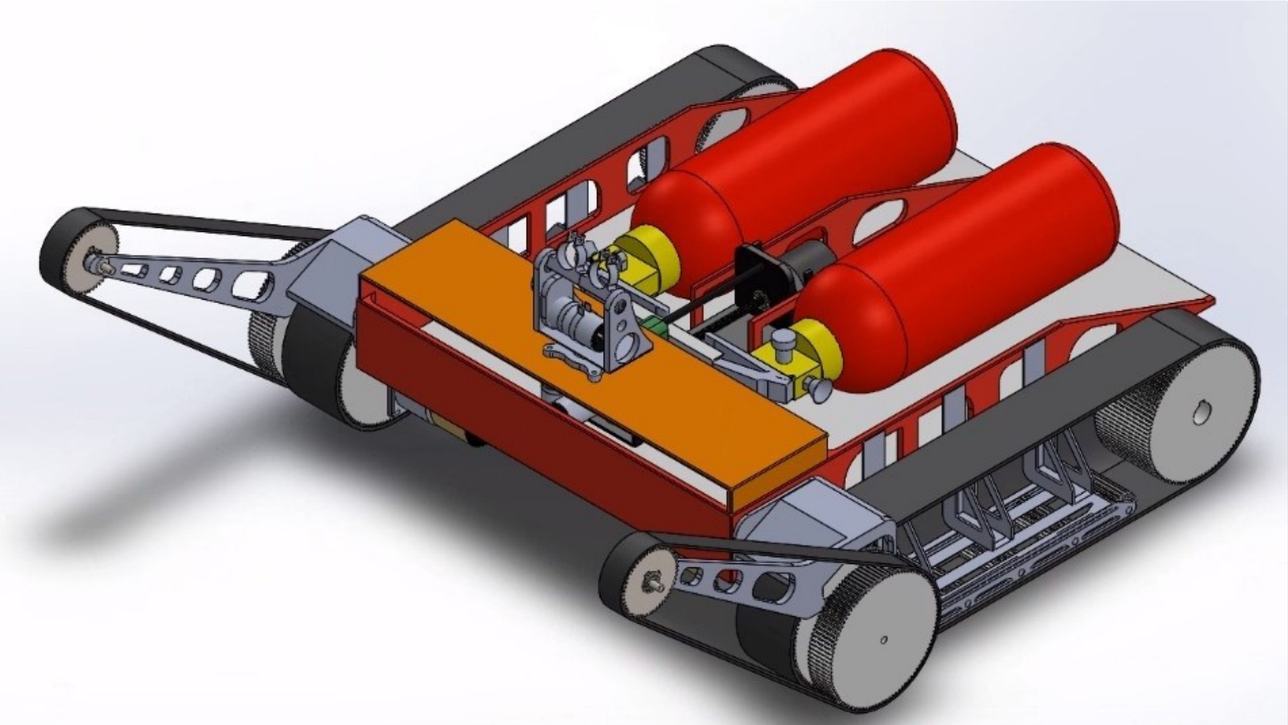
MECHANICAL DESIGN

AUTONOMOUS WALL FOLLOWING

IMAGE PROCESSING

AUTONOMOUS FIRE DETECTION



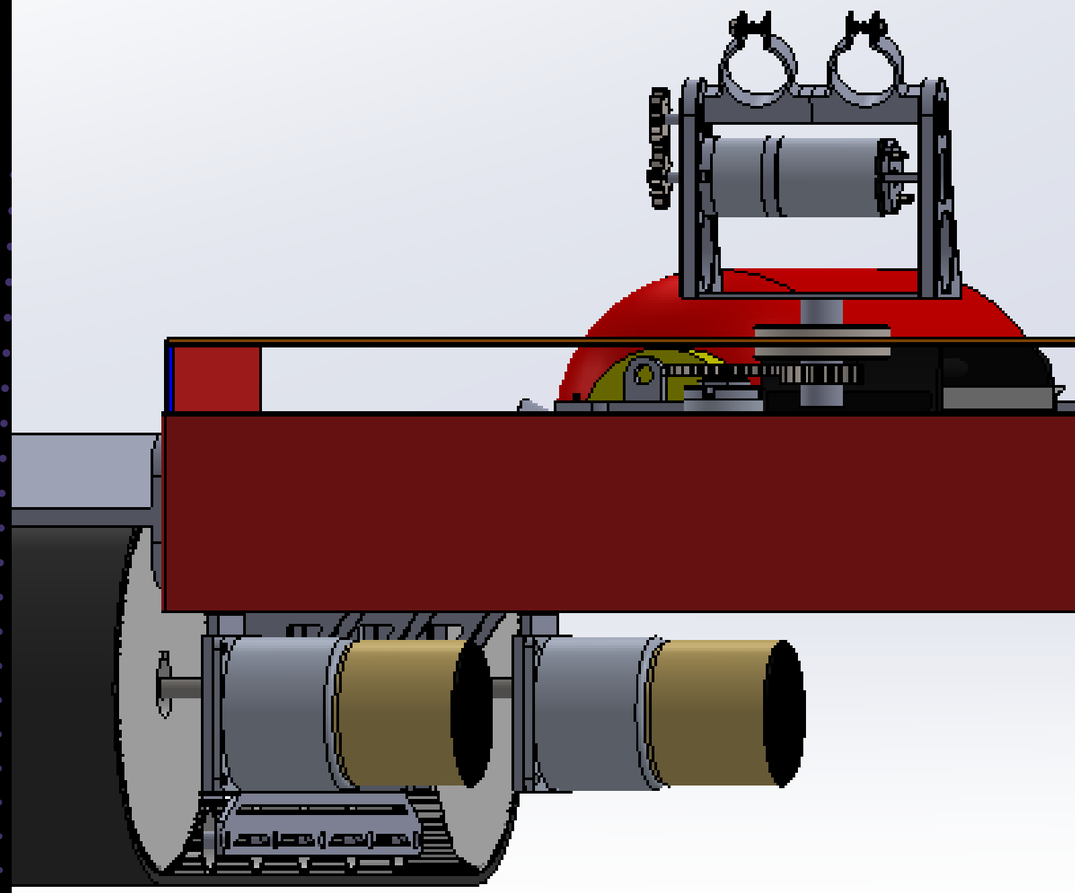


FINAL BOT

MECHANICAL DESIGN

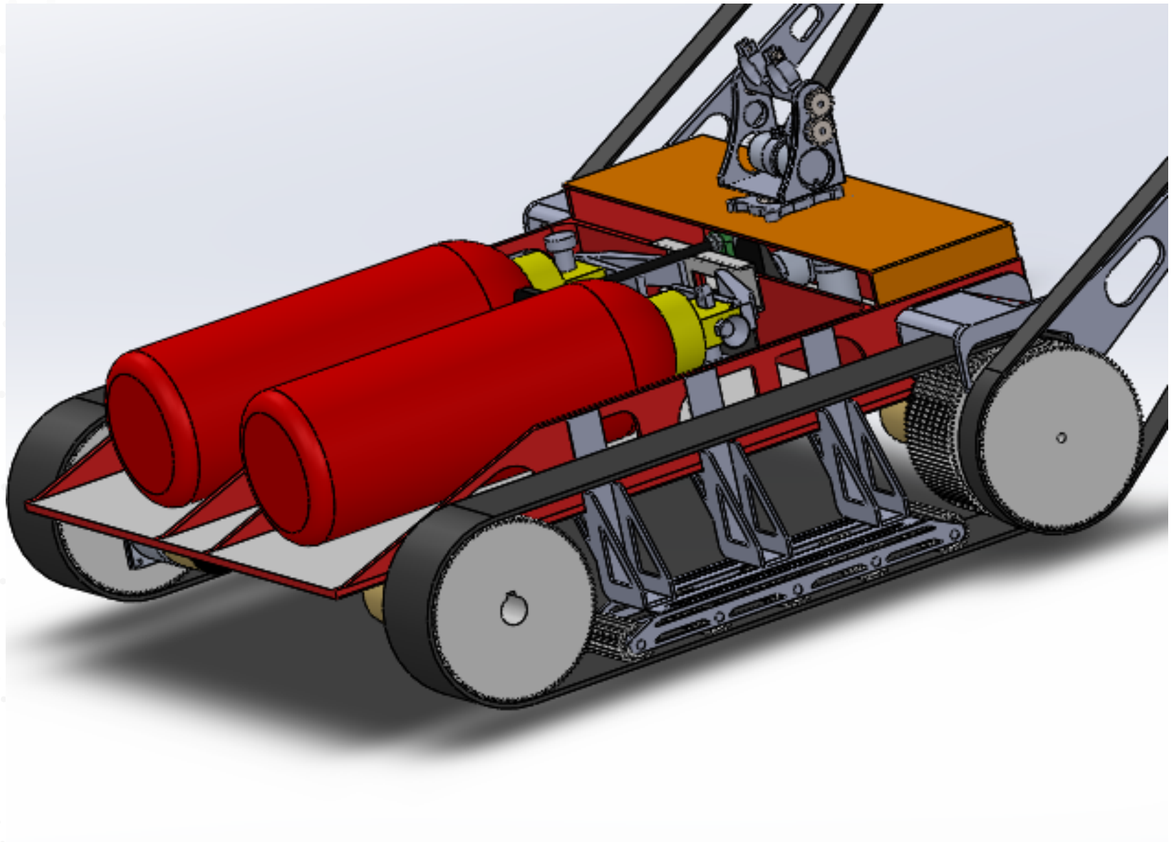
Mechanical Design encompasses 4 major Components -

- Wheel Assembly
- Nozzle Mechanism
- Lead Screw Mechanism
- Stair Climbing Mechanism



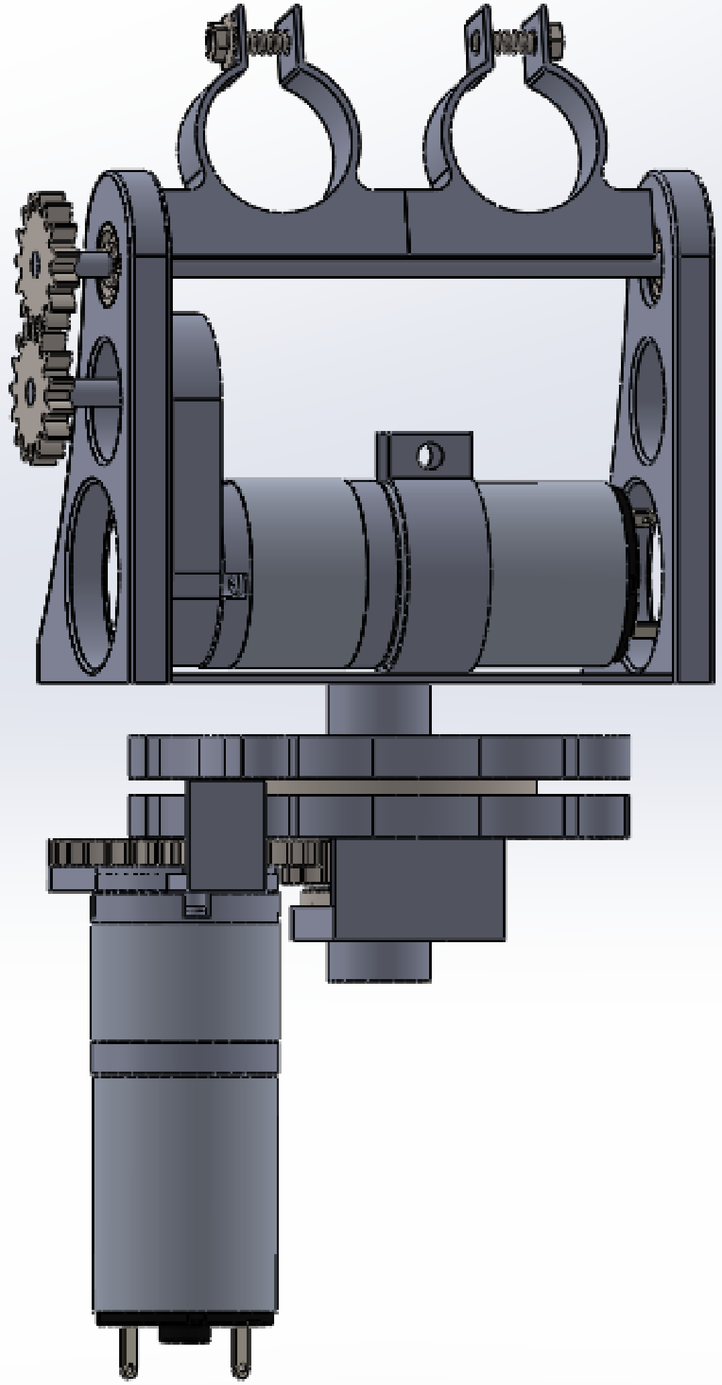
WHEEL ASSEMBLY

The Wheel assembly is a Timing Belt Mechanism. This provides an advantage of easier mobility and larger weight carrying capacity over other mechanisms such as the Rocker Boogie Mechanism.



NOZZLE MECHANISM

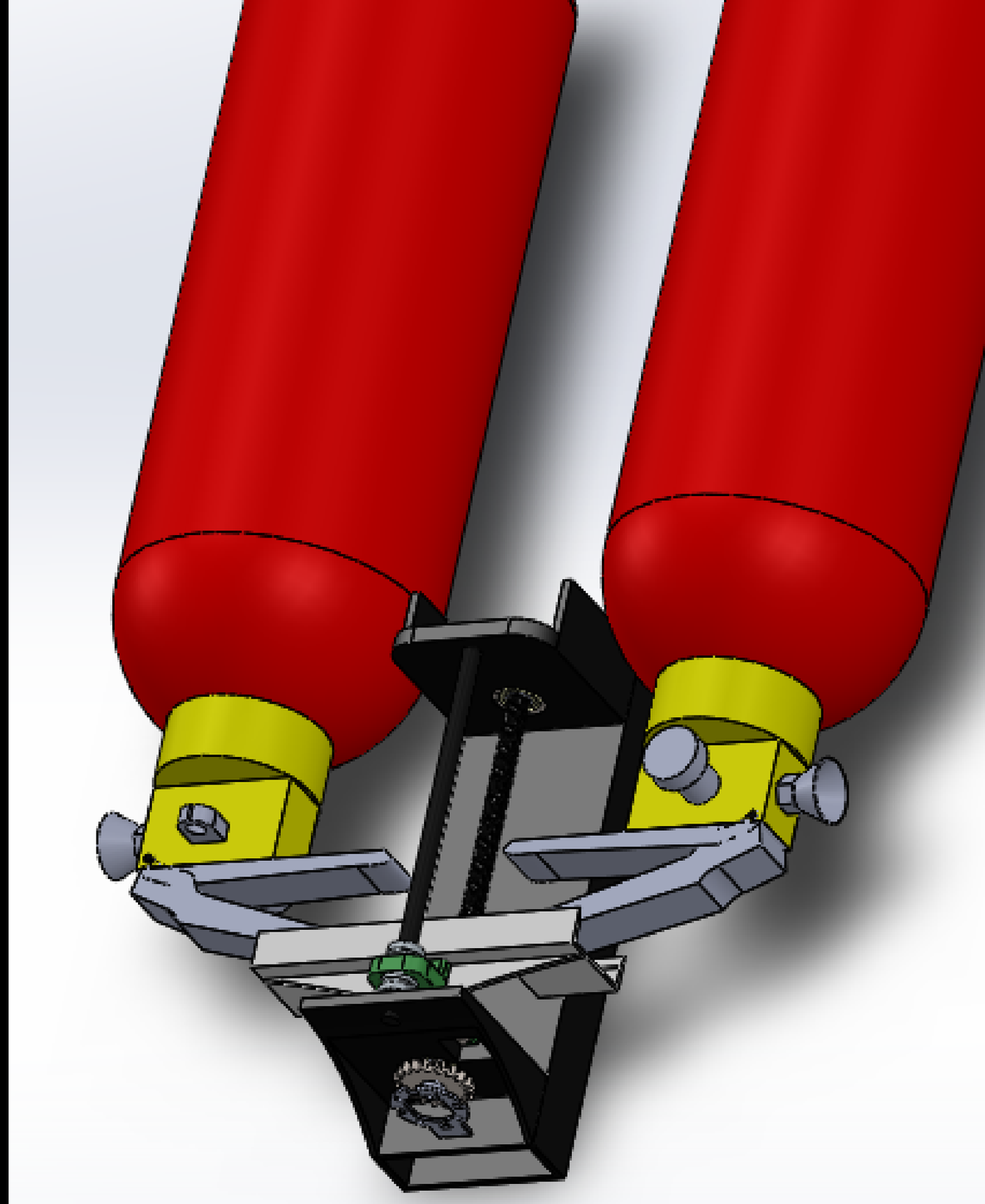
Nozzle Mechanism is a 2-axis gimbal. This Mechanism can rotate 30 degrees in both horizontal directions and 30 degrees in both vertical directions.



LEAD SCREW MECHANISM
for Handle Pushing

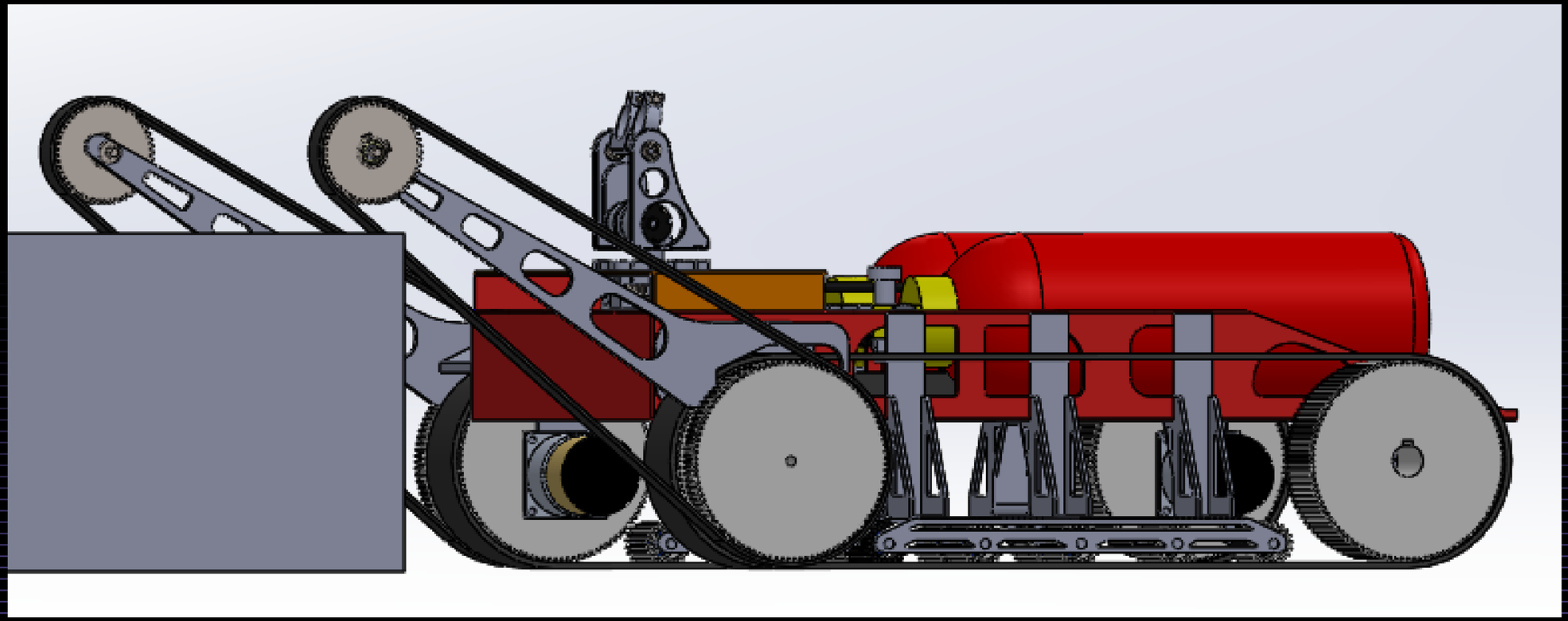
OBJECTIVE BEHIND LEAD SCREW MECHANISM

Leadscrew Mechanism is used because it can provide a torque of large magnitude, and the motion cannot be reversed by the back force applied by the handle.

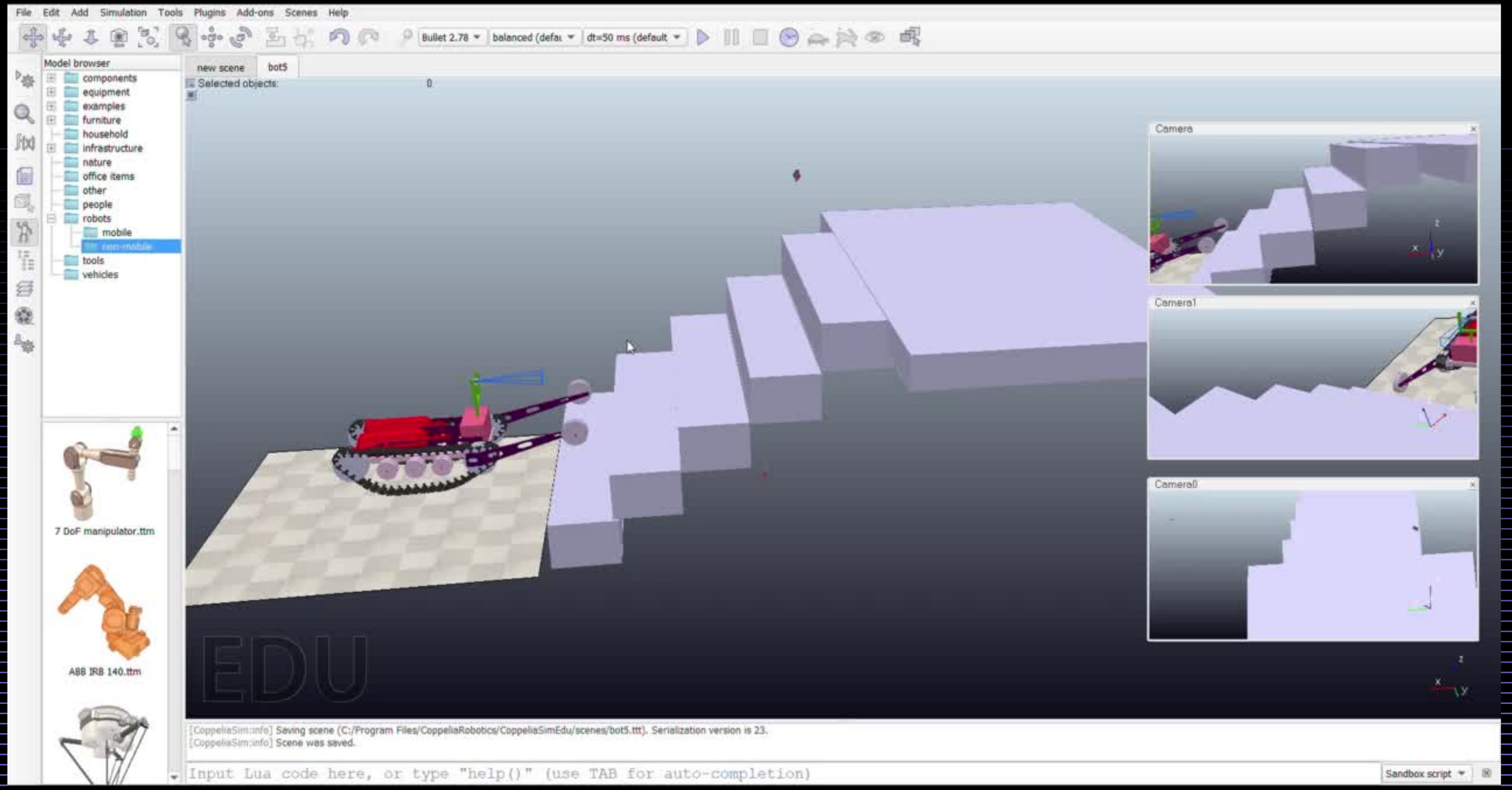


STAIR CLIMBING MECHANISM

The stair climbing mechanism works on the basis of two-timing belts, making an angle of 23 Degrees. This angle was Decided after a brief round of simulation on coppeliasim.

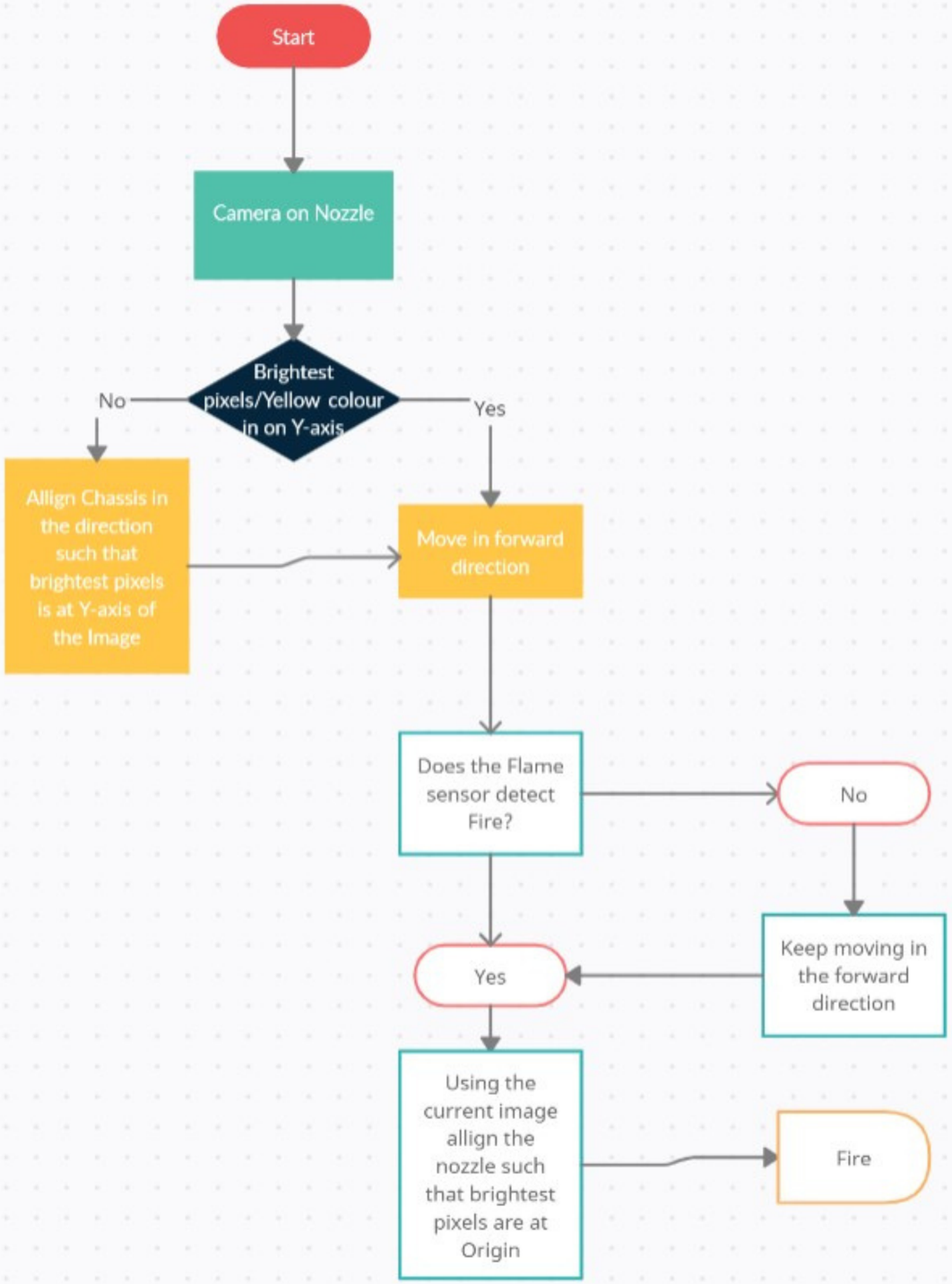


STAIR CLIMBING IN COPPELIASIM

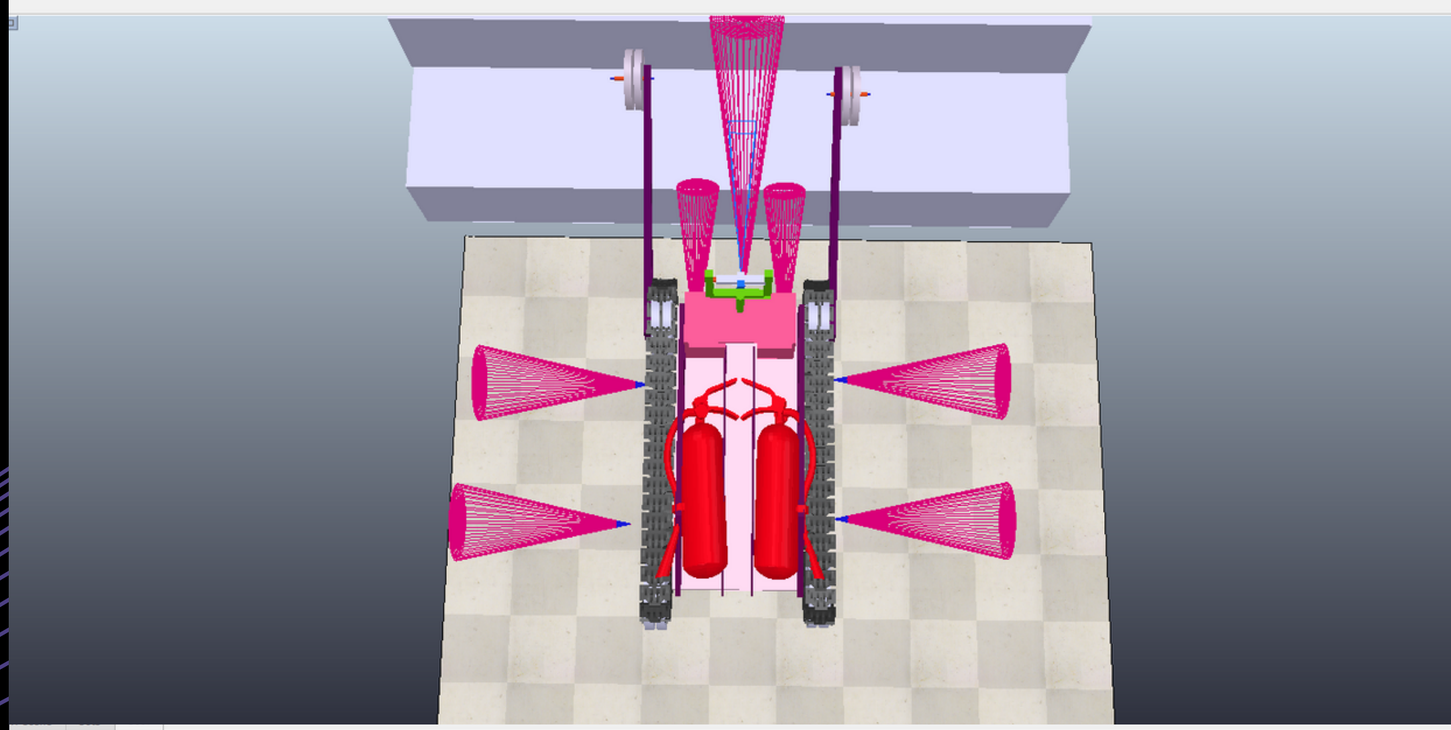


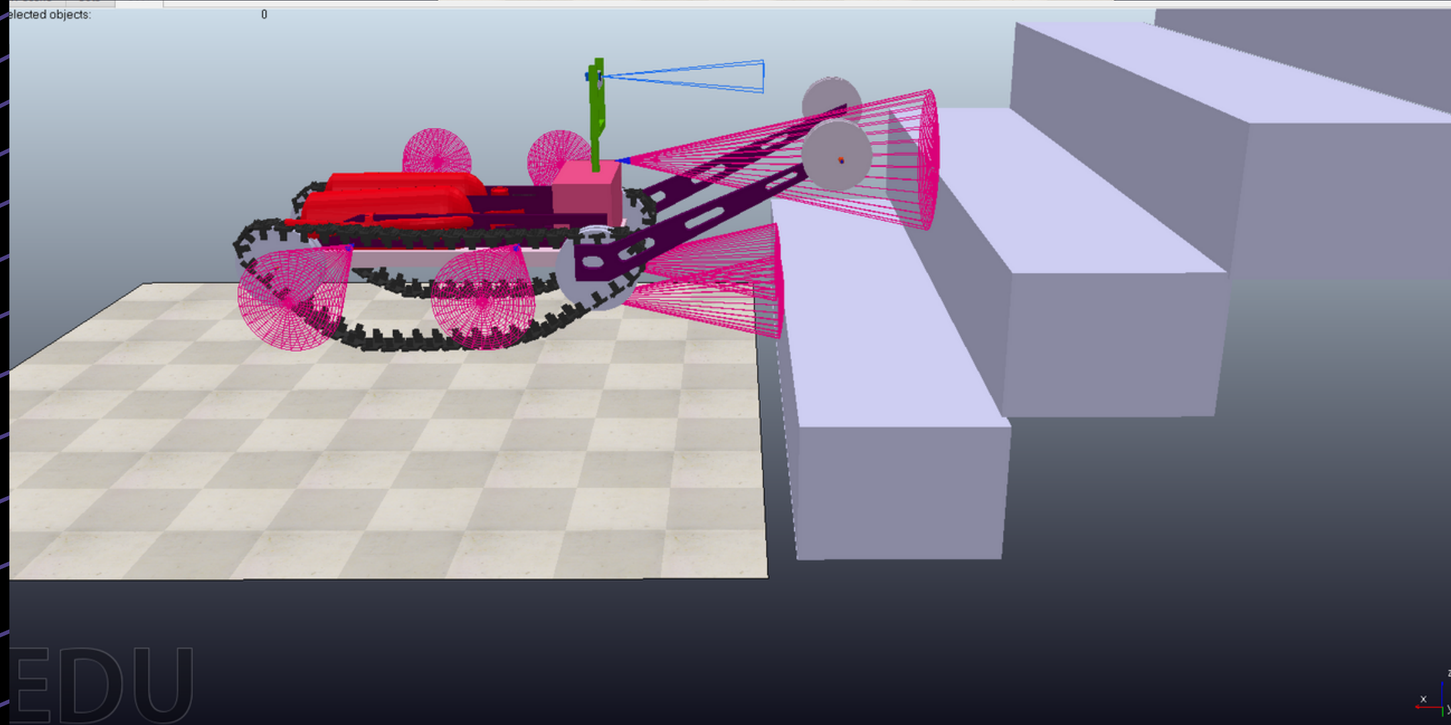
SENSORS

- CAMERA
- FLAME SENSOR
- ULTRASONIC SENSOR
- TEMPERATURE SENSOR

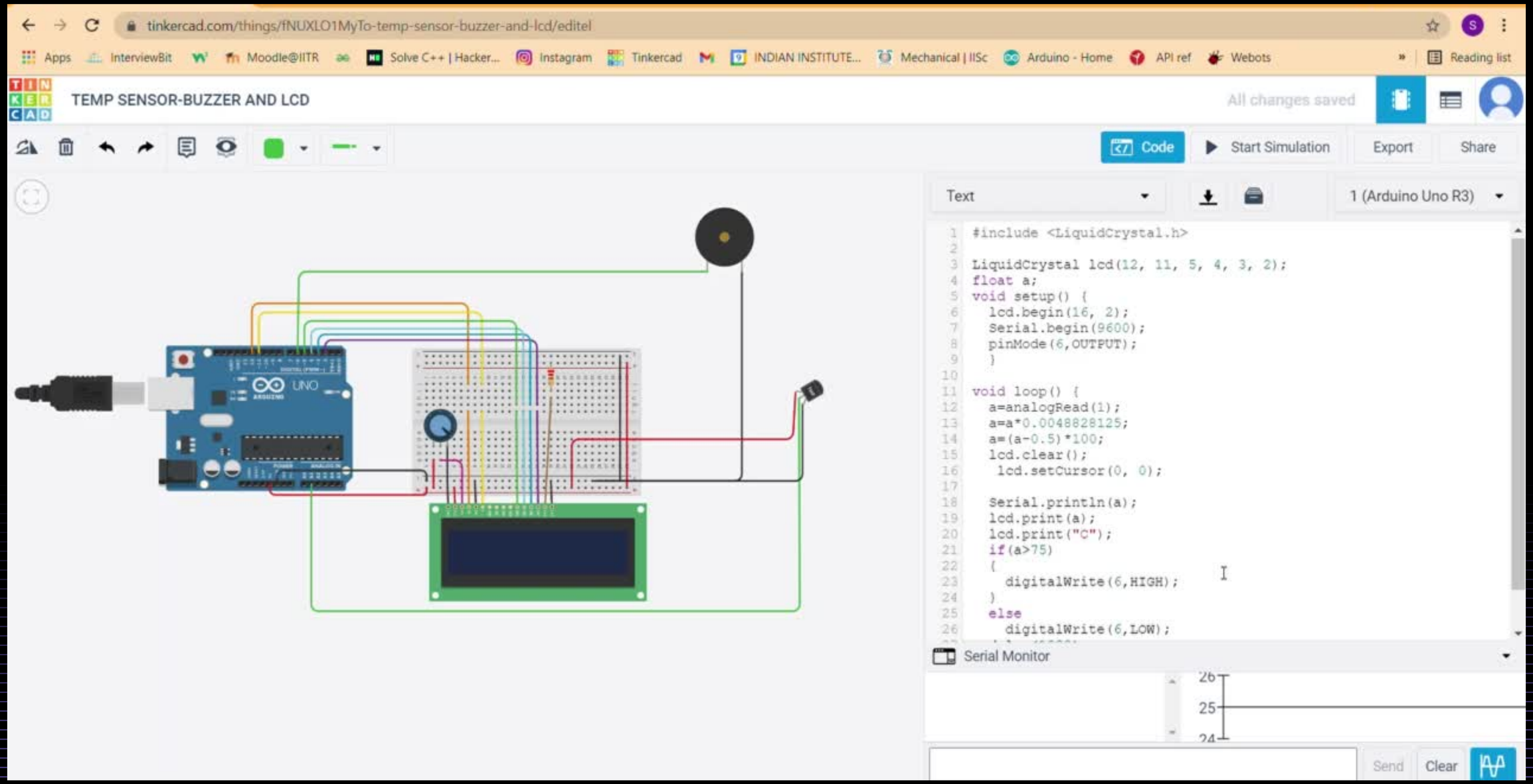


ULTRASONIC DISTANCE SENSOR

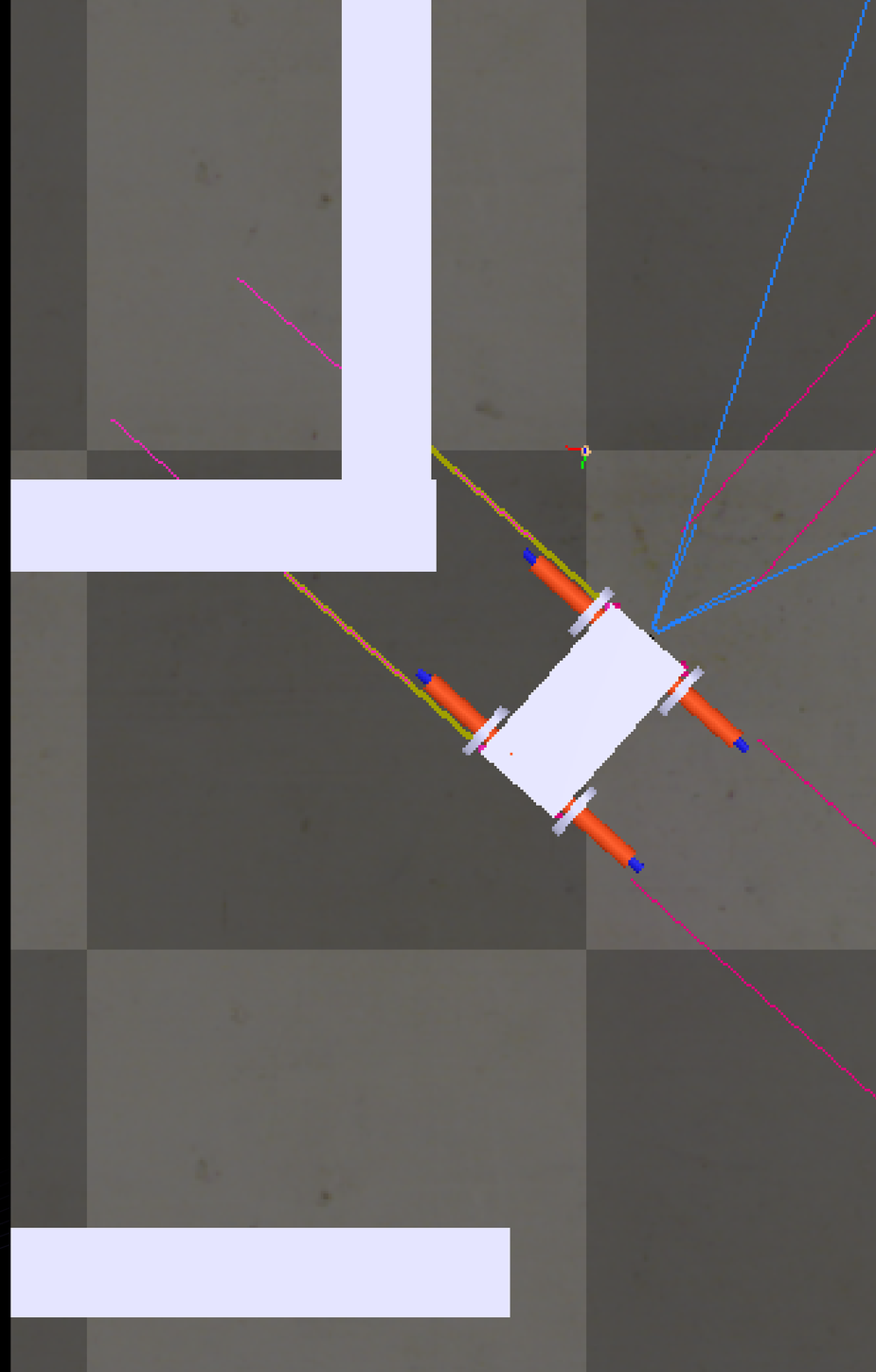




TEMPERATURE SENSOR



AUTONOMOUS INDOOR NAVIGATION



BOT MOTION

- Left wall following
- Move towards the centre of the fire.
- Motion using PID
- Stop at a distance followed by motion of nozzle

THE WALL FOLLOWING

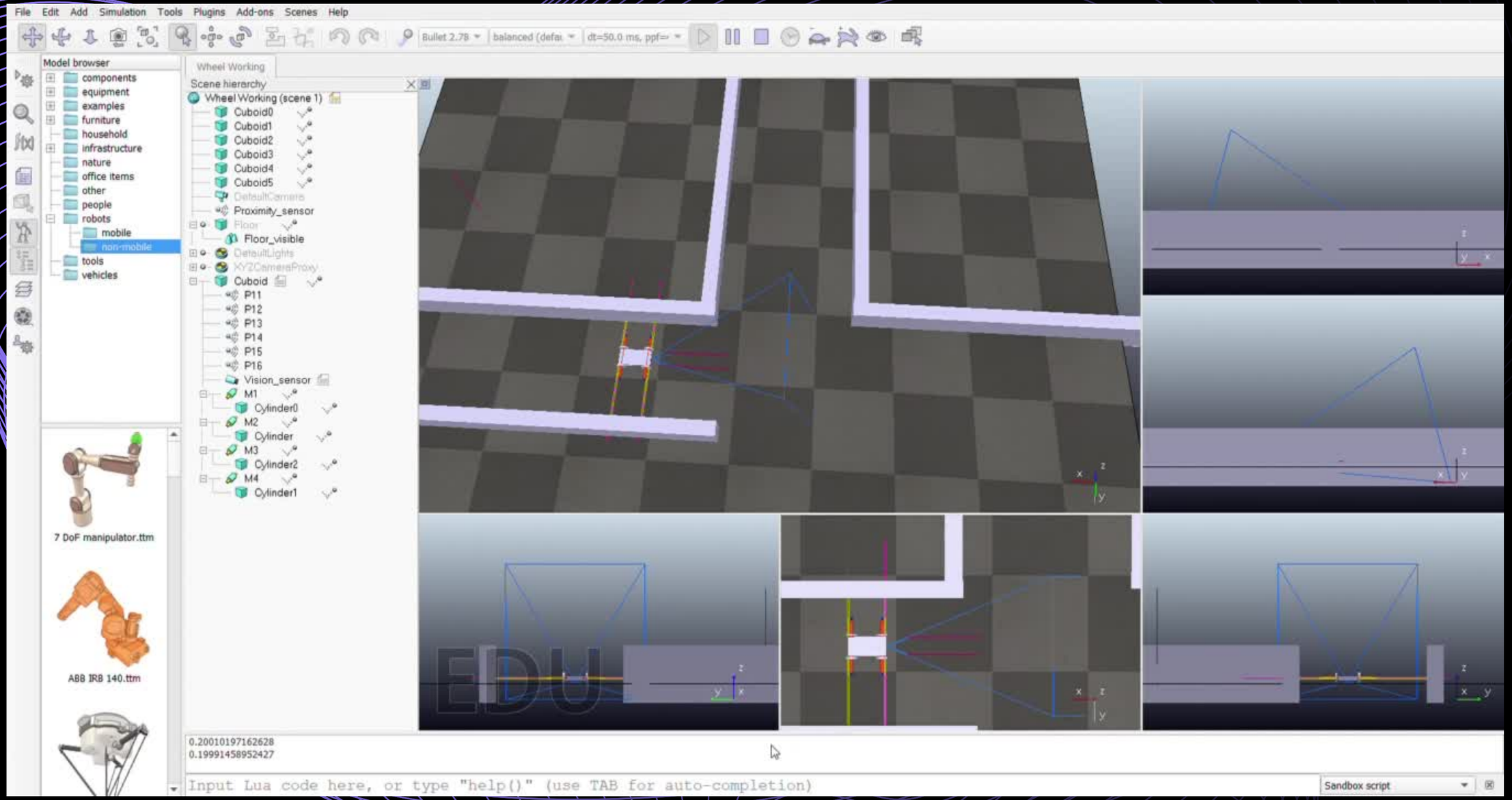
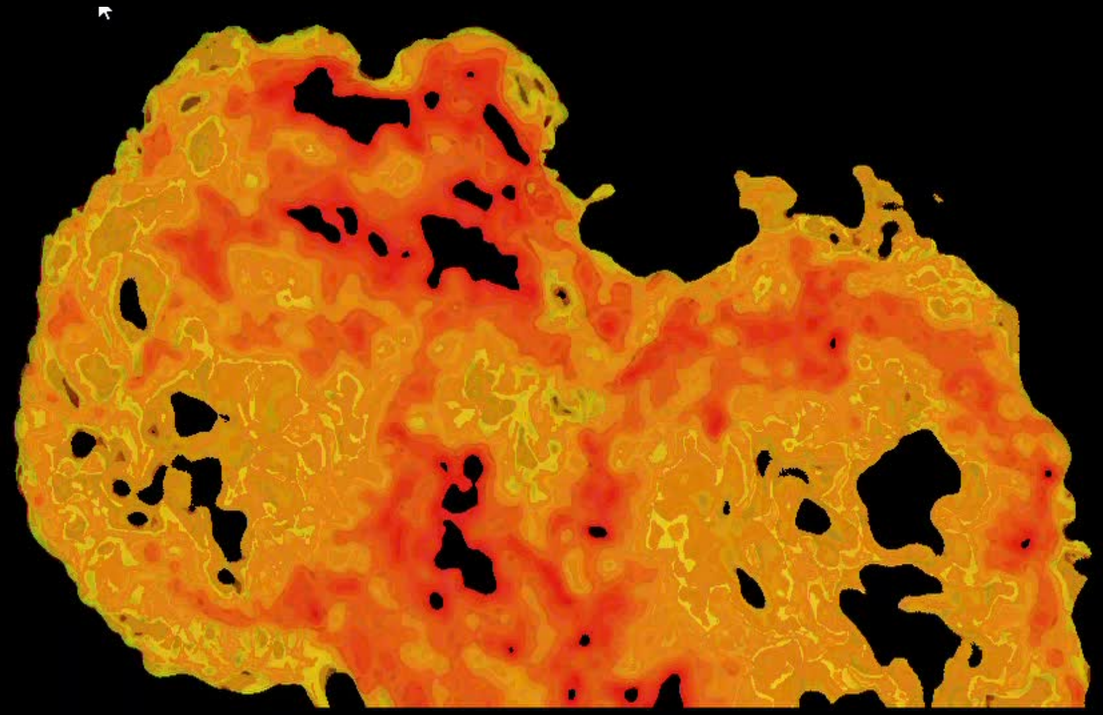


Image Processing And Fire Detection



FIRE DETECTION

For Fire Detection, we use Image Processing to find the approximate coordinates of the center of the fire.
This is done in OpenCV

HSV VALUES

In Coppeliasim, the HSV values of fire lie between [18,50,50] and [60,255,255]

GRAY SCALE IMAGE

This calculates the light intensity in order to detect Fire. The Gray Scale Image values lie in between [190 to 220]

COMPLETE PROCESS OF FIRE DETECTION

Getting Data from Coppeliasim

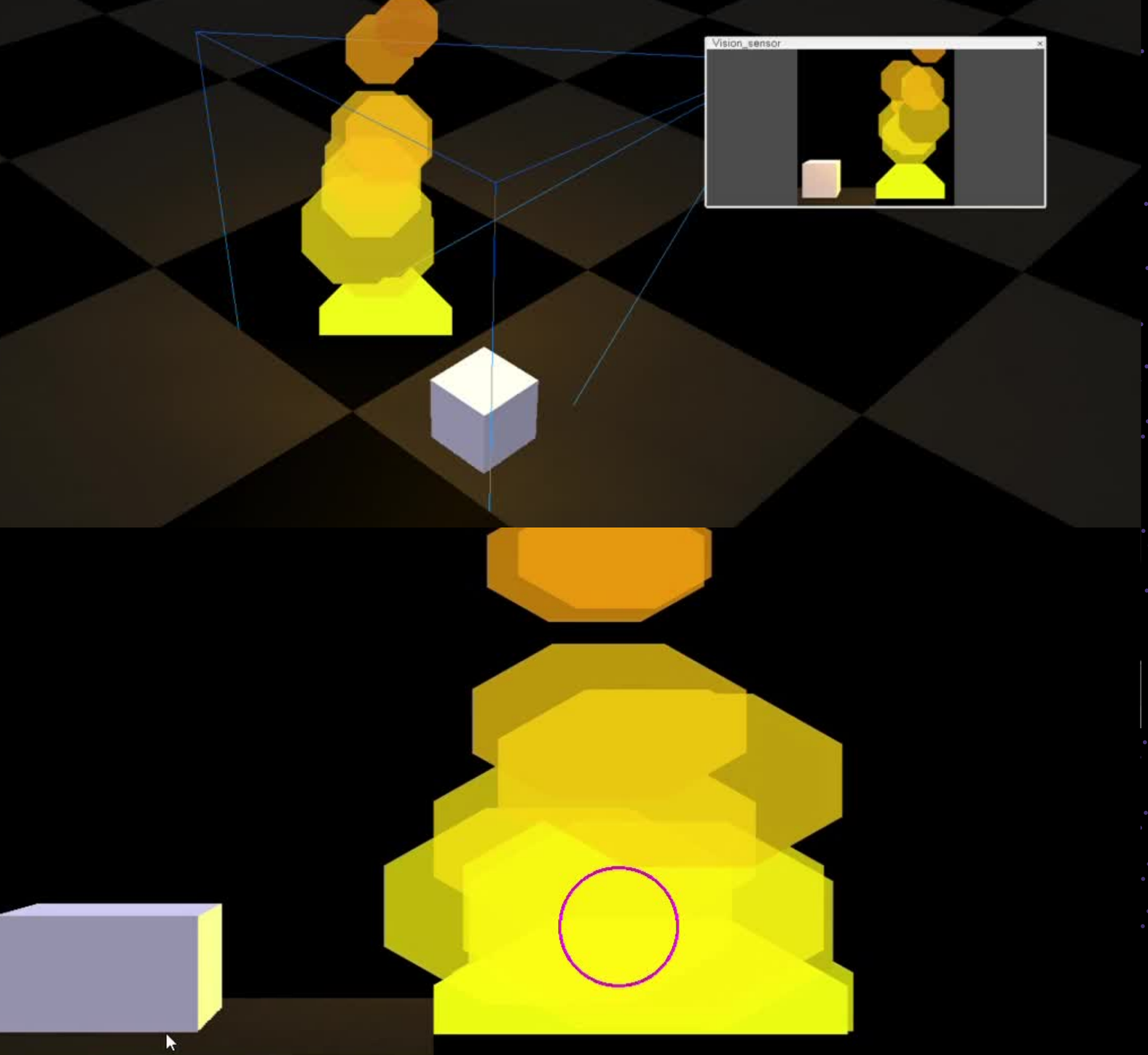
The input for OpenCV is taken from Vision Sensor in Coppeliasim.

Processing Information in openCV

The constantly updated Image input is taken in OpenCV and fire is identified on the basis of HSV values. Then the image is converted into GrayScale to identify the highest intensity spots. We identify a circle around the fire and the coordinates of the centre of this circle are stored in a text file.

Exporting Information to coppeliasim

In Coppeliasim, the coordinates of the centre of fire in the text file help bot to move to the exact location of fire.



Simulation

SHORT COMMINGS

- Takes time to detect fire
- Needs manual assistance while changing the fire extinguishers
- Usable for household fires only

IDEAS FOR FUTURE EXPANSION

- Install cameras in every room
- Link with smoke sensors in the area
- Use custom made cylinders to avoid manual assistance

MEMBERS

- Akanksha Vijayvergiya
- Eeshan Punde
- Ganesh Kalanidhi
- Mritunjay Kumar Choubey
- Poreddy Sahith Reddy
- Srushti Parbat

MENTORS

- Naman Agarwalla
- Parul Chaudhary
- Shubham Goyal