

On the Organization of the “Robot Sapper” Competition and the Procedure for Determining the Winners within the Framework of the “Future Engineers”

Regulations

1. General Provisions

1.1. These Regulations define the general rules for organizing, conducting, and rewarding participants of the “Robot Sapper” competition (hereinafter referred to as the Competition) within the framework of robotic engineering.

1.2. The Regulations serve as the main document binding for all stages and directions of the Competition. All additional regulations related to the Competition must comply with these Regulations.

1.3. Participants’ age: 18 – 30 age

1.4. The following key terms are applied in these Regulations:

Jury – a collegial body composed of representatives of relevant ministries, agencies, industry enterprises, and foreign organizations, responsible for reviewing applications, evaluating, and determining winners at the final stage.

Manipulator Arm – a mechanical-technical device designed to grasp, lift, place objects, and perform technological operations, remotely or automatically controlled via a designated control system.

Cameras and Sensors – a set of electronic devices intended for visual and technical monitoring of the environment, detecting objects, measuring distance, movement, and other physical indicators, and transmitting data to the control system.

Hazardous Zone – a specially organized area, enclosed by various artificial and technical obstacles, designated for robot-sappers to navigate and perform assigned tasks under remote control.

Robot Construction – the mechanical, electronic, and software components of the robot, demonstrating stable operation, functional task performance, and resistance to external influences.

2. Main Objectives of the Competition

2.1. To develop engineering and technical skills in the field of robotic sapper activities.

2.2. To increase interest among youth in designing, programming, and operating robot-sappers capable of safely neutralizing mines and explosive devices remotely.

2.3. To identify and support young talents and involve them in scientific and technical activities.

2.4. To encourage innovative ideas and technological developments of young engineers in the robot-sapper field.

3. Competition Organizers

3.1. A special Organizing Committee shall be established to organize and manage the Competition. The Committee performs the following functions:

- Approving the competition regulations;
- Forming the Jury;
- Addressing technical and organizational issues of the Competition;
- Reviewing complaints and appeals.

3.2. The Organizing Committee operates independently, and all its decisions are final.

4. Procedure for Conducting the Competition

4.1. The Competition consists of three stages: technical expertise, practical task, and project defense.

4.2. All robots undergo a technical inspection before the Competition, which includes:

- Demonstration of the robot construction;
- Testing of the manipulator arm;

- Inspection of cameras and sensors;
- Testing of the remote control system.

4.3. In the practical task, the robot must detect and neutralize suspicious objects in the field.

4.4. Practical stage tasks include:

- Entering and navigating the hazardous zone;
- Detecting suspicious objects;
- Cutting a wire in a suspicious object;
- Lifting and relocating objects using the manipulator arm;
- Placing objects in a safe area.

4.5. At the final stage, participants present their projects to the Jury, explaining the robot's capabilities, algorithmic solutions, and answering additional technical questions.

5. Technical Requirements for Robots

5.1. The mobility system must ensure stable movement on wheels or tracks under any conditions.

5.2. It must be equipped with a remote control system with a camera, as well as a safe power source not exceeding 12 V or a wired power supply.

5.3. The manipulator arm must be capable of grasping and relocating suspicious objects.

5.4. The sensor system must detect, measure, and map mines and similar obstacles.

5.5 The robot's dimensions must not exceed $100 \times 100 \times 100$ cm, and its weight must not exceed 30 kg.

6. Additional Rules

6.1. Special rules and regulations of the Competition are published on the official website.

6.2. The Organizing Committee reserves the right to make changes to the regulations.

6.3. In unforeseen circumstances not covered by these Regulations, the decision of the Organizing Committee shall be final.

6.4. Participants may take part individually or in groups of 2–3 people.

7. Jury

7.1. The Jury is formed by the Organizing Committee and monitors compliance with the rules throughout the Competition.

7.2. The Jury's responsibilities include:

- Ensuring compliance with the rules;
- Making final decisions in case of disputes;
- Evaluating participants' compliance with technical requirements.

7.3. Decisions of the Jury are final and not subject to review.

8. Additional Rules

8.1. Special rules and regulations of the Competition are published on the official website.

8.2. The Organizing Committee has the right to make changes to the regulations.

8.3. In unforeseen circumstances, the Organizing Committee's decision shall prevail.

8.4. Participants may compete individually or in groups of 2–5 people.

9. Competition Area

9.1. The robot starts moving from the starting point and is considered to have completed the task upon reaching the finish point.

9.2. The “Robot-Sapper” competition will take place in an area measuring 10 × 10 meters.

9.3. The area will include obstacles such as uneven terrain, climbing up and descending slopes with sharp angles, and bypassing horizontally placed obstacles.

10. Evaluation Criteria for Determining the Winners of the “Robot Sapper” Competition

No	Evaluation Criteria	Total Score	
1.	Level of Scientific and Technical Novelty	10 points	
	Technological Solution Novelty: The idea must be new and original compared to existing and current technologies. Potential for Implementing Technological Innovation: The idea should propose an innovative solution to relevant engineering challenges.		
	1.	Completely new and advanced solution	5-10 points
	2.	Partially new technological elements present	0-5 points
	3.	No scientific or technical novelty	0 points
2.	Neutralization of Suspicious Objects	40 points	
	The robot-sapper's ability to detect, neutralize, and mark suspicious and explosive objects, as well as transmit the collected data to the control system		
	1.	Object detection	5 points
	2.	Object neutralization (cutting the wire)	20 points
	3.	Transporting the object to the designated location	15 points
3.	Movement Accuracy and stability	20 points	
	Accuracy The robot-sapper's movement must be precisely controlled, minimizing trajectory deviations and ensuring stable navigation along the designated path under complex environmental conditions. Stability: The robot-sapper must maintain stable movement regardless of external influences, uneven terrain, or obstacles, ensuring continuous and reliable operation of its systems.		

	1.	Precision and Smoothness of Movement: The robot demonstrates accurate and smooth maneuvering capabilities, effectively avoiding obstacles.	5-20 points
	2.	Remote Control Quality and Signal Stability: The robot maintains reliable remote control response with stable communication signals.	0-10 points
	3.	Operational Reliability under Various Conditions: The robot functions consistently and reliably across different environmental conditions, ensuring system dependability.	0-20 points
4.	Responses to Questions from the Jury		30 points
	A comprehensive set of answers to questions aimed at assessing the participant's level of knowledge regarding the project, technical justification, and compliance with the competition requirements		
Final Score			100 points