



# Trekking RULES

Revised Document 01/10/2023

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## Trekking | Rules

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<b>1.</b>	<b>Introduction</b>	<b>03</b>
<b>2.</b>	<b>Robots Specifications</b>	<b>03</b>
<b>3.</b>	<b>The Environment</b>	<b>04</b>
<b>4.</b>	<b>The Match</b>	<b>04</b>

## 1. Introduction

- Modality Name: Robo Trekking
- Number of Robots per Match: One
- Match Duration: 10 minutes
- Available Classes: Pro
- Maximum Robot Dimensions: 500x500x500mm
- Circuit Specifications: See item 3 "The Environment"
- Control Specifications: Autonomous

**NOTE: Each robot can only participate in a single category during the event, for example: a robot registered in the combat category cannot participate in the hockey category and vice versa.**

The Robo Trekking modality has emerged as a way to encourage the development of autonomous vehicles, using the most advanced technologies in the fields of artificial intelligence, computer vision, spatial sensing, among other scientific areas.

This document presents the requirements for participating in this modality and how timing takes place. It is highly recommended that a briefing be held with all participants of the modality before the start of the competition to address issues such as safety before and during timing, track presentation, and general aspects of the robot, such as accepted lighting devices. If there is an audience, it must stay outside the track, meaning outside the competition arena.

## 2. Robot Specifications

- 2.1 The robot must be fully autonomous, terrestrial, and have all components on board, not being externally controlled by wire, radio, or any other communication device. However, the use of a wireless communication device to deactivate the robot in case of malfunction (also known as failsafe) is recommended. If the robot has a failsafe system on a remote control or circuit external to the robot, this system will be controlled exclusively by the competition judge during timing. Wired failsafe systems are not allowed in this modality.
- 2.2 Additions, removals, or modifications of hardware or software between timing takes are allowed during the match. The match time will not be paused during robot modifications.
- 2.3 The robot cannot exceed the dimensions of a cube with an edge length of 500 mm throughout the match.
- 2.4 The robot cannot have sharp tips and/or cutting edges that could harm someone in case of collision.
- 2.5 The use of guides or any physical connection between the robot and the competitor during the match is not allowed.
- 2.6 The robot must have a luminous indication device, easily visible from a long distance, to signal the arrival at the milestones. The judge will analyze the luminous device of each robot and inform the team before the matches whether the device can be accepted or not. If the device is not accepted, the team must adjust it to be able to make the timing takes at the scheduled time.

- 2.7 If a team participates in this modality with more than one robot, these robots must have their timing takes in sequential order, and matches of other teams' robots are not allowed between the matches of this team.
- 2.8 Teams may exchange their match time with other teams, as long as rule 2.7 is complied with.

### 3. The Environment

- 3.1 The competition can be held in both indoor and outdoor environments. The floor may have unevenness, gaps, holes, and ramps. Obstacles and variations in terrain may also be included in the environment as part of the challenge, such as rocks, soil, sand, uneven surfaces, and objects. The robot must be able to overcome all obstacles (without any human intervention).
- 3.2 If the competition takes place in an outdoor environment, the robot will be exposed to the weather conditions of the day, and therefore, the competition will not be postponed or rescheduled in case of rain, except for extreme cases that will be evaluated by the competition judges.
- 3.3 The robot does not need to cross flooded surfaces, but it must be prepared to face adverse situations such as wet floors and sections with puddles.
- 3.4 There are 4 milestones defined by a yellow metal plate with approximate dimensions of 1000mm x 1000mm x 2mm. The robot must be able to climb and identify these milestones.
- 3.5 The addition of signaling cones in orange and white colors with a height of 50 cm, as described in Figure 1, may be requested to the organization to be placed in the center of the milestones described in item 3.4.



Figure 1: Signaling Cone

- 3.6 On the competition floor, there may be various lines and markings.

### 4. The Start

- 4.1 There are 4 markers (as defined in item 3.4) randomly positioned in the environment. Once the competition begins, the positions of the markers will remain fixed.
- 4.2 The robot starts from marker 1 and must be able to autonomously reach the other markers in the defined order (from marker 1 to marker 2, marker 2 to marker 3, and marker 3 to marker 4).
- 4.3 Around marker 4, obstacles will be added to make access to the marker more challenging. These obstacles will be located at a minimum distance of one meter from the center of marker 4. These obstacles do not have a predefined size, but they must be circumvented. It is not allowed to remove, drag, or bypass these obstacles.

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- 4.4 When the robot reaches a marker with at least one part of its structure touching the marker, it must signal using a visible and apparent light device before proceeding to the next marker.
  - 4.5 The robot does not need to stop on the markers; it only needs to activate its light device while passing by them.
  - 4.6 The light device can remain activated for up to 2 seconds after the robot has completely left the marker.
  - 4.7 If the light device is activated before the robot reaches the next marker, the current timing will be stopped, and only the time until the arrival of the previous marker (if applicable) will be counted.
  - 4.8 If the team has requested the use of signaling cones according to rule 3.5, there will be no problem if the robot drags or throws the cone outside the marker.
  - 4.9 The time taken by the robot to reach each marker will be recorded. When the robot reaches the last marker and signals, the time will be stopped.
  - 4.10 Except during official timing runs, the field will be available for testing on all competition days. During official timing runs, only the team holding that period will be allowed to have their robot on the track. If a team wants to give up their time for other teams to perform tests, they must inform the judge.
  - 4.11 Each robot will have the right to three official timing runs per competition day. These timing runs will be consecutive, constituting a "Start." A schedule with the timing runs' timetable will be generated. Each robot will have its predetermined time and must be present at the scheduled time for the timing runs.
  - 4.12 An official timing run is considered every time the robot starts from marker 01, and the competition judge initiates the timing.
  - 4.13 If an official timing run is requested, and the robot does not move after the judge's signal, a tolerance of 30 seconds will be granted for the robot to start moving. If the robot remains immobile after this time, the timing run will be canceled, and the robot may attempt a new timing run if it still has attempts and time remaining.
  - 4.14 During the timing run, if the robot gets stuck, falls in a way that it cannot right itself, or requires any manual intervention, the robot will be disqualified from that timing run. The robot may attempt a new timing run if it still has attempts and time remaining.
  - 4.15 During the timing runs, only one team member may be inside the enclosed area. This team member must stay at a distance of at least 3 meters from the robot (unlike the judge, who may stay at a distance deemed most appropriate from the robot). At no time during the timing run may a team member be closer to the robot than the judge.
  - 4.16 The match will have a maximum duration of 10 minutes. This means that the three consecutive timing runs must occur within this period. If the match time expires in the middle of a timing run, the timing run will be terminated, and only the progress up to the previous checkpoint (if any) will be counted.
  - 4.17 The ranking will be determined according to the following criteria in descending order:
    1. The shortest time taken to complete the sequence up to checkpoint 4.
    2. The shortest time taken to complete the sequence up to checkpoint 3.
    3. The shortest time taken to reach checkpoint 2.

- 4.18 Only the robots that reach at least checkpoint 2 will be eligible for awards.
- 4.19 The teams whose robots rank first, second, and third must present a simplified flowchart of the robot's operation to the judge. The flowchart can be presented in print or digital format (PDF or Word). Failure to present the document will result in disqualification.
- 4.20 The participating teams in this category are allowed to film the matches of other teams to resolve any doubts regarding timing runs or for the purpose of project development in this category. All cameras intended for these purposes must be positioned outside the enclosed area that encompasses the arena. If teams wish to use the footage to resolve doubts regarding timing runs, they must position a minimum of 2 cameras in opposite positions of the arena and provide the footage with a timestamp indicating the date and time within 30 minutes after the timing run in question.