Workshop 1
Competition Rulebook

E-JUST ROBOTICS CLUB

robotics.club@ejust.edu.eg
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Workshop 1 Competition

Table of contents

1) Rules

1.1) General Regulations

- All team members must be from those who applied for the form and included in the "Teams Table" sent to the Whatsapp group.
- Competitors must follow the judge's ruling and any offense may lead to points deduction or team disqualification.
- No member can adjust or touch the kit placed without supervision from the judges.
- No member can upload the code without supervision from the judges.
- During the competition round members can't cross the field.
- Only the team leader is allowed to open a discussion with the judge.
- Contestants must respect the opposing team.
- **Cheating is considered a bold trespassing for the competition rules and may lead to team disqualification.**

1.2) Evaluations

- The teams will compete in the whole four sub-competitions.
- Each sub-competition will have a maximum score of 25 points.
- The overall maximum score for the competition will be 100 points.
- The team with the most points at the end of the competition will be declared the winner.
- In the event of a tie, there will be a tiebreaker round, the details of which will be announced at that time.
- Points will be awarded based on performance in each competition. The exact criteria for scoring will be outlined before each competition.
- It is the responsibility of each team to ensure that they understand the scoring criteria for each competition.
- In the event of a dispute or disagreement regarding scores, the judges' decision will be final.
- The final evaluation will be conducted on the competition day and the groups of highest positions will receive awards.
- The competition organizers reserve the right to modify the scoring rules or criteria at any time, as necessary, to ensure fairness and a level playing field for all teams.

1.3) Awards

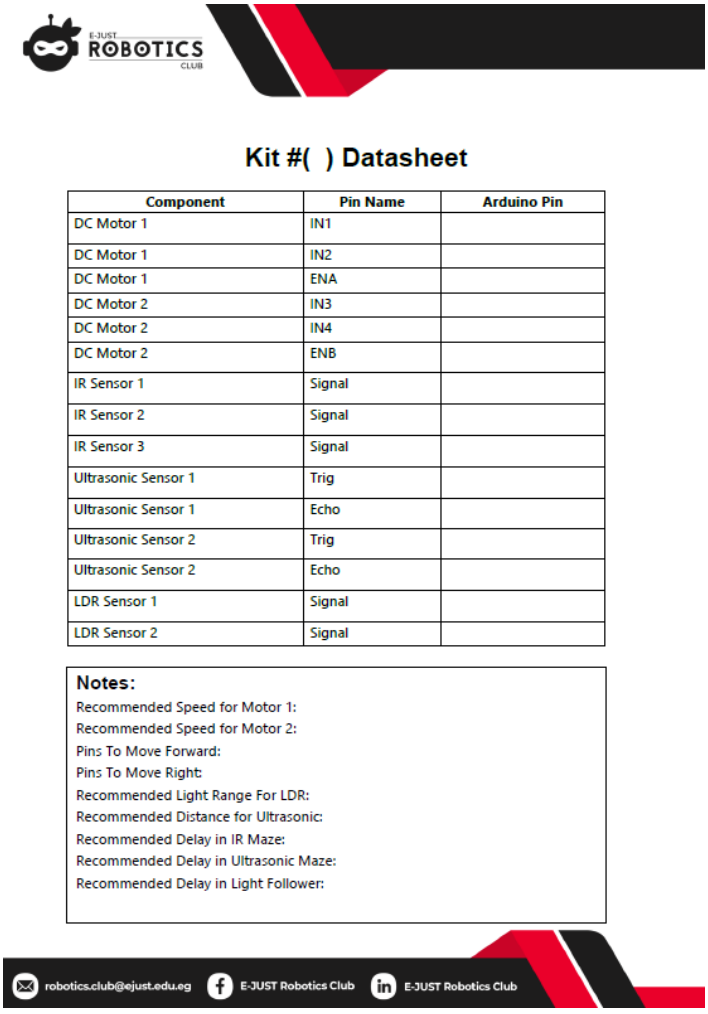
- First Three Positions will receive major awards that are still to be announced on the following days.
- A reach-competition will be conducted, and the winner will receive a special award.

2) Competitions:

Main Information: Each team will bring four distinct written codes, one for each competition, and will be assisted by mentors to upload them onto the field laptop and consequently uploaded to the kit's Arduino. Once the code is uploaded the kit will be placed on the field and start the round.

There is an exception for the "Paint-Fight Competition" where the team leader can upload a different code to a different algorithm between two different rounds.

Additionally, a data sheet will be provided beside each kit to aid the team in adjusting the code pin numbers as components are installed. A piece of the datasheet is shown below:



Kit #( ) Datasheet

Component	Pin Name	Arduino Pin
DC Motor 1	IN1	
DC Motor 1	IN2	
DC Motor 1	ENA	
DC Motor 2	IN3	
DC Motor 2	IN4	
DC Motor 2	ENB	
IR Sensor 1	Signal	
IR Sensor 2	Signal	
IR Sensor 3	Signal	
Ultrasonic Sensor 1	Trig	
Ultrasonic Sensor 1	Echo	
Ultrasonic Sensor 2	Trig	
Ultrasonic Sensor 2	Echo	
LDR Sensor 1	Signal	
LDR Sensor 2	Signal	

Notes:
Recommended Speed for Motor 1:
Recommended Speed for Motor 2:
Pins To Move Forward:
Pins To Move Right:
Recommended Light Range For LDR:
Recommended Distance for Ultrasonic:
Recommended Delay in IR Maze:
Recommended Delay in Ultrasonic Maze:
Recommended Delay in Light Follower:

2.1) Ultrasonic Maze

2.1.1) Description

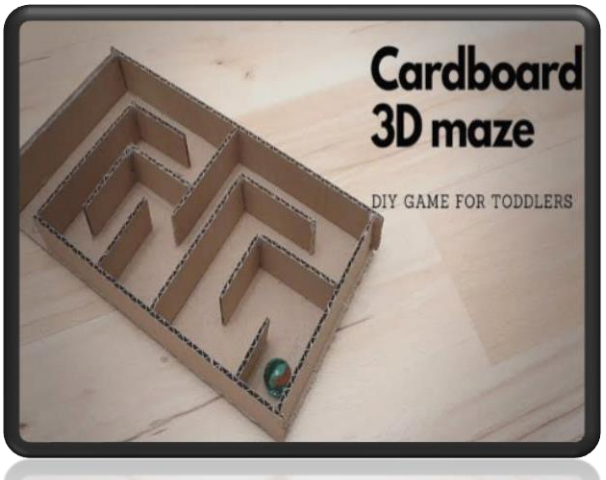
Idea: The robot navigates through a maze and finds its way to the end point.

Components used:

- **3 Ultrasonic Sensors**
- Robot car chassis
- Arduino Uno
- Motor Driver
- battery
- 3 Sensor Brackets
- Small Breadboard and jumper wires

The team must find the **best algorithm** to reach the endpoint in the least amount of time, **without touching the walls of the maze.**

The next photo shows the idea of the maze (the 3-D cardboard maze is just for illustration) and **the 2-D representation of the actual competition maze.** The walls of the maze are the obstacles that sensors detect. Once the robot detects the obstacles, it should move in the direction where there are no obstacles, the distance between the walls of the maze is **20** cm and the height of the walls is **15** cm.

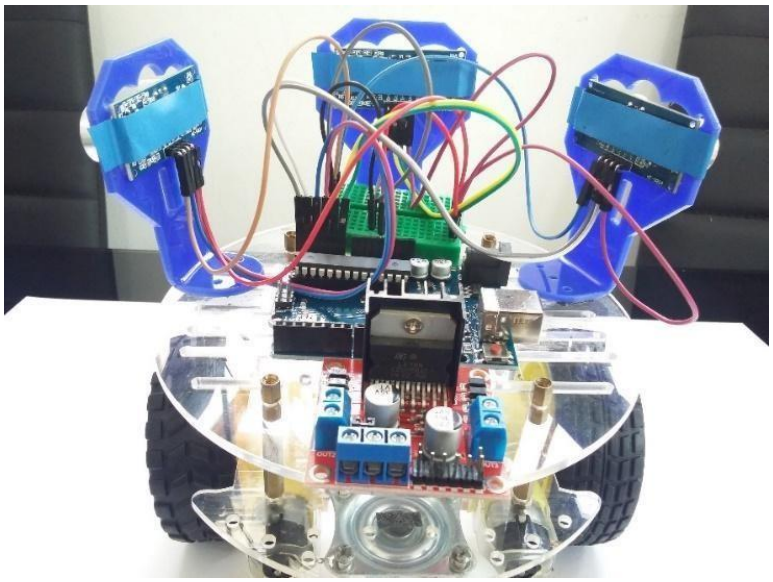


Hardware design of the robot.

The positioning of the sensors will be as follows:

- One Ultrasonic facing the forward position.
- One Ultrasonic facing the left position.
- One Ultrasonic facing the right position.

The next photo shows an example of a maze solving robot.



2.1.2) Scoring

- 4 Checkpoints will be presented in the maze (announced at the competition)
- Successful passing of a checkpoint gives you **5 points.**
- Robots can be returned to the previous checkpoint infinitely as long as he managed to reach it before at the cost of **1 point.**
- The best time to solve the maze will be granted **5 points.**
- Every team will be granted **5 points** for the time minus **0.5 points** for each 5% deviation from the best time.
- The time of calibrating the robot will not be calculated from the running time.

- The time will only be stopped when called by the participants and can only be started again by the judge.
- All points gained up until the game's finish will be awarded to the team.

  Bonus Points will be announced during the competition.

2.2) Line (IR) Maze

2.2.1) Description

Idea: The robot navigates through a line maze and find its way to the end point

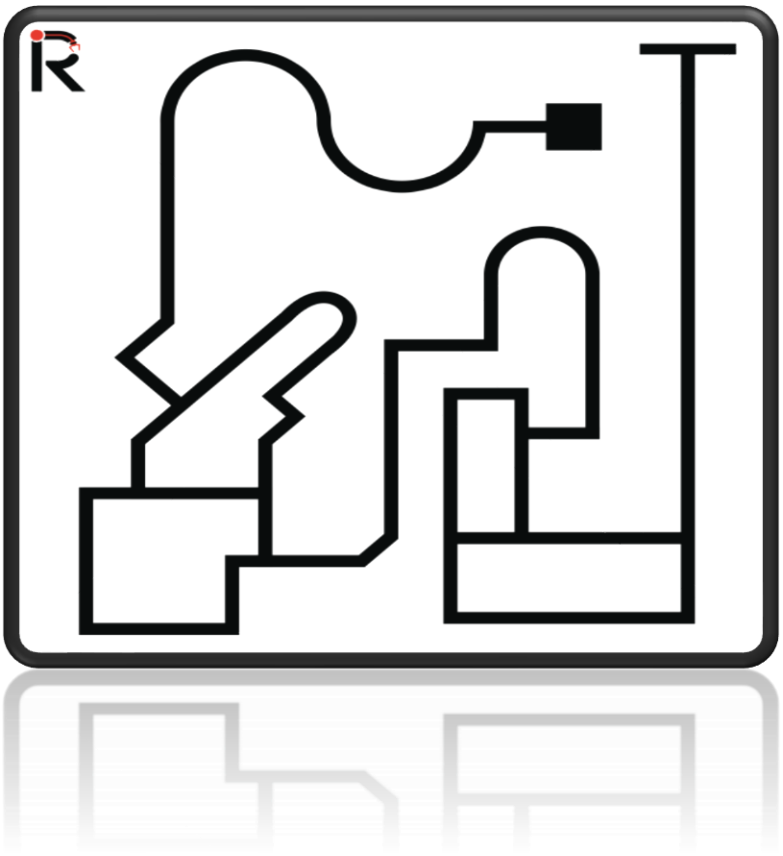
Components used:

- **3 Infrared sensors**
- Robot car chassis
- Arduino Uno
- Motor Driver
- battery
- Small Breadboard and jumper wires

The team must find the best algorithm to reach the endpoint in the shortest amount of time **without deviating from the black line**

The next photo **is the representation of the competition maze.** The robot must follow the black line and reach the endpoint, so once the

robot detects the black line, it should move, the width of the black line is **3 cm.**



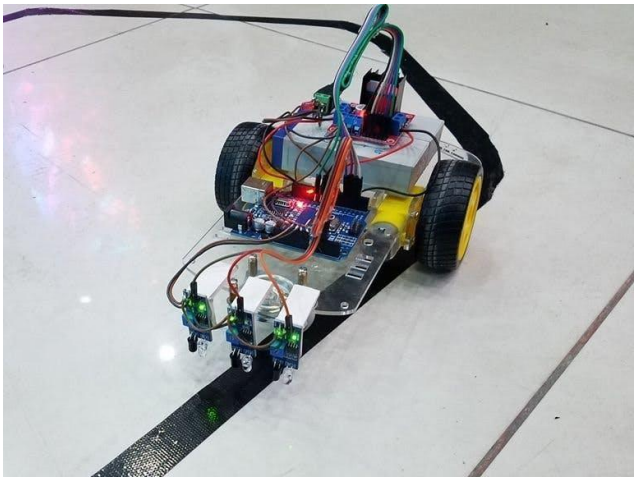
Hardware design of the robot.

The positioning of the sensors will be as follows:

- One IR in the center forward position
- One IR in the left position (also front of the robot).
- One IR in the right position (also front of the robot).

Note: The three IR sensors will be **5 cm** apart from each other.

The next photo shows an example of a line maze solving robot.



2.2.2) Scoring

- A robot is awarded points for successfully navigating each tile. Points are awarded per tile as follows:
  - **2 points** for passing a straight-line tile.
  - **3 points** for passing 90 degrees turn tile.
  - **3 points** for passing a curved turn tile.
  - **4 points** for passing an angled turn tile.
  - **3 points** for reaching a checkpoint.
  - **5 points** for reaching end tile (exit point).
  - **5 points** for passing a branch successfully (move from the start of branch to its ending point).
- Time Points:
  - **20 points** for the robot with the least time taken to solve the field.
  - **-2 points** for every 5% increase over the least scored time.

- The total score is **100 Points** and will be divided to be **25 points** and rounded to the nearest integer.
- Robots can be returned to checkpoints if lack of progress happened.
- The robot must reach the checkpoint to claim the checkpoint points.
- If a robot cannot pass a specific tile, the robot can skip to the next checkpoint without acquiring the points of that checkpoint.
- Checkpoint markers are going to be predetermined by the field designers.

2.3) LDR

2.3.1) Description

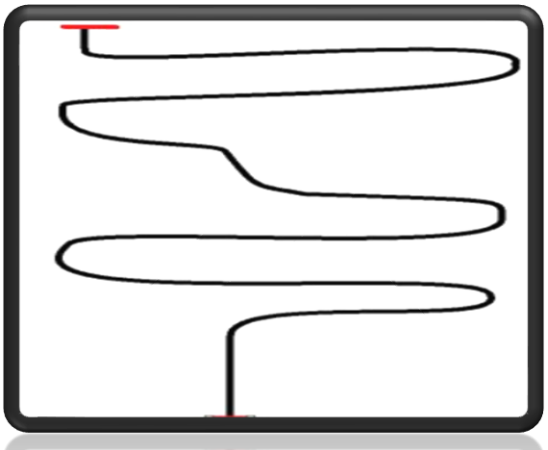
Idea: The robot will follow the direction of the LED rope light using 2 LDRs, one on the right and the other on the left. The LED rope light is located about **15 cm** from the floor, and the LDRs will sense the direction of the LED rope light, So LDRs will be directed upward.

Components used:

- **2 LDR Sensors**
- Robot car chassis
- Arduino Uno
- Motor Driver
- battery
- Small Breadboard and jumper wires

The team must find the best algorithm to reach the endpoint in the shortest amount of time while **keeping the light at the center of the robot.**

The next two photos show the LED rope light and a top view of its installation shape. The rope will take the shape of a wave, but in a horizontal direction and the robot will follow this direction.



2.3.2) Scoring

- A robot is awarded points for successfully navigating each part. Points are awarded per part.
  - **2 points** for passing a straight-line.
  - **5 points** for passing 90 degrees turn.
  - **3 points** for passing the first curved line.
  - **2 point** for reaching each checkpoint. (Total **6 points** available)
  - **4 points** for reaching the end of the course.
  - **-1 points** deviating from the course.

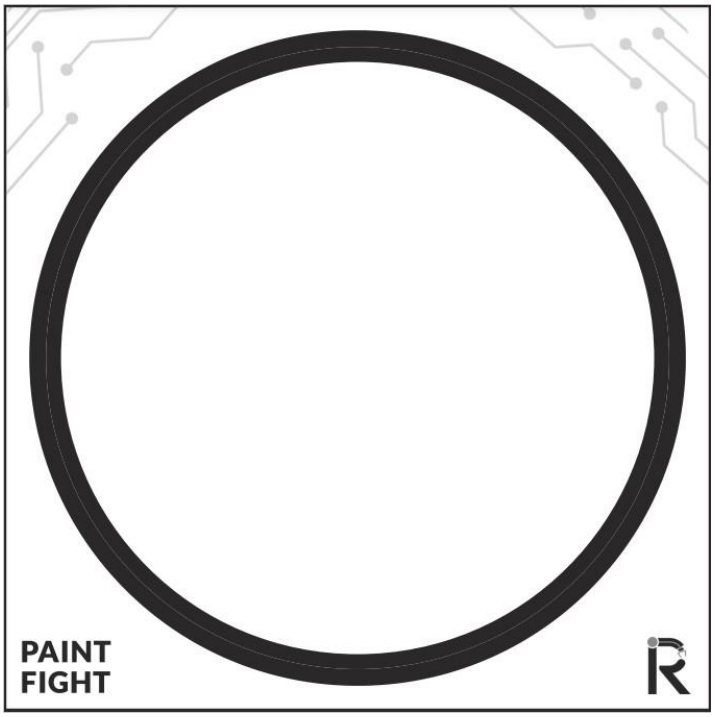
- The best time to finish the track will be granted **5 points.**
- Every team will be granted **5 points** for the time minus **0.5 points** for each 5% deviation from the best time.
- All points gained up until the game's finish will be awarded to the team.

- If a lack of progress occurs, the robot must be positioned on the previous checkpoint.

2.4) Paint Fight

2.4.1) Description

Idea: Two teams with two robots each will compete against each other at the same time. One team's robot will be red *(the color is only for the program not concerning the actual team color)* and the other team's robot will be blue. The robots will move freely within a circle with a diameter of 1.5 meters **(shown in the following image)**. Two IR sensors will be used to prevent the robots from leaving this specific area. OpenCV (an image processing program) will be used *(by the competition organizers)* to display the motion of the two robots on a screen. Each robot will leave a line on the screen with its respective color (red or blue) wherever it moves. If the other robot moves over this line, the color of the line will change to the color of the last robot that moved over it.



Components used:

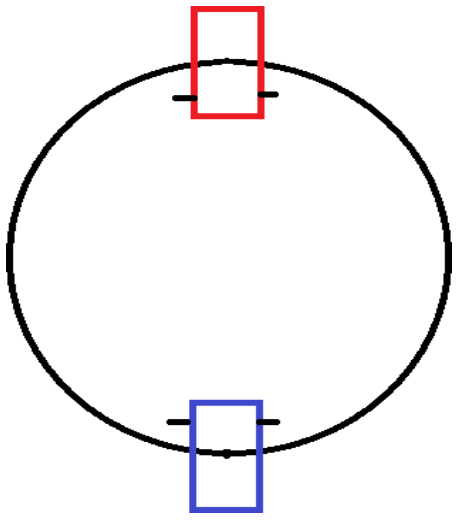
- **2 IR Sensors**
- **1 Ultrasonic Sensor** *(Positioned facing the front forward direction to avoid collapsing with the other robot)*
- Robot car chassis
- Arduino Uno
- Motor Driver
- battery
- Small Breadboard and jumper wires

The team must develop the best algorithm for the robots to move within the circle without crossing its boundaries. The competition will be repeated three times, and **the team with the most colored line on the screen at the end of each round will be declared the winner of that round.**

Note: *The teams may upload different codes of different algorithms between the rounds.*

Initial position of the two robots:

The two robots will be on the circumference of the circle, with a distance 1.5m between the two robots, the front side of the robot will be toward the center of the circle.



2.4.2) Scoring

- There will be two paint fight Rounds (new opponent in every round).
- Each round lasts for 30 min, and it contains two matches with the same opponent team.
- The Round is divided as follows:
    - 10 mins for preparation and code uploading.
    - 5 mins for match including errors and stop time (The real time in field is 1 min).
    - Changing kits between two teams
    - 10 mins for preparation and another code uploading.
    - 5 mins for match including errors and stop time (The real time in field is 1 min).

- Total time for competing in the game is **1 minute.**
- Points will be awarded for each team according to possession percentage as the following:
    - Possession > 40% = **15 Points**
    - Possession > 30% = **12 Points**
    - Possession > 20% = **9 Points**
    - Possession > 10% = **6 Points**
    - Possession < 10% = **3 Points**
- Each win will grant **5 Points** to the winning team.
- Draw will grant **3 Point** to each team.
- Lose will grant **1 point.**

- Your possession percentage will be calculated as the **average possession percentage** in the 2 matches.
- If a robot went out of the circle will be granted a **warning**, the second time will result if the deduction of **2 points**, the third time will result in the **exclusion** from the field.

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3) Competition Timeline

Time	Duration	Activity
4:30 – 5:30	1 Hour	Calibration (Every team selects a kit and try it out using their pre-made code.)
5:30 – 6:00	30 min	Round 1
6:00 – 6:30	30 min	Round 2
6:30 – 7:00	30 min	Round 3
7:00 – 7:30	30 min	Round 4
7:30 – 8:00	30 min	Round 5
8:00 – 8:30	30 min	Round 6
8:30 – 10:00	1 hour	Closing ceremony (awards and certificates)