



# Free creative category<sup>1</sup>

## 1. General Provisions

The team exhibits one robotics project for judging.

### 1. Job Description

As part of the competition in the creative category and in order to determine the vector of further development of creative projects, the organizing committee specifies the concept of robot(s) in a creative robotics project.

The robot according to the festival version must necessarily possess three main components: 1) mechanical, 2) electronic, 3) algorithmic, which are interrelated and each of which plays an essential role in the functioning of the entire project.

With this in mind, a robot is an automatic device with feedback, acting according to the program laid down in it, capable of independently interacting with the environment and responding to its changes.

Interaction with the environment must necessarily cause reactions of the robot: movement of its parts, movement of the robot itself in space, movement of other objects by the robot.

Interaction should assume the ability of the robot to analyze sensor readings, respond to the magnitude of the disturbance, and form commands for actuators depending on the sensor readings.

The interaction must be supported by control algorithms whose logic depends on the environment and is not an implementation of direct program control.

Any project that meets the accepted definition is eligible to participate in the creative category, otherwise the project may be rejected at the registration stage or receive zero points when evaluated by the judges.

If plagiarism with attribution is detected by the judges, participants may receive penalty points from the judges up to and including disqualification.

When implementing the project, freely distributed libraries and other software must be used. It is not allowed to use closed code in the program part of the solution.

## 2. Limitations

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<sup>1</sup> The "Free Creative Category" regulations of the Robofinist festival were used as a basis for the regulations

The team must meet the following requirements:

- the number of participants in a team is 3 or less, the number of leaders is not limited;
- age of participants is limited by the age categories of the competition.

Competitions are held separately in three age categories. The age category is determined by the oldest participant (not counting the leader).

- 1) Junior age: 2012 birth year (inclusive) and younger;
- 2) Average age: 2011-2009 year of birth (inclusive);
- 3) Senior age: 2008 birth year (inclusive) and older.

## 2. Project Requirements

There is no mandatory or restrictive list of parts to be used in these competitions.

The project must meet fire and electrical safety requirements, comply with sanitary rules, regulations and hygienic standards established on the day of the competition.

The project can be carried out by a group of participants with the help of third parties. However, the festival participants are obliged to indicate their part of the work as well as the part of the work done with the help of third parties.

## 3. Requirements for materials to be submitted

When registering, each team must submit mandatory project materials:

- 1) Brief description - required to evaluate the team in step 1;
- 2) Photo - required for team evaluation in step 1;
- 3) Video clip (2 minutes) - required for team evaluation in Step 1;
- 4) Detailed description - required to evaluate the team in Step 1;
- 5) Defense presentation - required for team evaluation in Step 2.

According to the regulations, the team is NOT given the opportunity to upload any additional missing files after the entries have been finalized.

### 1. Brief description

The project description should be at least 500 characters.

In the description, it is necessary to indicate on the basis of which platform the project is built, describe its design, tell what is the uniqueness of the robot and what is its purpose.

### 2. Photograph

The photo should show the actual project, placed in the center of the photo, occupying the majority of the photo and being in focus. No more than five photos from different angles are allowed.

### 3. Video clip

The video should include an oral presentation of the project and demonstrate its operability. The video should include a fragment containing an A4 sheet or other media (e.g. a blackboard with writing on it) on which the team name and the date of filming can be clearly seen. The duration of the video must not exceed TWO minutes.

### 4. Detailed description

A detailed description should include:

- 1) specifying the platform on which the project is built;
- 2) functional diagrams;
- 3) description of the design;
- 4) description of algorithms;
- 5) program<sup>2</sup> code of the robotic device;
- 6) A story about the purpose of the robot;
- 7) The history of the project's creation;
- 8) Photographs;
- 9) other information directly related to the project.

## 5. Presentation for the defense of the project

The online defense is completed within five minutes. The presentation for the defense must meet the following requirements:

- 1) Presentation format .ppt, .pptx, .pdf;
- 2) the aspect ratio of the presentation slides is 16:9;
- 3) the number of slides is not more than 5;
- 4) There is a lack of animation.

## 4. Order of the competition

During the competition, each team has to present their project.

The competition consists of **TWO** stages:

Stage 1 - preliminary (absentee) evaluation by judges on the basis of submitted materials;

Stage 2 - final evaluation by the judges based on the results of the project defense.

Three teams from each age category with the maximum number of points in their age category are eligible for Stage 2 (project defense)<sup>3</sup>.

## 5. Project appraisal

### 1. Judicial evaluation of projects

At stage 1, the work of each team is evaluated by the judges according to the criteria given in Table 1. Each judge evaluates the project independently, putting points in the protocol.

Then for each team the judges' scores are summarized in terms of criteria.

In each age category, three teams with the maximum number of points are selected and allowed to proceed to stage 2 (project defense).

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<sup>2</sup> The program code should be open, which will ensure that the judges can check it against the evaluation criteria when evaluating the project. It is optimal to use formats that can be opened without special software (e.g. text files). For block languages use pdf.

<sup>3</sup> The final number of teams admitted to the second stage may change at the discretion of the jury

All teams that have submitted the required materials and passed the 1st stage of evaluation will receive a diploma of participation in the competition.

The second stage - project defense takes place at a separate time determined in advance by the competition organizers. The project defense is carried out online. To demonstrate the project, the participant (team) must have a computer connected to the Internet, with a camera and microphone, and with ZOOM videoconferencing tool installed and configured.

At stage 2, based on the results of the project defense, each judge fills in the final project evaluation protocol. The work of each team is evaluated by the judges according to the criteria given in Table 1. Each judge evaluates the project independently by assigning points in the protocol. At stage 2, each judge has the opportunity to add points relative to the preliminary assessment of the project made at stage 1.

5.1.1 For each criterion, a team may receive from each judge a number of points not exceeding the number specified in Table 1.

5.1.2 For each judge, a ranked list of the projects he/she has reviewed is compiled. If several projects received the same number of points, they are assigned places with the same number. After that, for each project, the places that the project took in each such ranked list are added up. The resulting sum is the judge's evaluation of the project.

## 2. Final result

5.2.1 Projects are ranked according to the value of the judges' scores, the higher the score, the higher the place.

5.2.2 If the final results are equal, the judges will decide which project to give priority to.

## 6. Procedure for determining the winner

The higher ranked team is declared the winner.

If the final results are equal, the decision on which project to give priority to is made by the panel of judges. When analyzing the level of the submitted projects by a general vote, the panel of judges has the right to decide not to award any of the places (1, 2, 3) or to award several identical places, as well as to mark the projects with nominations.

Table 1. Criteria for evaluating the project at two stages

№	Criterion	Description	Points	Stage 1 (max number of points)	Stage 2 (max number of points)
1	1) Relevance (3)	the project does not solve the assigned task or the task is not formulated as a robotic task	*0	3	0
2		project addresses a relevant topic	0 / 1	1	
3		proposes a solution, realizes an interesting practically valuable idea	0 / 1	1	
4		the proposed solution may be relevant in the proposed format	0 / 1	1	
5	2) Novelty (3)	similar projects have already been presented by other authors at competitions, on the Internet or there is no robotics content of novelty	*0	3	0
6		the project has significant circuit-technical differences from the analogs presented earlier	0 / 1	1	
7		the project has significant algorithmic differences from the analogs presented earlier	0 / 1	1	
8		the project has significant constructive differences from the analogs presented earlier	0 / 1	1	

9	3) Design complexity (3+1)	the project has a primitive mechanical component or the robot does not use it	*0	4	0
10		the project has simple mechanisms, standard primitive movable structures	0 / 1	1	
11		the mechanisms that the project uses function together and in a harmonized manner	0 / 1	1	
12		interesting design solutions are used to increase the efficiency of its operation	0 / 1	1	
13		dissenting opinion	0 / 1	1	
14	4) Electronic Complexity (3+1)	the project uses only standard solutions from the robotics construction kit	*0	4	0
15		the number of sensor types is more than 3 and/or a non-standard connection is used	0 / 1	1	
16		Arduino hardware platform (or analogs), single-board computers are used	0 / 1	1	
17		electronic components of our own design (including sensors) are used	0 / 1	1	
18		dissenting opinion	0 / 1	1	
19	5) Cybernetic complexity (7+1)	all control is reduced to single relay control	*0	8	0
20		several relay regulators working together and/or there are other regulators	0 / 1	1	
21		encoder controllers are used, motor position is strictly controlled, speed is synchronized	0 / 1	1	
22		there are customized PD, PID, cubic regulators	0 / 1	1	
23		sensor readings are filtered and noise is eliminated	0 / 1	1	
24		calculation of the control action is based on the complex analysis of readings of several sensors of different types	0 / 1	1	
25		complex mathematical algorithms (physical modeling, forecasting, calculation of necessary trajectories, SLAM, computer vision elements, etc.) are used.	0 / 1	1	
26		machine learning methods have been applied	0 / 1	1	
27		dissenting opinion	0 / 1	1	
28	6) Programming quality (6+1)	the algorithm has a linear structure, only action and expectation commands and direct control are used; the algorithm is more complex, but participants cannot explain it	*0	7	0
29		All basic algorithmic structures (branching, loop, subroutine) are used, simple feedbacks are present	0 / 1	1	
30		used arrays and operations with large amounts of data	0 / 1	1	
31		robot control is realized on the basis of a finite automaton	0 / 1	1	
32		third-party libraries are connected, increasing the system's efficiency	0 / 1	1	
33		written their own libraries that improve the efficiency of the system	0 / 1	1	
34		the program code is provided with comprehensive comments	0 / 1	1	
35		dissenting opinion	0 / 1	1	
36	7) Workability (6+1)	participants were not able to demonstrate operability or the robotics component is missing	*0	8	0
37		participants demonstrated autonomous operation of one project node	0 / 1	1	
38		participants demonstrated autonomous operation of several project nodes	0 / 1	1	
39		autonomous operation of the project as a whole demonstrated	0 / 1	1	

40		demonstrated fully autonomous and coordinated operation of all declared parts of the project:		1	
41		mechanical, electronic and algorithmic	0 / 1	1	
42		there were no failures when demonstrating the autonomous behavior of the robot	0 / 1	1	
43		after brief customization the project is ready to be restarted	0 / 1	1	
44		dissenting opinion	0 / 1	1	
45	8) Technology (5+1)	only ready-made components of educational constructors are used	*0	6	0
46		added "handmade" parts made by the authors of the project	0 / 1	1	
47		there are parts that are self-made on a 3D printer, laser cutter, milling machine	0 / 1	1	
48		more complex and labor-intensive technologies are used (e.g. silicone molding)	0 / 1	1	
49		details are neat, post-processing has been used	0 / 1	1	
50		a substantial part of the design was created in CAD, process simulation technologies were used	0 / 1	1	
51		dissenting opinion	0 / 1	1	
52	9) Defense, presentation (3+1)	the defense did not reveal the essence of the project as robotics	*0	0	4
53		defense conducted	0 / 1		1
54		the robotic essence of the project is disclosed and defended	0 / 1		1
55		the answers to the questions were comprehensive	0 / 1		1
56		dissenting opinion	0 / 1		1
57	10) Aesthetics (3+1)	the creators of the project did not care about any aesthetics, the project looks sloppy	*0	4	0
58		the project is neatly done, but there is no aesthetics to speak of, only functionality	0 / 1	1	
59		the project is aesthetically designed, all design elements are well combined with the project functionality	0 / 1	1	
60		there's the setting, the script, the elements that support the script	0 / 1	1	
61		dissenting opinion	0 / 1	1	
62	11) Photo quality (2)	the photo does not reflect the essence of the project	*0	2	0
63		the project photo is of sufficient quality and corresponds to the topic of the project	0 / 1	1	
64		the photo is of good quality, clear, the angle is well chosen and gives an idea of the project, corresponds to the project description.	0 / 1	1	
65	12) Quality of description (3)	the description does not reveal the essence of the robot project	*0	3	0
66		description is	0 / 1	1	
67		the description exhaustively discloses the essence of the robotics project, neatly organized	0 / 1	1	
68		there is a developed design documentation	0 / 1	1	
69	13) Video Quality (2)	the essence of the robotics project is not disclosed	*0	2	0
70		There's an informative video	0 / 1	1	
71		the video qualitatively shows a robotics project with full demonstration	0 / 1	1	
Total				54	4