Ministry of Communications and Information Technology

DIGITAL EGYPT BUILDERS

DEBI Robotics Challenge 2023

Rules and Guidelines

Sponsored by:

HUAWEI

In Cooperation with:

جامعة مصر للمعلوماتية
EGYPT UNIVERSITY OF INFORMATICS

Challenge Description

In continuation of the efforts of Digital Egypt Builders Imitative (DEBI)[1], launched by the Egyptian Ministry of Communications and Information Technology, the **DEBI's Robotics & IoT Track** launches the annual **DEBI Robotics Challenge**. Inspired by the GdR TurtleBot Challenge 2018 (TU Darmstadt)[2], DEBI Robotics Challenge is a physical competition to advance robotic software and autonomous capabilities.

DEBI Robotics Challenge 2023 is a competition between robots in a one-vs-one matches in a predefined playground. The playground shown in Figure 1 is divided into two identical halves separated by a red line mounted on the ground. Initially, the robots start the match at a predefined robot position. Furthermore, each half of the playground has three randomly placed balls with random colors, with only one color for each ball. The main mission for each team is to reduce the number of the balls in their area by moving these balls to the opponent's side. Additionally, robots must act autonomously during the match without any human intervention. At the end of each match, the referee will count the number of balls on each side to determine the winner team who has less balls at their side.

DEBI will provide each team with TurtleBot robot equipped with a manipulator to use during the challenge. However, each team has the freedom to bring their own robots to compete with. It is worth mentioning that in case any team decides to bring their own robot (or build it), they must obtain an approval from the competition committee on a case-by-case basis. Thus, such teams must inform the competition committee with all their robots' specifications. A key factor of the committee decision in the robot's size compared to the TurtleBot robot, e.g., a Nao robot will be the biggest robot to be approved. Accordingly, each team has the right to choose the suitable action to move balls from their side to their opponent side. In other words, each team may implement a pick-and-place task, kick the ball, pick-and-throw the ball or any other task within the frame of the competition rules based on their robot's ability.

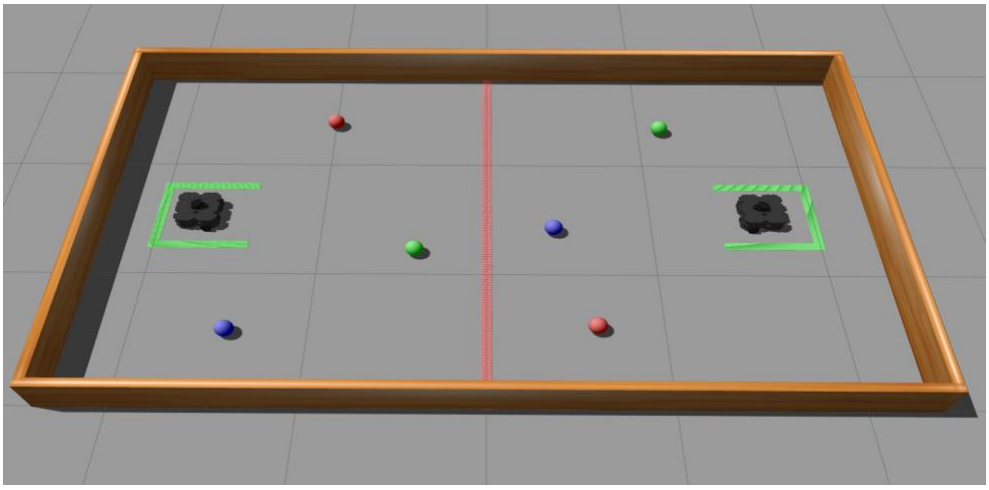

Figure 1: Competitions playground

[1] **DEBI Facebook Page:** https://www.facebook.com/DEBI.EGY
[2] **GdR TurtleBot Challenge 2018 (TU Darmstadt):** https://emanual.robotis.com/docs/en/platform/turtlebot3/challenges/#gdr-turtlebot-challenge-2018-tu-darmstadt

Rewards

The winning teams will receive a financial award, as follows:

- First place: 80,000 EGP,
- Second place: 60,000 EGP,
- Third place: 40,000 EGP.

DEBI preserves the right to withhold the award in case of there are no winning teams, or in case of ethical, fraud or scientific misconduct.

Important Dates & Competition Location

The competition will take place on May 13, 2023, on DEBI's campus at Gezira Youth Center at 12th El Gabalaya Street, Zamalek, Cairo (Location). The competition tentative timeline is as follows:

- Orientation Session: Saturday 1st of April 2023 (online)
- Registration Deadline: Sunday 2nd of April 2023, at 11:59 pm (online)
- TurtleBot Workshop: Monday 3rd of April 2023 (online at 2:00 PM)
- Competition Day: Saturday 13th of May 2023 (in-person at DEBI Campus)

Robotics Challenge Rules

1. All team members must be physically present on the competition day.
2. The competition is based on knockout matches till the final match. However, DEBI preserves the right to change the competition style based on the number of the participating teams without any prenotice, given that any modifications to the competition style will be announced before the competition day.
3. The robot must be fully autonomous, and it cannot step onto or pass the red line or the playground walls.
4. If a robot crosses the boundaries of its side of the playground (red line and walls) the robot has to start over from the initial position, i.e., the referee will ask its team to move it to the initial position. Furthermore, if such violation led to moving a ball to the opponent side such ball will not be counted and the referee will move it back to the violated robot's side placing at any random position at its corresponding side.
5. The moved ball to the opponent's side will be counted only if the robot does not touch the red line.
6. The match duration is 10 minutes and if no team could win, i.e., each team has three balls at its side, the match will resume for another 3 minutes. If the match ends in a draw after the first 13 minutes, a golden-ball scheme will be followed, i.e., the first team that moves a ball on the other side will win.
7. If the match ends in a draw after 10 minutes, and none of the robots could move any of the balls to the other side at all, the two teams will be eliminated from the competition.
8. The only way to reduce the number of the balls is to move them to the opponent's side and if a team moved a ball outside the playground the referee will move it back to that team's side in a new random position.
9. If a robot gets stuck to either a software or mechanical error, its team can manually move it to the initial position to start over, however, any picked balls by that robot's grippers must be placed in random.
10. Group members must follow the referees' instructions during the match time without any sort of objection.

11. If any team decides to bring their own robot (or build it), they must obtain an approval from the competition committee on a case-by-case basis. Such teams must inform the competition committee with any updates regarding their robots' specifications at least one week before the competition day, i.e., **before the start of 7th of May 2023**. A key factor of the committee decision in the robot's size compared to the TurtleBot robot, e.g., a Nao robot will be the biggest robot to be approved.
12. In case the competition committee suspects any scientific misconduct or fraud, the competition committee has the right to inspect the specifications of the robots including, but not limited to, software codes, software programs, and hardware components.

Eligibility Criteria and Teams Formation:

- All participants must hold the Egyptian nationality.
- All participants must be a registered undergraduate student at any of the Egyptian Universities (from a relevant background).
- Graduates from no more than 5 years are allowed to participate, i.e., at most graduated in 2018.
- Each team is expected to consist of 3-5 members. Teams with more than five members will not be allowed to participate in the competition.
- Each team must select a member to be the representative of the team (Team Leader).
- Team leaders must register their own teams online via the following link: https://docs.google.com/forms/d/e/1FAIpQLSeo3kIEH8JFRYel3X1pjjYk661Ijf73Y1p3jzBIht2GlDLPaw/viewform?usp=sf_link
- The team members of each team must be explicitly stated. No outsourcing or existence of hidden members is allowed. Furthermore, if discovered this team will be immediately eliminated from the competition.

Technical Specifications

- DEBI provides TurtleBot 3 Waffle Pi equipped with OpenMANIPULATOR-X [3] with installed configuration of Ubuntu 20.04 and ROS1 Noetic Ninjemys.
- Playground dimensions: 420 cm x 300 cm, walls height is 31 cm (see Figure 1).
- Balls: diameter = 5.5 cm, Color = random.

Contacts

Please send your inquiries to robotics@debi.gov.eg

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[3] **TurtleBot Specifications:** https://emanual.robotis.com/docs/en/platform/turtlebot3/features/#specifications
OpenMANIPULATOR-X Specifications: https://emanual.robotis.com/docs/en/platform/openmanipulator_x/specification/#specification