

**2020 International autonomous intelligent robot
competition**

Running-Robot 2020



**“Go Up the Stairs” Individual Event
Rules and Arrangements**

V1.0

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Chapter 1 Competition Rules

1. Teams and robots

Those who are willing to participate in the competition shall organize their own teams and apply to the Organizing Committee of the competition.

There will be no more than 5 persons per team.

The robot participating in the competition must be able to complete upright walking and other action tasks in a complex environment, according to specific circumstances, autonomously and intelligently (i.e. taking action without human intervention). "Robot walking upright" refers to a robot simulating human beings to move on the track in a way that only the sole of the foot (without other parts) contacts the ground and supports the whole body.

The participating robots must be designated by the Organizing Committee of the competition, or submitted to the Organizing Committee of the competition for approval of the robot hardware (and development board). Refer to attachment for a description of the reference dimensions.

2. Game scenarios and tasks

The competition scene is that the robot walks upright and completes the task of going up the ladder, and turning back and down the ladder at

any time.

See the attachment for the description of the game scene and task.

3. The calculation of rounds and final results

(1) There are 2 rounds for each team.

(2) The "competition time" of each team in each round is 6 minutes.

(3) Start the second round after all teams in the first round.

(4) Each team takes the best of two scores as the final score.

4. End conditions of each round of competition and calculation of results

In a match, the round ends when one of the following conditions is met :

(1) In the game, when the robot reaches the finish line ;

(2) In the competition, when the team touches the robot ;

(3) In a race, when the robot leaves the track ;

(4) In the competition, when the robot finishes the climbing task and has already started to perform the descending task, it turns back again and starts to perform the climbing task ;

(5) When game time arrives.

The results and ranking of each round of competition are calculated according to the two dimensions of primary and secondary.

- Main dimension: measured by the number of steps up and

down completed by robots (standing walking); the winner is the one who completes more steps.

Note that "the ladder completed by the robot" refers to the ladder on which the back foot falls when the bottom of the robot's feet falls on the ladder and supports the whole body stably (i.e. other parts do not touch the ladder and support the body) during the process of climbing and descending the ladder (when two feet fall on two different ladders, if the robot is climbing the ladder, this ladder is the one below A ladder; if the robot is going down the ladder, this ladder is the one above); a ladder whose sole has not fallen does not count; a ladder whose sole has fallen does not count if the other parts of the robot support the body.

- Sub dimension: the time from the beginning to the end of participating robots; among all robots completing the same number of stairs, the one with less time (i.e. faster) wins.

Chapter 2 Competition arrangement

1. Competition sequence

Before entering the competition field, the team members shall draw lots to determine the order of the competition.

2. Pre match preparation

(1) Each team, according to their own schedule, enters the preparation area in advance before the start of the competition, completes the robot debugging, confirms the only (robot) "operator" and other preparations, and reports "ready" to the referee ;

(2) After receiving the "ready" report, the referee will check the team and the robot to confirm that the team is "ready". If the requirements are not met, the referee has the right to require the team to prepare again ;

(3) 10 minutes before the start of the match, if the "ready" cannot be confirmed by the referee, the match will be withdrawn.

3. Enter the competition

(1) "Ready" teams bring robots into the competition area. The operator places the robot at the starting point and signals

that the referee is ready ;

- (2) The referee declared "the start of the game" and started the timing device at the same time. The operator will not be able to start the robot until the game is announced. If the operator starts the robot first, he will be warned by the referee; if he starts again, he will be disqualified.

4. The competition is going on

- (1) From the beginning to the end of the competition, only the operator can enter the field and operate the robot according to the regulations. In the game, no one else can operate the robot in any way. In case of violation, you will be disqualified ;
- (2) It is the operator's responsibility to ensure that all of his operations comply with the rules of the game. If any operation does not meet the competition rules, it will be disqualified.

5. The end of the game

- (1) The referee declared "the end of the game" according to the rules and stopped the timing device. At this time, the timing device displays the completion time.
- (2) At the end of the competition, the referee is responsible for calculating the results and filling in the report card according to the rules. The team confirms the report card of the team

and leaves with its own robot.

6. Other instructions

- (1) If there are any changes to the rules of the competition, the organizing committee will inform all teams in the first time ;
- (2) In the competition, the referee has the power to decide. If you have any objection, please submit it to the referee ;
- (3) The organizing committee is responsible for the final determination of all objections and the resolution of all disputes.

Attachment - 2020 competition scenario

1. Overview of the game

The area of the venue is 5 m x 5 m.

The track is located in the middle of the field and is a simplified step. The steps are divided into two sections. The steps are arranged in the way of turn back, and the platform is set at the turn back place.

The width of the track road, that is, the step, is 60 cm; there are 9-11 steps in each section of the two steps, the height range of each step is 5-8 cm, and the depth is 12-15 cm; the connection platform and the top turn back platform of the two steps are about 60 cm in depth. "Robot leaving the track" means that the robot falls off a ladder, link or turn back platform.

There is a starting line on the ground. "Put the robot at the starting point" means that the robot foot is close to but does not touch or exceed the starting line. The starting line is set for placing the robot and measuring the performance, and the robot does not need to recognize this kind of marking line.

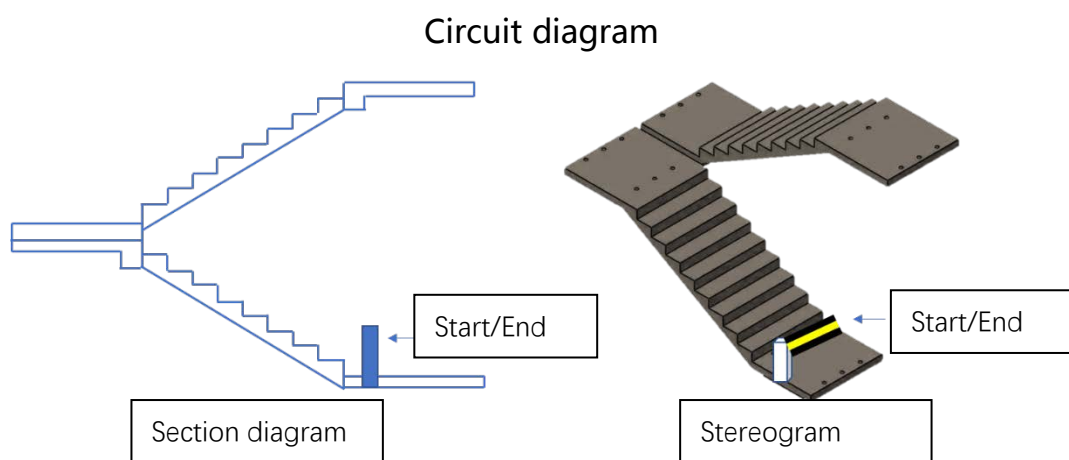
"The robot reaches the end" means that after the robot completes the task of up and down the stairs, it completely relies on two feet to

support and return to the ground.

The main body of the track is the melamine board with pitted surface, and the surface color is gray. In order to get close to the actual working environment of the robot, part of the track surface is covered with spray-painted film, and the spray-painted pattern does not use 3D pictures, but only uses 2D pictures to represent grass, floor tiles, wood floors and other patterns; some of the track may be covered with carpets or rubber mats. There is a circle of fence advertisements around the track, the fence is about 50 cm away from the track boundary, with LOGO on it; there are ground advertisements on the center site of the track.

It is suggested that the static friction coefficient of the robot foot is about 0.1 (each team can stick anti-skid materials on the robot foot as needed).

The circuit diagram is as follows (refer to the above description for dimensions):



2. Robot size specification

The robots designated in the competition can be used in the single event, and the teams are encouraged to design stronger robot hardware, but the robots must meet the following requirements :

- (1) Upright walking humanoid robot, with head, trunk, arm and leg and foot, with a joint on the leg and foot, the length proportion of trunk, arm and leg and foot is roughly in line with the proportion of human body ;
- (2) Robot size is less than (height) 60 cm x (width) 60 cm.