

Rulebook of “Grand Concours” Robopoly 2023-2024

Robospace invaders

Your rover has landed on an unknown planet... After having scoured the complex terrain to acquire samples, it encounters a horde of aliens. To bring them back to base, you're gonna have to knock 'em all out!

Yes, that's right! The “Grand Concours” is finally back for the new 2023-2024 edition! For this occasion, Robopoly invites you to develop a robot on the theme of space exploration: overcome obstacles, deliver samples, advance in complex terrain and most importantly, eliminate aliens... Your robot will have to prove itself to have a chance to win the many prizes at stake.

As such, it is with great pleasure that Robopoly presents the rules of the “Grand Concours”!





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1 Generalities

1.1 Registration

You can register for the “Grand Concours” in teams of one to four people. A provisional registration is made via the following link (also available on our website and social media):

https://docs.google.com/spreadsheets/d/1lAd5LZxJkqPH6KzIXOGmXRTfPIbb4mEQT3_QR3REmb0/edit?usp=sharing.

This allows you to create your teams and to give us an idea of the number of participants. A final registration will open shortly before the final date of the competition to confirm your participation.

1.2 Categories

Robopoly’s competition is open to all (members and non-members), regardless of age and knowledge of robotics. As such, all types of robots are authorized (Base of Prisme Kit, Arduino, Raspberry Pi, Mindstorms...). All will be able to compete against each other with their robot, but points for originality and complexity will be awarded.

1.3 Schedule

The competition will take place in week 10 of this semester. The exact date as well as other important dates and times will be communicated to you by email and on our social media as soon as possible.

1.4 Q&A Sessions

The Monday evening hours sessions will henceforth be more focused on preparation of the “Grand Concours”, to answer questions and supervise the development of your robots if necessary. Other Q&A sessions may be organized if necessary. In any case, all dates of the various events will be published on our website, sent by email and posted on our social media.

Don’t hesitate to ask your questions even if they seem stupid to you! It is better to avoid learning on the day of the competition that what you have done is forbidden! You can always contact us via email or social media (linktr.ee/robopoly).

1.5 Interpretation

Everything that is not prohibited is allowed. The committee reserves the right to change the rules without notice.

2 Process of the Competition

2.1 Course

The field is divided into 4 main zones: Classic Line Following, the Ramp (ascent and descent), Shooting Area, and Irregular Terrain. Your robot must complete these 4 zones by picking up the load (samples) at the beginning of the course (after the first step of Line Following) and depositing it at the end (Base). Each stage represents a task to be accomplished (picking up the load, overcoming the slope; your robot is supposed to perform each of them in the order set by the course to validate the points corresponding to these tests. However, if it fails to complete a stage or perform a task, it is still allowed to move on to the next checkpoint to continue the course. Naturally, the points for the failed task will not be awarded.

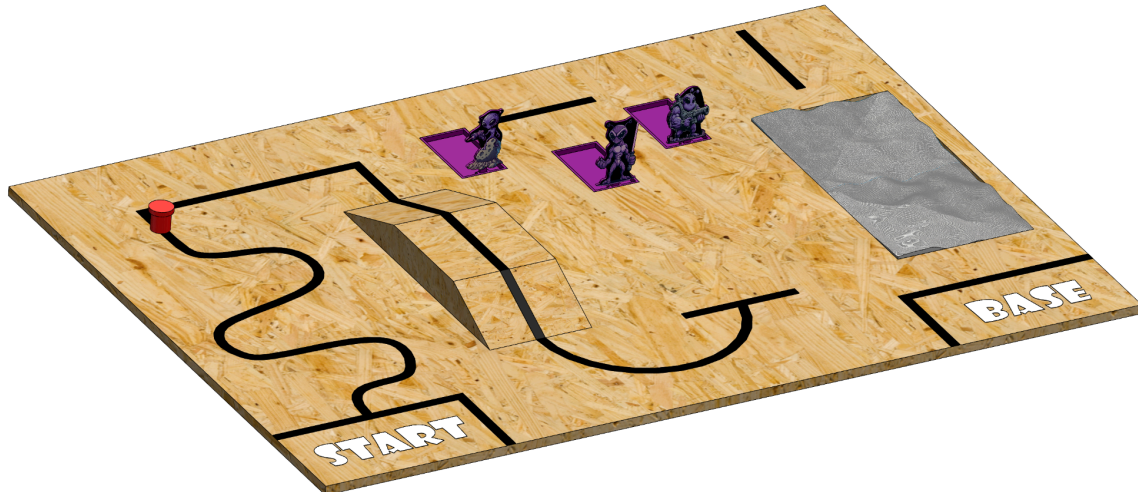
2.2 Missions

2.2.1 Generalities

The missions must be accomplished in order for the given course. Once a mission is successfully completed, the points are secured even if the course is attempted again without success. It is indeed possible to restart a course, but only from the previous checkpoint or the start. The referees will ensure the course is reset. Each additional attempt is penalised by 1 point. Finally, the points for each mission can only be obtained once.

2.2.2 Overview of the Field

The game table measures 1800mm x 1300mm. A “START” zone and a “BASE” zone, both 400mm x 200mm, mark the beginning and end of the course, respectively. The black lines that your robot must follow are 20mm wide.



!!WARNING!!

The above image is only to give you an overall view of the terrain as a whole. The exact layout of the black lines, the position of the load (although actually positioned on the line), the exact position of the aliens, and the precise topology of the irregular terrain will not be the same on the day of the contest. The goal is still to ensure that your robot adapts to its environment instead of simply being programmed to follow a specific path.

You will find useful details on certain parts of the course in the “Specifications” section.



2.2.3 Scoring System

The maximum score is 20 points. There are 16 points available based on performance, 2 points for originality and complexity, and 2 points for aesthetics. In the event of a tie, robots will be ranked based on the time taken to complete the course.

1. Line Following (2 pts)

Objective : The robot must follow the black line to the first checkpoint.

Score : +2 points once the robot reaches the checkpoint without cutting the line.

2. Collecting the Sample (3 pts)

Objective : The robot must pick up a sample which will be placed on its path, and bring it to the end of the course.

Score : +1 point for picking up the sample. +1 point for transporting it to the end of the course, +1 point for depositing it at the designated destination.

3. Ramp (2 pts)

Objectif : The robot must ascend and descend the slope.

Score : +1 point once the robot reaches the top of the ramp. +1 point once the robot successfully descends.

4. Alien Encounter (6 pts)

Objectif : The robot must stop in the shooting zone, knock down the aliens, and continue on its way.

Score : +2 points if the robot stops in the zone and shoots. +1 point for each alien eliminated, +1 point for successfully moving on afterwards.

5. Lunar Soil (3 pts)

Objectif : The robot must successfully navigate a bumpy and uneven path.

Score : +3 points if the robot manages to traverse the terrain while keeping the load.

2.3 Test Module

During the semester, three test modules will be made available in the workshop for testing your robot. Access to the test modules is unlimited and allows you to test your robot on the final course challenges. **ATTENTION:** The final course will not be exactly like the test modules; the layout of the elements will be different. The aim is to ensure that the robot can adapt to the course and not just memorise the modules by heart.

There will be:

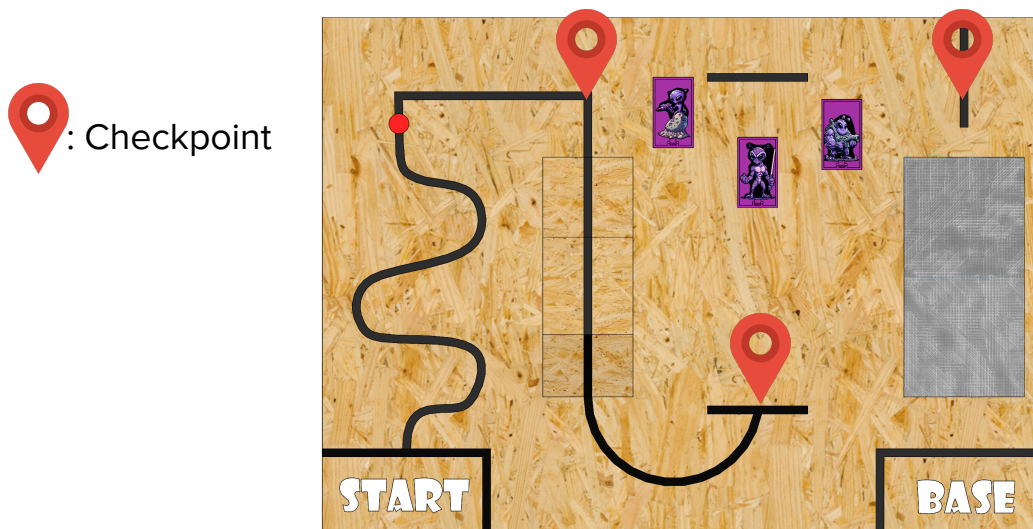
- Line Module: To test the Line Following and Sample Pickup.
- Alien Module: To try out your solution for detecting and shooting down aliens.
- Lunar Module: To face an irregular terrain challenge.

Access to the final course will be possible a few days before the start of the “Grand Concours”, allowing each team to test their robot on the course for a limited duration.

2.4 Start and Finish

The robot must be completely inside the starting area.

The timer starts as soon as your robot begins moving (plan for a button, switch, or any other actuator to start).



The end of the course is defined by depositing the load (red point) in the base. The timer stops and the task is validated as soon as the entire body of the load is inside the "BASE" zone and remains there (it is not necessary for the robot to be inside as well, but it must naturally have finished crossing the lunar soil to validate the points of this challenge). If the robot fails to collect the load, the end of the timer will be marked by the robot's arrival at the base.

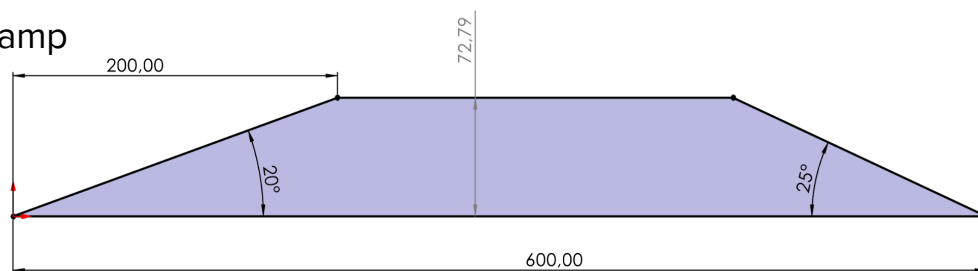
2.5 Specifications

Here you will find all the dimensions, peculiarities, and specifications of the course to enable proper design and programming of your robot.

2.5.1 Line Following

The first line following zone (right after the start) takes place over a total width of 550mm (delimited by the edge of the ramp in the next zone). This width is sufficient to avoid any collision of your robot with the ramp, provided that your robot respects the imposed size limit. The line throughout the course is 20mm wide.

2.5.2 Ramp



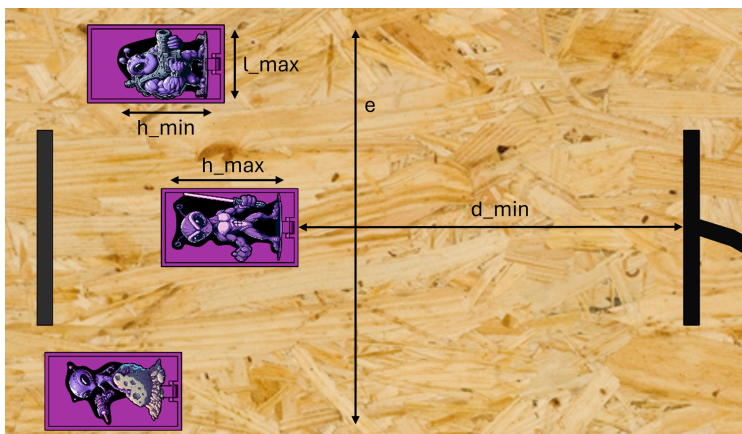
The ramp has an entry slope of 20° and an exit slope of 25° , extending over a total length of 600mm for a maximum height of 72.79mm.

2.5.3 Alien shooting

The third zone consists of shooting at a horde of aliens to clear the path. Your robot must be capable of detecting the end of the line and thus stopping in the shooting area (maximum line overshoot by the front of the robot of 50mm) while ensuring it is well-positioned to proceed straight ahead once the targets are downed.

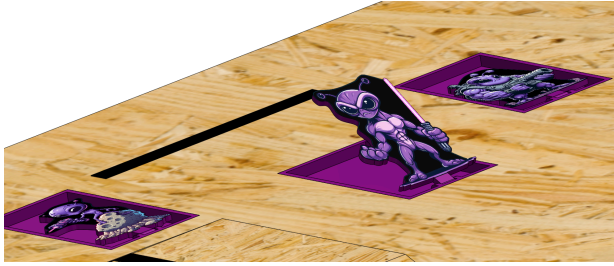
The exact placement of the 3 targets will remain unknown until the limited access to the terrain a few days before the contest. Your robot must therefore be able to detect their locations to aim at them. Here are some specifics:

- Minimum distance between the 1st target and the end line (shooting zone): $d_{\min} = 500\text{mm}$
- Minimum height of a target: $h_{\min} = 120\text{mm}$
- Maximum height of a target: $h_{\max} = 150\text{mm}$
- Maximum width of a target: $l_{\max} = 90\text{mm}$
- Spacing between the two outer target edges: $e = 510\text{mm}$



!!WARNING!!

As previously stated, the aliens will not be exactly in this position on the day of the contest (do not rely on the image).



Each alien must be hit one by one (no machine guns or projectiles destroying all 3 at once).

Once hit, they will fall and blend with the rest of the terrain so that your robot can pass over them.

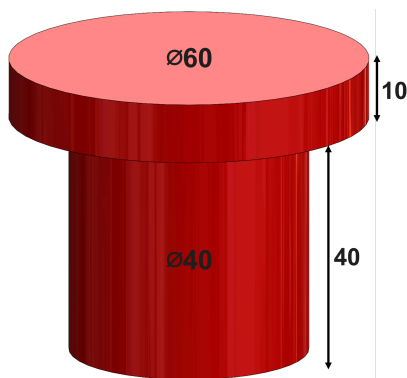
Once the 3 targets are hit, your robot must resume its course (only after the 3 are down; points lost for each target still standing after departure) until the black line behind the aliens indicating the end of the zone is reached, then reorient to head towards the beginning of the lunar soil zone, also marked by a black line..

Safety! The projectiles used must not compromise the safety of participants or the integrity of the course; use balls, nerf ammunition, for example, or others in the same style.

2.5.4 Lunar Soil

The irregular terrain characterising the lunar soil extends over a length of 600mm for a width of 300mm. Your robot must navigate to the base (after properly orienting from the previous black line) while ensuring it keeps the load and delivers it to the base.

2.5.5 The Load: Samples



The samples to be collected (the load) are modeled by the shape shown here, with a total height of 50mm, including a cylinder with a diameter of 40mm for a height of 40mm and a lid with a diameter of 60mm for a height of 10mm.

The load will be placed on the black line at the end of the first course zone.

2.6 Presentation of your Robot

As you can see in the scoring, 4 points concern the originality, complexity, and aesthetics of your robot. While these may seem minor, they can be decisive for first place in the event of similar performance levels.

Therefore, at the end of its course, each team will make a short presentation (max 5 minutes) to boast the merits of its robot, its story, its style, why it is more complex than it appears, and why it is by far the best...

The goal here is not to lose time on the presentation at the expense of the robot's development time itself but to defend your robot as best as possible and help the jury and other participants see it as you do.

3 Participating Robot

3.1 Generalities

Only one robot per team is allowed to compete throughout the competition. A robot consists of a brain (a control board or unit) and the motors attached to it. Purely mechanical parts (without motors or sensors) are allowed to be detached from the robot.

The design as well as the components and elements used to build your robot are completely unrestricted. However, it must fit within the ratification template, which is a block of 200mm in length, 200mm in width, and without a height limit. The template corresponds to the maximum dimensions of the robot at the start. We do not prevent it from extending or separating to reach larger dimensions during the run.

Every participating robot must be fully autonomous and may not receive any human commands, whether from a team member or a spectator. No wireless communication devices – Bluetooth, Wifi, RF – are allowed.

Any device capable of damaging the opposing robots, the terrain, or its elements, as well as spectators, are strictly forbidden. This includes, but is not limited to, sharp elements, pyrotechnic effects, liquids, or projectiles (except for those intended to shoot at the aliens during the corresponding course challenge). Elements likely to disorient opposing robots, such as highlighted lights for this purpose, are also banned. The committee reserves the right to intervene in case of damage to the terrain or its elements.

3.2 Ratification

Ratification consists of a simple verification of your robot by the jury members to check that it complies with the contest rules (size, safety, etc.). It is necessary to validate the registration and can be carried out up to two hours before the official start time of the contest.

3.3 Intervention on Robots

During matches, technical problems can and will occur. Therefore, an intervention system is set up in case the robot loses one of its components or goes astray on the field.

Each intervention incurs a penalty of 1 point; the robot will be placed at the last checkpoint passed. Participants must indicate how to handle their robot before the start of the matches so that the robot is not damaged during interventions.

4 Prizes

4.1 How to win?

To win, you must score the maximum points. The points are counted by the organisers of the tournament, Sonny Basso and Adrian Morel. In case of dispute, they will always have the final say. In the event of a tie, teams are ranked based on the time taken to complete the course.

4.2 Prizes

For each category, several prizes can be won depending on the number of participating teams:

- From 2 teams : 1 prize
- From 4 teams : 2 prizes
- From 5 teams : 3 prizes

The distribution of prizes is as follows: the winner of the 1st place can choose from three prizes from the lot. The 2nd place winner can choose between the remaining two prizes, and the 3rd place wins the last prize.

The current prizes include a DIY oscilloscope kit, an iFixit kit, and a Raspberry Pi. Details and/or minor modifications may be communicated later.

A jury prize will be awarded to the most stylish robot: a Robopoly hoodie!

5 Investments

Robopoly offers to reimburse certain investments made for your robot as part of the “Grand Concours”. In this case, the robot must be handed over to Robopoly and fully documented. Any funding will be discussed on a case-by-case basis with the committee.

6 Advice

- The committee is here to help, so don't hesitate to ask your questions!
- You have a month and a half to prepare, so don't start working at the last minute. There are always unforeseen issues. In this contest, your robot might have a movable part like a turret, so you need to perform tests to ensure everything works before the contest.
- The contest start time is fixed. If your robot isn't ready, we won't delay the start.
- To work efficiently, don't forget to back up your code. It will be very useful, trust our experience!
- Pay close attention to reading infrared sensors or others by eliminating ambient light, especially in the presence of bulbs or other lighting conditions in the location.

7 Conclusion

The entire Robopoly committee hopes you will enjoy participating in this contest. Be inventive in both the design of your robot and the strategies you choose, respect your opponents, and most importantly: have fun!

You will find most of the components you need for this contest at the association's premises (BM9139 (level -1) EPFL).

If in doubt, do not hesitate to ask the committee for more details about these rules. However, please note that the committee reserves the right to modify these rules without notice.

Finally, all club news, which may potentially concern the “Grand Concours”, can be found on our website:

<https://www.epfl.ch/campus/associations/list/robopoly/evenements-2/grand-concours-2023-2024/>

And on our social media.

8 Key Information to Remember

- Indicative first registrations (number of participants, teams, etc.) are open.
- Final registrations a little before the contest.
- The contest takes place in week 10.
- All current and upcoming information on our networks (<https://linktr.ee/robopoly>)
- Ask us questions.
- Have fun!

Good Luck!

Our sponsors

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