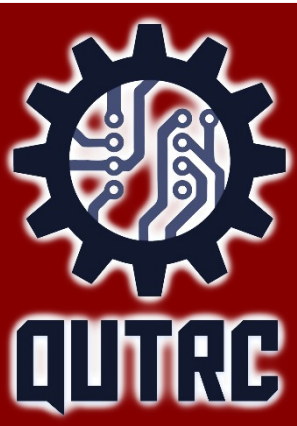
QUT Droid Racing Challenge 2024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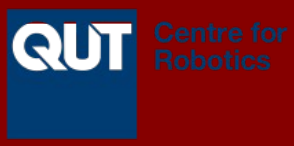
QUT
Centre for
Robotics


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Contacts

General Inquires

For general inquires regarding the droid racing challenge, please contact the DRC team through the QUT Robotics club discord.

Discord

https://discord.gg/cQa8VzVgT4

Gmail

qutroboticsclub@gmail.com

Facebook

https://www.facebook.com/QUTRoboticsClub/

Instagram

https://www.instagram.com/qut.roboticsclub/?hl=en

For more information and official contact, please check out our website;
https://qutrobotics.com/

1. Team Eligibility

1.1 Eligible competitors;

1.1.1 Higher degree students (i.e. Masters and PhD students, and Researchers and Education facility staff)

1.1.2 Undergraduate University Students

1.1.3 Highschool Students, provided they have an accompanying teacher

1.1.3.1 This challenge is designed for undergraduate students; changes Will not be made to accommodate high school students.

1.1.3.2 Highschool teams must have a dedicated staff member present for the entirety of the event and exercise control over the students.

1.1.3.3 If the high school team consists of students from multiple schools, a teacher from each school must be present.

1.2 Teams may have a maximum of six official members. We recommend at least four, (Two programmers, one electrical and one mechanical)

1.3 Each university or representing group has a maximum of **three** team allowed to compete.

1.4 Teams must be able to show their progress through a video diary/showcase/ logbook before the competition to ensure they are ready to compete.

1.5.1 The DRC committee will use this to validate the entry

1.5.2 Email to qutroboticsclub@gmail.com by 07/07/2023

1.5 Teams must have at least one staff contact if currently enrolled at an education facility.

1.6 Mentors are allowed but must not have significant input in the team. Please refer to the RoboCup Jr. and FIRST competition rules for more info on this.

2. Robot Specifications

2.1 The total budget for the finished robot must not exceed $1500 AUD. This is to ensure an even playing field. All components will be at the expense of the team.

2.2 The droid must be able to wirelessly start, stop and finish the race. Do this through using a handheld device that can control those functionalities of your robot. This device must not be used for any other parts of the race.

2.3 Any software may be used.

2.4 Any processing method, including off-board may be used.

2.4.1 External devices used will not be included in the budget, provided they were not bought specifically for DRC.)

2.5 Only on-board sensors may be used. Main guidance must be computer vision based (i.e. No GPS, RC, LiDAR)

2.5.1 On-board sensors may be used to detect obstacles

2.5.2 The droid must use computer vision to sense the boundaries, obstacles, and other droids.

2.6 The droid must be battery powered, i.e. no gas or fuel liquid powered propulsion

2.7 Each robot must have a solid red outer shell that covers at least 80% of the robot

2.8 Droids must not be designed to intentionally or unintentionally interfere with other droids.

2.9 Must be a wheeled robot that remains on the ground the entire time.

2.10 LEDs or screens on the robot may be used as long as no previous rules Are broken

2.11 It is recommended to avoid having open wheel design. Two robots failing this may get their wheels tangles up. Though judges should still be able to see When a wheel has contacted a track marker

2.12 Maximum Dimensions are as follows;

- Width: 400mm
- Height: 350mm
- Length: 800mm

2.13 Each robot will be judged on the day to ensure it meet specifications. If it does not it will NOT be allowed to compete. Scrutineering will occur at the beginning of each race to ensure this.

3. Track and Environment Specifications

3.1 The competition will be held at **QUT Gardens Point Campus**

3.2 The track will be indoors on a hard flat surface

3.3 The track will be in a large lab space meaning there may be equipment around that we cannot move (including objects the same colour as the track lines).

3.4 Yellow and blue coloured tape will indicate the boundaries (See Appendix A)

3.5 Time penalties will apply if the robot crosses the boundaries

3.6 The start and finish line will be indicated by a solid green line

3.7 The width of the track will range between one and two metres

3.8 There will be obstacles on the track that the droid will need to avoid. They will vary in size (Maximum 400x400x500mm), with up to two obstacles at any part of the track. (See Appendix B)

3.9 The obstacle configuration will increase in difficulty with each round.

3.10 Judges will be walking the edges, on and over the track during races to ensure proper scoring is conducted. Please ensure your droids can cope with this.

3.11 Spectators are allowed within 250mm of the track edge on one side. Be wary of them wearing clothing or shoes similar in colour to items needing to be detected on the track.

3.12 Access to power and a table to setup will be provided

3.13 Access to a workshop will be provided. It will have power supplies, soldering equipment, hot glue guns, basic hand tools, etc. The possibility of laser cutting and 3D printing is also available.

3.14 Teams should bring whatever non-workshop equipment they may need (Laptops, spare parts, etc.). We may be able to supply some items at request, but cannot guarantee it.

3.15 Teams are encouraged to print spares of mechanical and electrical parts for the worst case scenario.

4. Turning Challenge

4.1 A left or right hand turn road marking “similar to actual road markings” will be added to the track, this will indicate a left or right hand turn to be performed by the droid (These will be placed on the ground of the track)

4.2 Only one sign/section shall be present on the track at any time.

4.3 The sign will be approximately 28x20cm and will be black

4.4 The sign may be present up to a 3-4mm raised section on the track and its surface may also increase or decrease a droid’s grip on the track. Droids will need to account for this.

4.5 The sign will indicate which side of the fork the car shall take when it approaches the sign.

4.6 -5 seconds will be taken from a car that takes the correct route.

4.7 A car that fails to make a decision (at the judge’s discretion) will be places onto The correct path if needed and +10 second time penalty will be given to that car.

4.8 The direction of the arrow will be randomised with each race.

4.9 Both routes will be the same length and design

4.10 See appendix C for more arrow specifications

5. Performance

5.1 Judges will scrutineer the droids before each race to ensure they comply with The rules

5.2 When the heat is due to start, a judge will give a countdown for the heat to start. After which, both teams may hit the start button on their external device for their Droid to start moving.

5.3 Droids will start nose on the start/finish line. The car must stop once it's nose reaches the start/finish line after a lap before being repositioned for another lap time to be recorded.

5.4 Teams will have a certain amount of time of the day to do as many laps during the rounds (time to be specified on the day based on the amount of competing teams.)

5.5 The best time from the laps completed during each round will be used to rank the teams, i.e. if there are four rounds, each team will have their best time taken from each round to figure out their final best time for team rankings and finals.

5.6 If a judge determines that a droid has entered an unrecoverable state (such as completely lost the track), the car is reset with time still running unless the team opts to have a percentage of track completed with time to be recorded.

6. Prizes

6.1 A prize will be awarded to the overall winner of the competition based on track performance, robot design score and MathWorks Adoption Prize entry (if teams chose to compete for this) ($350 AUD)

6.2 Placing prizes will be awarded as follows

6.2.1 First Place - $300 AUD

6.2.2 Second Place - $200 AUD

6.2.3 Third Place - $100 AUD

6.3 A prize will be awarded to the best designed droid, which will be judges by an expert panel ($100 AUD)

6.3 MathWorks will be awarding a prize to the best performed droids that implement MATLAB and/or Simulink

Appendixes

Appendix A ; Tape

Official Blue Tape : https://www.bunnings.com.au/scotchblue-36mm-x-55m-original-multi-surface-painter-s-masking-tape_p1214159

Official Yellow Tape : https://www.bunnings.com.au/scotch-36mm-x-41m-exterior-surface-weatherproof-painter-s-masking-poly-tape_p1662363

Appendix B; Obstacles

Official Colour of Obstacles : Magic Magenta by Taubman's

https://encycolorpedia.com/864e79

Example Obstacle :

https://drive.google.com/drive/folders/1h_r-iIn--jWyq43rSTpdbEBnNRCACWT-?usp=share_link

Appendix C; Arrow

Official Information for the turning arrow:

https://drive.google.com/drive/folders/1CeoVitw1RynVSLZrAoV2ZQFHG5e3hgcK?usp=share_link