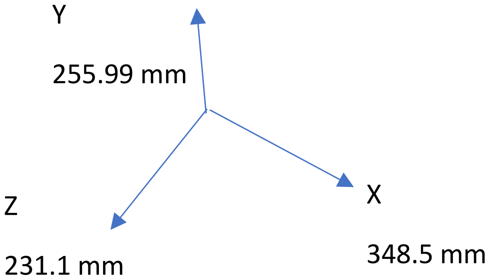
Operations

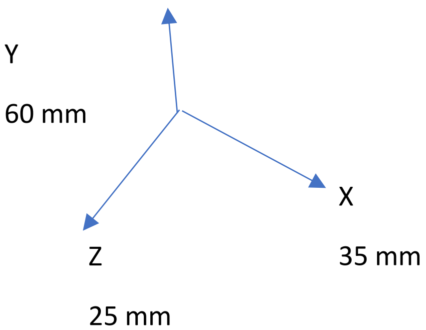
Problem Statement:
Goal: **Design an advanced fighting robot to win the competition**
Objectives: • **Minimizing the cost of manufacturing** • **Easy to use and install** • **Able to respond to the commands quickly** • **Friendly environment** • **Easily recyclable**
Constraints: • **Must have the ability to move with no less than 15 m/min** • **The battery must last for 1.5 hours per 1 charge** • **The size must be smaller than 5000 Cm^3** • **The robot must be controllable from more than 10 m** • **At least 60% of the parts should be manufactured using a 3D printer**

Dimensions

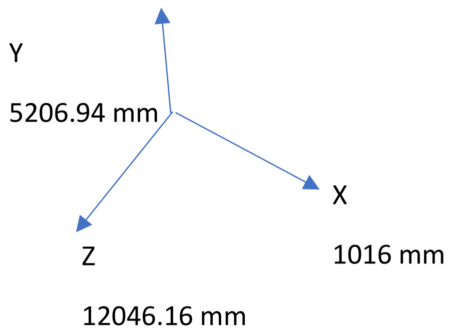
Arm



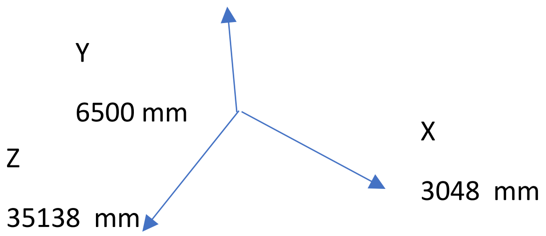
Balloon



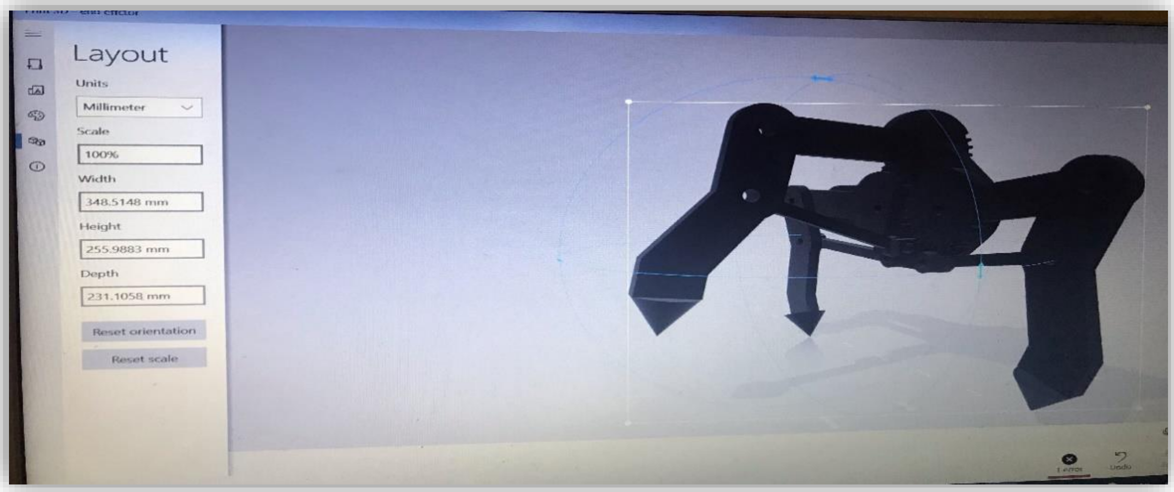
Body



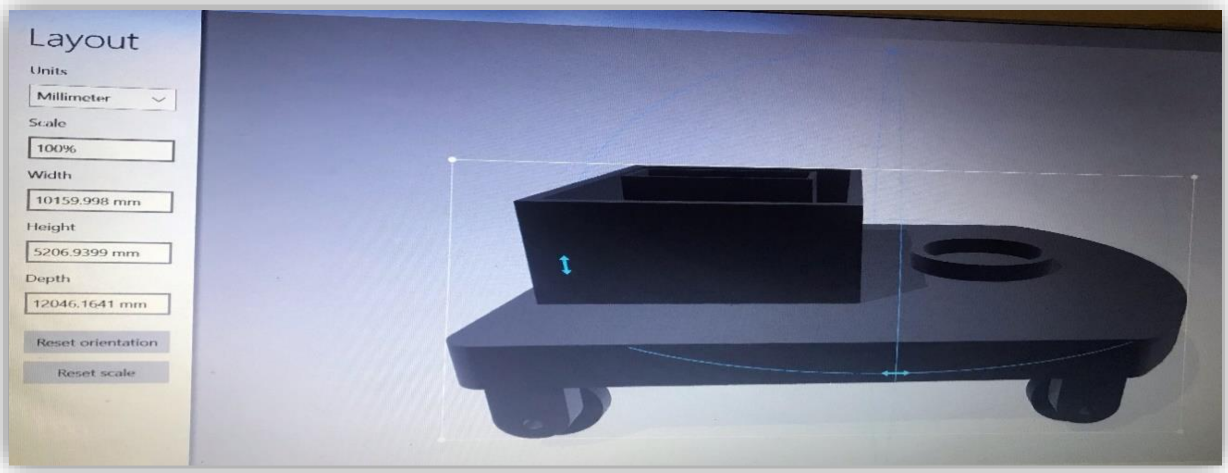
Fight arena



Arm:



Body:



Operating Rules

1- the fight should be inside the field

2- Players should stay away from the field of about 5 m

3- Start the fight after the whistle

4- technical issues with any of the robots meaning losing the match

5- match should end after 10 minutes from the start otherwise draw will be considered

Control Panel:

There will be 5 degrees of freedom with our robot distributed among 3 categories:

1- motor column

2- degrees column

3- value column

In addition to the save & On/Off buttons

Technical Operation Details

Parts
15V DC voltage source
L298n motor
Joystick

3 DV motors	
Controller	
Electrical circuits	
Microcontroller	

TESTING

1. Unit Testing

We have tested the parts of the report to know if they are working fine or not. Firstly, we have 5 Arms Motor, and they all operate better. Secondly, balloon. The distance between the arm and the balloon is ideal for popping the balloon with the arm. Finally, we have two parts in the body which are base and Wheels. Firstly, base. The base's proportions and area are satisfactory and adjusts to the size of the arm, the balloon's location, and the size of the wheels. Secondly, wheels. I tested each of the four wheels we have, and they all perform excellently.

2. Integration Testing

We have some results to discuss from testing the parts. Firstly, Arms Motor. We checked each motor individually in the first phase, and now we are attempting to test them all together, with a positive result because all motors are operational. Secondly, balloon. As described in the preceding section, the distance between the balloon and the hand is large enough for the hand to easily grasp and burst the balloon, and the balloon is properly attached so it does not blow away in the wind. Finally, the two parts of the body. Base, at this point, we have assembled and tested all the base motors, and they all function well, including them. For a long period, it must resist. Wheels, all four wheels operate admirably, bearing the weight of the hand and the ball well and allowing for extended distance travel.

3. System Testing

This test has two stages which are the arm and body. Firstly, the arm. System testing on arm motors has no defects and functions effectively; also, there are no slow movements; rather, it operates rapidly and consistently. Secondly, body. System testing on base motor have tested each of the four bikes, and they are all great. Finally, we tried the system on both arm and base drives and discovered no issues or faults throughout the process.

4. Usability Testing

We came to test the use of the robot and its movement with other robots, and after a while of launching the robot, we drew the movement so that the robot would rotate around the other robot, move its arms, and let the robot pass. we were not happy with that, but we took many others for this test and the robot passed all tests.

5. Compatibility Testing

We first thoroughly test each component of the robot, then gradually begin to assemble the components, and test them together, and ultimately, we fully test the robot “with its software and non-software functions” and everything together in this section. Well done, and no comments are necessary.

6. Performance Testing

It comes in four stages which are Load testing, Stress testing, Scalability testing and Stability testing. Firstly, Load testing. The arm only breaks if it can sustain a load of up to 500 volts and has worked hard with three arms. Secondly, Stress testing. The robot was put through its paces under extreme conditions, and while it performed admirably at first, it did so safely with time. The robot was moving slowly after the sixth test, and the arm had broken, unable to withstand more than 500 volts. Thirdly, Scalability testing. We developed another robot to evaluate the robot's scalability. Three robots, since when the first refused to hold my robot, we decided to create two more and keep ours as well. It came with a couple of robots and our robot, but our robot broke on the fourth robot and is no longer functional, so the robot can be expanded to incorporate three more robots. Finally, Stability testing. The robot has been tested in a variety of settings, including testing with four robots, testing with different circuits, and testing in extreme heat and cold. It can work in a variety of settings, but we discovered that the robot cannot resist excessive heat or cold, i.e., it can only work at a maximum temperature of 50 degrees Celsius and cannot sustain more than three robots. In addition to this, the robots can only endure up to 10 kms.

Tolerance

- Mechanics:

1. Fitting issues related to parts sizes.
2. Low torque or excessive weight of the robot parts
3. Missing parts
4. Parts not thought of or designed this is needed.
5. Missing Lubrication or tightness problem
6. Incorrect assembly
7. Design errors
8. High Depth of field resulting in parts clashing.

- Electronic:

1. Faulty circuits design
2. Faulty circuit wiring
3. Power requirement mismatching. i.e. low or excessive power per part.
4. Polarity issues resulting in wrong motors directions.
5. Utilizing an Incorrect motor.
6. Utilizing an Incorrect wires too thin or too thick
7. Excessive power to the Arduino board
8. Faulty code.

- Artificial Intelligence:

1. Detection errors
2. Files and directory issues
3. Missing libraries
4. Long or wrong files names

5. Mismatched versions

6. Duplicated files

7. Changes made to files directory.

8. Incorrect libraries names

- Internet of Things:

1. Internet connections problems

2. Difficult to use interface

3. Security issues related to data and connection

4. Website overload and crashes

5. Lack of query performance

6. Delayed responses

7. Data losses

8. Fail connection to DB or API.

- INDUSTRIAL:

1. Disorganization

2. Improper management3. Losing grip of tasks

4. Follow up deficiency.

5. Improper documentation

6. Lack communication with members.

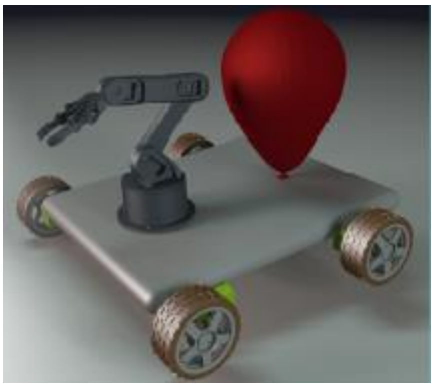
7. Incoherent/mismatched ideas

8. Haphazard Due dates

User Manual

1- To Run Robot

The assembly will be carried on different stages. The robot consists of different parts, first the arm, second the body and third the balloon. The arm parts will be assembled independently then the body and wheels. later the body and arm will be joined together to be like the figure below.



A little element like this will be used to control the robot. Plug it into our laptop. Now that you have figured out how to set up and run your system, it is time to put it all together and control over the robot.

2- To the Contest Participant

First and foremost, while you are here, you should be aware of that you must follow the instructions, please read them carefully. Your goal is to pop the balloon of the other robot.by using a control panel to control the sharp arm that you already have on your robot. There are three rounds in this competition, with the last round being the most difficult. Each round lasts 15 minutes and after each round there is 5-minute break time. The first person to reach the target gets the point and go to the next round.

Warranty

The warranty is one year due to our country's geographical location. The climate is exceedingly hot, and on this basis, the robot's internal parts cannot resist extreme heat and even extreme cold. This declaration has been proven based on the many robot tests we conducted.