

Industrial_Operational_File_Task2

1.Operation

1.1 Operation Explanation (Technical Perspective)

The concept of our Fighter Robot is to compete with another robot in the Arena. Each Robot will contain a robotic Arm attached to its base, that will try to destroy the balloon of the other robot (opponent) with a needle, knife or any weapon that the gripper is designed to hold, of course while protecting its own balloon to avoid being announced as a loser.

At the beginning the user should adjust the robot's arm to its starting position (initial position) at the arena, the user will then try to aim for the balloon of the other competitor and move the wheels accordingly.

Any arm movement will be stored in the Database that is connected through the php page. The command from the control panel interface will be sent to the database, and it will be saved and converted into an electrical signal in order to move the motors. The new position data will replace the previous position.

The AI will be done by using the ROS to control the motors by simulation after it is programmed into the Arduino UNO board.

1.2 Elements

Each round will contain:

1 Arena, 2 Robots, 2 Controllers, 2 Targets (Balloons), 2 Weapons (Knife, Needle, etc.)

1.3 Arm & Base Dimensions

A. Robot Arm Dimensions:

Arm height = 420 mm

Arm length = 100 mm

Arm width = 110 mm

B. Robot Base Dimensions:

Base height = 65 mm

Base length = 300 mm

Base width = 170 mm

1.4 Robot Dimensions

Height = 485 mm

Length = 300 mm

Width = 170 mm

1.5 Arena shape and size

The Arena will be square shaped with the following dimensions depending on the size of each robot, especially and most importantly to give enough space for each robot to be able to flank behind its opponent.

Arena Size: (Length = 1000 mm, Width = 1000 mm)

1.6 Competition rules

Rule Number One: The robots should go through a general check before the competition including checking on the balloons Air Pressure.

Rule Number Two: The robots will be positioned in the Arena facing each other with an equal distance from the edge of the Arena.

Rule Number Three: Before the start of the competition every person should be in the range of 2-meters distance from the Arena and only the competitors will be 1 meter closer for a better vision and signal.

Rule Number Four: No one touches the robots.

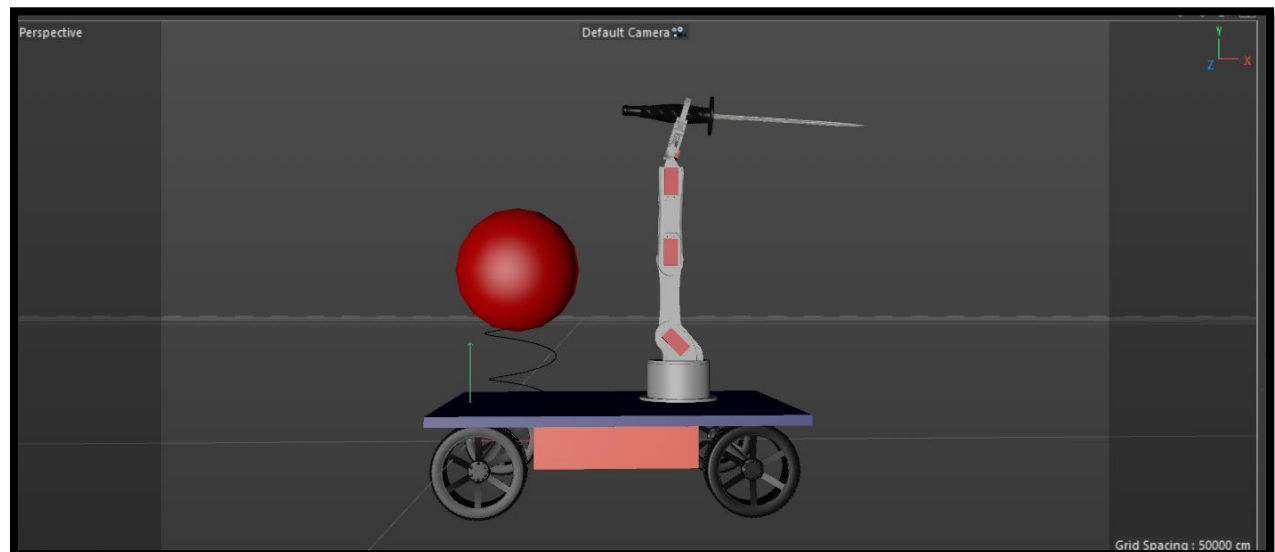
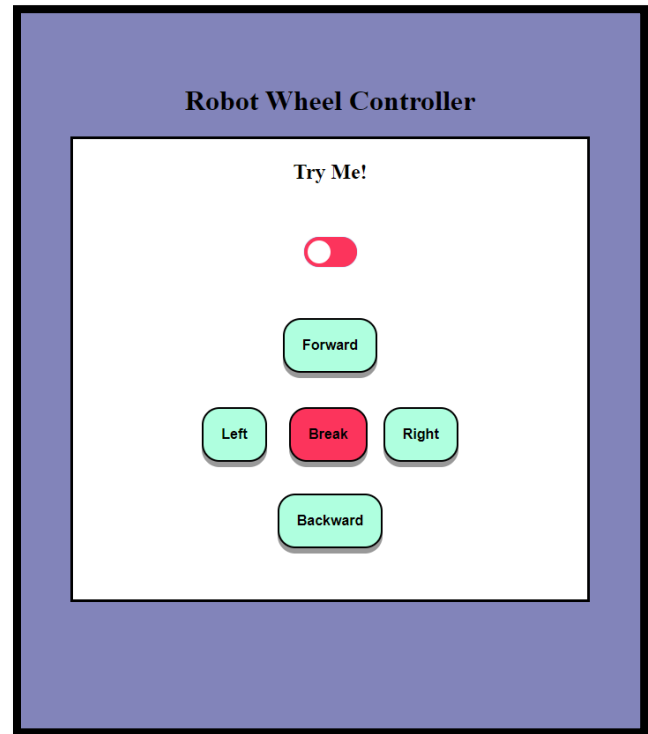
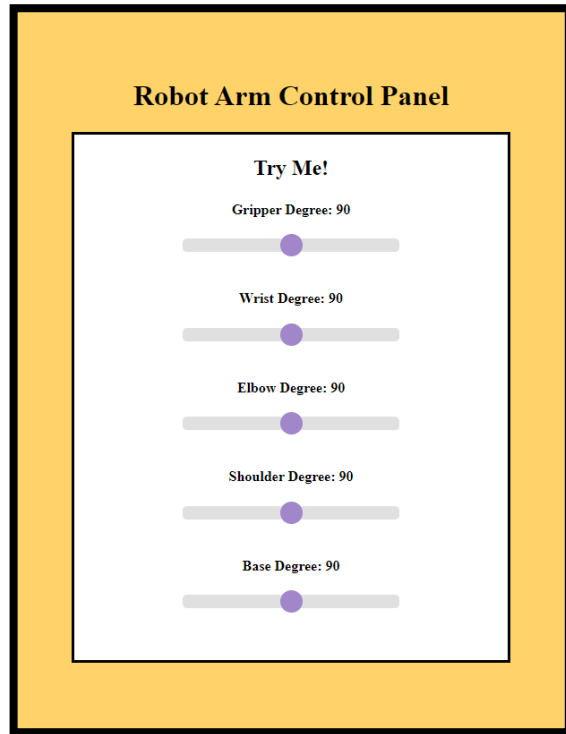
Rule Number Five: No one is allowed to throw any item at the robots.

Rule Number Six: The first robot to drop its weapon will be announced loser.

1.7 Controller Type

Arm controller: Sliders of 5 motors with 180 degrees and the default value of each is 90 degrees.

Base controller: 5 directional buttons and a combined ON/OFF switch.



2. Testing

2.1 Functional Testing

Unit Testing

In unit testing, each part of the robot will be tested individually to make sure each part is working as expected. First testing the arm component separately such as the gripper, elbow, shoulder, wrist and each of the 5 motors will be tested individually. Then testing the Base components such as each wheel, balloon holder and its stability and check the base stability.

Integration testing

This testing process will focus on testing two components or more and check their interaction, such as how the wheels are stable and how they are carrying the base and check whether the wheels are attached properly with the base. Next, test the base and the wheels tolerance to check its ability to carry the arm, putting in mind the wheels will go in different directions every time. After that, test the arm shoulder and elbow and check if the angle movement is achieved and stable when we move them in opposite directions.

And the same process goes for the wrist and its movement, angle degree, stabilization while the other parts are moving with it at the same time.

Lastly, check the gripper and its ability to achieve its purpose through aiming the whole arm towards the goal and make sure to test every component with the other one.

System testing

When talking about system testing, the best way to test the actual performance of a robot is to put it in a simulated environment of the competition. Such as having a balloon in the site and trying to destroy it, then transform it into a moving target and have obstacles around the robot and try to avoid it as fast as possible and focus on implementing as many of the robot parts as possible simultaneously.

2.2 Non-Functional Testing

Performance Testing (Stress Testing)

- A.** Test the gripper tolerance by putting it under pressure when testing how many stabs it could perform on a foam board before it breaks.
- B.** Test the wheels of the robot by putting it under the pressure of different speeds during long periods of time, also test the breaks and how many seconds it takes to stop the robot completely.
- C.** Check how many hours the robot can last on maximum performance of power and speed.

Usability Testing

Participants will try the robot functions, while we will evaluate the performance of the user controlling the robot and make sure the user interactions are implemented in a proper way.

Compatibility Testing

The Control panel should work on any browser platform, such as google chrome, safari, Firefox, etc.
Also, it should be compatible on any platform such as mobile, pc desktop etc.

3. Tolerance

Phase	Expected error
Mechanical	<ul style="list-style-type: none">• Motor misalignment.• Motor drive errors.• Motors overheat.• Motors are misplaced.• Motors are not connected to the wires properly.
Electrical	<ul style="list-style-type: none">• Circuit overload.• Wrong type of wires.• Damaged wires.• Errors in volts calculation.
IoT	<ul style="list-style-type: none">• Internet failure.• The Website is down.• Traffic on the server.• Local servers could lag.• Duplicated value in the database.• Failure of communicating with the server.
AI	<ul style="list-style-type: none">• Errors in ROS.• Lack of Packages.• Errors in packages.• Outdated packages.• Error in ROS and Arduino communication.• Coding errors.• Incompatible packages with the software version.

4. User manual:

4.1 User manual for user

The robot is allowed to be used for +16 users, else, the user must have adult's supervision while using the robot.

When setting up the robot, make sure to contain it on a flat surface.

When setting up the robot, make sure to watch out for sharp edges and electrical wires.

Make sure you do not spill any liquids near the robot to avoid electrical shocks.

Please, contact us if any problem was faced during setting up or running the robot.

4.2 User manual for competitor

Place the robot on the arena away from the edges and the weapon is facing the opponent's robot.

Make sure to attach the weapon properly so it does not fall in the middle of the fight.

Make sure to stand away from the robot for at least 1 meter.

Make sure to change the robot position to the initial position before starting the match.

5. Warranty - How long and why?

5.1 Hardware

The hardware warranty will be only **1 Month** to check if there is any industrial defects, since it is a Fighting robot where it often exists in a tough environment with a high chance of receiving many hits and damages from its surroundings or opponent, our job is to check the quality and make sure the robot is working and responding appropriately.

5.2 Software

The software warranty will be **1 Year**, and it will include the maintenance of the software side to avoid and fix any coding or system issues that could appear to the user, also will make sure to always provide the user with the latest system version and to keep it updated to avoid such errors.