Brick Educational Robot Contest-Universal Contest RULE

——Exploring space

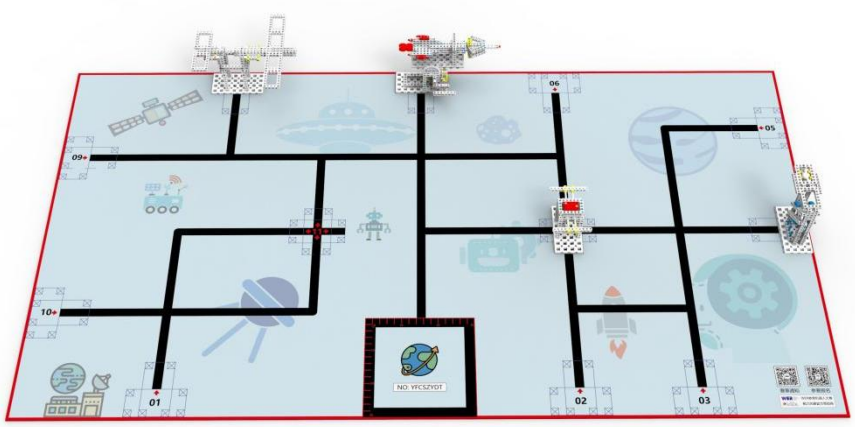
1. THEME INTRO

Space has always been the goal of human exploration. Since the earliest human beings entered space, the study of space has been more and more in-depth, and every discovery and progress have given us new views and understandings of space. The exploration of space involves a wide range of disciplines, including physics, astronomy, space science, materials science, optics, precision measurement, space technology and navigation. Every technological breakthrough is a great progress in human science and technology. Through the development of this theme, students have a strong interest in exploring space, and through continuous learning to understand some knowledge about space, and make their own contribution to the development of space exploration.

The sky of the universe, the vast sea of stars, everything in the world is varied and mysterious. With a curious mind, we continue to explore the mysterious and colorful space world and travel into the space full of infinite possibilities of life. The pace of discovery never stops, it continues...

2. Contest Arena and Environment

2.1 Arena Setup



The size of the arena map is 120*220cm, and the material is PU cloth. The width of the black guide line is 2cm-3cm. At the end of the black guide line is the location box of the task model (task model placement area), and the position is marked with thin outline. Red arrows as shown in the image below points to the front of each location. The location and direction of the model are randomly assigned prior to the contest date. The site has a base with a size of 30 * 30cm, and the robot can travel in and out of the base location for unlimited times.

2.2 Arena Environment

The environment of arena placement should have cold light source, low illumination and no magnetic field interference. However, there are many uncertain factors in the actual contest environment, such as lines and unevenness on the surface of the field, changes in lighting conditions and so on. Teams should consider various countermeasures when designing robots.

3. Tasks and Scoring

There are 7 tasks in each game, which are composed of two parts: pre-set tasks and on-site tasks. This rule gives a total of 4 preset tasks according to the difficulty level, and 3 live tasks are announced when preparing for the game.

The content of the preset task is published in this rule, but the position and direction of the model can be changed, and the field task and task description are only published in the preparation before the game. The participants should design the robot structure and program according to the field.

In the absence of specific requirements in the rules of the task, the description of the score is only a scheme reference, the contestant can have different solutions,

unlimited ideas.

The preset tasks described below are only simulations of real-life scenarios.

3.1 Departure (20 points) ★

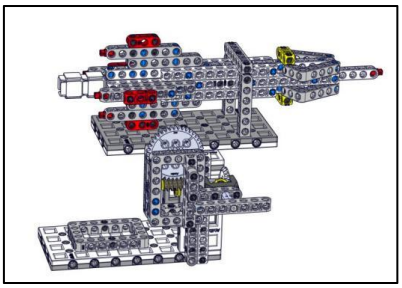
3.1.1The robot should depart the base with its vertical projection completely outside of the base area. One successful departure will be enough to score 20 points.

3.2 Launch a rocket (80 points) ★★★

3.2.1 The initial position of the launch rocket model is from 1-10, the position is variable, the direction is fixed, the red arrow indicates the positive direction of the model, the rocket is docked horizontally on the launch pad, and the crank is in the horizontal state.As shown in figure 3-2-1.

3.2.2 The robot needs to turn the crank to make the rocket in the vertical state to complete the state, and gets 80 points, as shown in Figure 3-2-2.

3-2-1

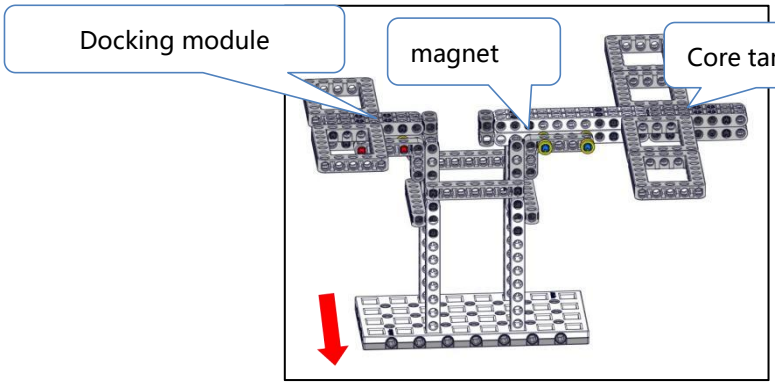


3-2-2

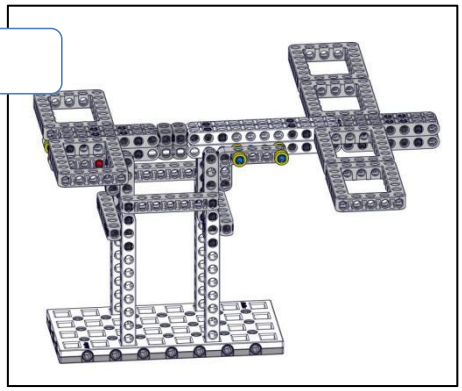
3.3 Docking station (60 points) ★★★

3.3.1 The initial position of the docking station model is 1-10, the direction and position are variable, the red arrow is the front direction of the model, and the station is in a separated state. As shown in Figure 3-3-1;

3.3.2 The robot can push the docking module to make the adsorption connection between it and the core module complete the docking successfully, and score 60 points, as shown in Figure 3-3-2.



3-3-1 Initial state

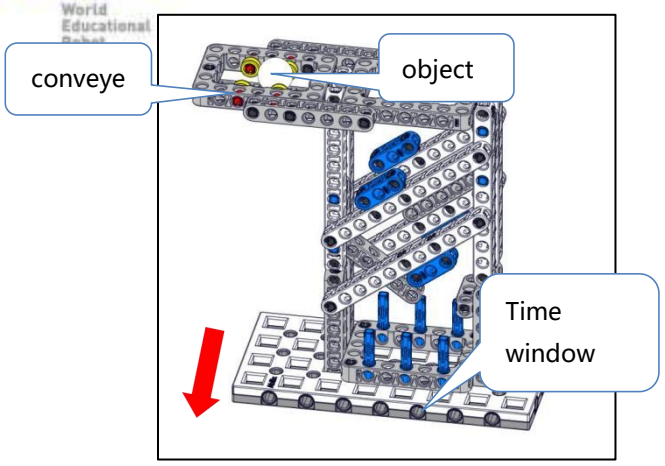


3-3-2 Complete state

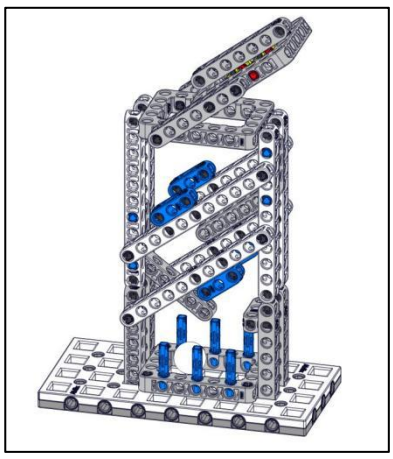
3.4 Time machine (70 points) ★★★

3.4.1 The initial position of the Time machine model is 1-10. Both direction and position are variable, the red arrow is the front face of the model, the conveyor is horizontal, and the object is on the conveyor.

3.4.2 The robot can flip the transfer device to make the object enter the time tunnel and pass through the time window below to complete the state, scoring 70 points, as shown in Figure 3-4-1.



3-4-1 Initial state

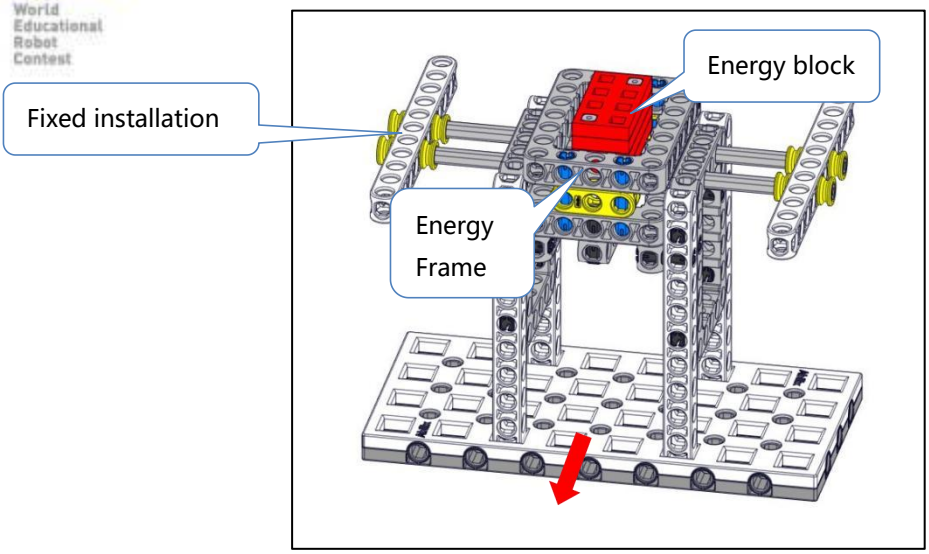


3-4-2 Complete state

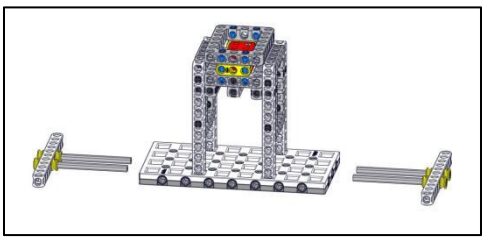
3.5 Energy core (100 points) ★★★★

3.5.1 The initial position of the energy core is 11 and 12, the direction and position are variable, the red arrow is the front direction of the model, the energy block is placed on the fixed device, the fixed devices on both sides are in contact state, and the energy frame is locked by the fixed device, as shown in Figure 3-5-1.

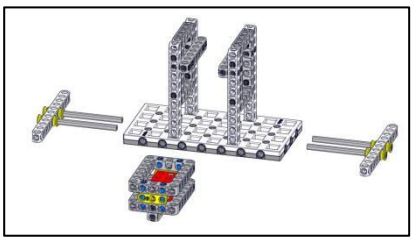
3.5.2 The robot can unlock the fixtures on both sides and completely detach from the model for 20 points per piece; As shown in Figure 3-5-2; Bring the energy box containing the energy block back to the base for completion state 2 add 60 points; As shown in Figure 3-5-3.



3-5-1 Initial state



3-5-2 Complete state 1



3-5-3 Complete state 2

3.6 Back (30 points) ★★

3.6.1At the end of the competition, the robot will score 30 points for returning to the base autonomously for the last time after completing the mission and completing at least one mission.

3.6.2 Any drive wheel of the robot can be scored within the base. Only one time per game.

In the above task execution process, the position and direction of the task model are some variable and some are constant. The position and orientation of the task model, once published, does not change.

4 Robot

This section provides the principles and requirements for designing and building robots. All robots must pass an inspection before entering the competition. To ensure fair play, judges will randomly check the robots during the game. Robots that do not meet the requirements need to be modified in accordance with the requirements of this rule, if the robot still does not meet the requirements, it will be disqualified.

4.1 Size: Before each departure, the size of the robot shall not be greater than 30*30*30cm (length * width * height); After leaving the base, the robot's mechanism can extend itself.

4.2 Controller: In a single round, the controller cannot be replaced. Only one controller is allowed per robot.

4.3 Actuator: Each robot is allowed to use a total of no more than 4 motors in the competition (digital steering gear is not allowed).

4.4 Sensors: There is no limit to the type and number of sensors allowed for each robot.

4.5 Structure: The robot must use the splicing structure of plastic material, and must not use cable ties, screws, rivets, glue, tape and other auxiliary connection materials.

4.6 Power supply: Each robot must have its own independent battery, shall not be connected to external power supply, battery voltage shall not be higher than 9V, and shall not use booster, buck, voltage regulator and other circuits.

5 competition

5.1 Participating team

5.1.1 Each team consists of 2-3 students and an instructor. Participants must be students in school.

5.1.2 The participants should have a positive attitude to face and independently and properly deal with various problems encountered in the competition; Self-respect, self-respect, self-discipline, self-improvement; Treat teammates and opponents with kindness; Respect volunteers, referees and all the people who have worked hard for the game, and strive to develop themselves into people with sound personality and healthy psychology.

5.2 Competition system

5.2.1 WER educational robot popularization competition is conducted according to primary school, middle school and high school groups respectively.

5.2.2 There are two rounds of the competition, no preliminary or final. Each race is 180 seconds long. Each game is scored.

5.2.3 If a team chooses a live task, the game will not be extended.

5.2.4 At the end of all matches, the total score of each team will be the sum of the scores of each team, and the teams will be ranked according to the total score.

5.2.5 The competition Organizing committee has the right and the possibility to change the competition system according to the registration and the actual situation of the venue.

5.3 Game process

5.3.1 Building robots and programming

5.3.1.1 Building robots and programming and testing procedures are carried out in the competition area.

5.3.1.2 The student members of the participating team can enter the debugging area after being checked. The referee has the right to inspect the equipment carried by the team, and the equipment used must meet the relevant regulations and requirements of the Organizing Committee. The team members can carry the robots that have been built into the debugging area. The team members shall not bring the communication equipment which is prohibited by the Organizing committee. After all the students are seated in the debugging area, the referee will inform the teams of the score description and the position of the task.

5.3.1.3 Teams should bring their own laptops, repair tools, replacement devices, spare supplies, etc. Participants are not allowed to surf the Internet in the debugging area, use cameras and other equipment to photograph the competition site, and must not contact the instructor or parents in any way.

5.3.1.4 There is 2 hours of preparation time before the competition, and the team can modify the structure of the robot and write programs according to the on-site environment.

5.3.1.5 The field uses daily lighting, and the participants can calibrate the sensors, but the organizing committee does not guarantee that the on-site lighting is absolutely unchanged. As the competition progresses, the lighting situation on the site may change, and the actual impact of these changes and unknown light should be adapted to or overcome by the participants themselves.

5.3.1.6 After entering the competition, the participants must debug and prepare the robot in an orderly and methodical manner, and shall not accept the guidance of the instructor in any way. Teams that do not follow the rules may be warned or disqualified. Before the end of the preparation time, each team should arrange the robot in the designated position in the debugging area, and then seal it.

5.3.2 Pre-competition preparation

5.3.2.1 When preparing to go on the field, the team members receive their own robots and enter the competition area under the lead of the referee. Any team that fails to show up within the time limit will be considered a forfeit.

5.3.2.2 The participating student players shall stand near the base.

5.3.2.3 Team members put their robots into the base. No part of the robot and its forward projection on the ground can exceed the base area.

5.3.2.4 Team members on site should take the time (no more than 2 minutes) to make preparations before the robot starts, check the site, and check whether the model is restored to the initial state. After completing the preparation work, the players should signal to the referee.

5.3.3 Startup

5.3.3.1 When the referee confirms that the team is ready, he will issue the countdown start command "3, 2, 1, Go". At the end of the password, the participant can press the button to activate the robot.

5.3.3.2 Starting the robot before the referee gives the "start" command will be considered a "false start" and will be warned or penalized (count one restart).

5.3.3.3 Once the robot is started, it can only be controlled by its own program. Team members are generally not allowed to touch the robot (except in the case of rebooting). Players must not touch the model during the game, once the model is touched, the task is not scored, regardless

Whether the task is complete and counts as a restart, and the task cannot be completed again.

5.3.3.4 After starting, the robot shall not intentionally separate parts or drop mechanical parts on the field. The separation of parts for the sake of competition is a foul act, and the robot's use of separated parts is invalid. Separate parts means that at some point the parts of the robot no longer maintain any connection with the main body of the robot. Part separation due to the reasons of the player prevents the player robot from completing the task, which is considered as part of the competition. During the race, stray parts remain in place. Players and umpires clear the field at the end of the game.

5.3.3.5 If the robot throws the items carried by it out of the field due to excessive speed or program error after starting, the items shall not return to the field.

5.3.4 Restart

5.3.4.1 If the robot fails or fails to complete a task during operation, the team members can take the robot back to the corresponding base and restart it. The tasks completed by the robot before restart are valid, but the scoring model carried by the robot is invalid and kept by the referee until the end of this round of competition. The timing does not stop during this process.

5.3.4.2 Robot autonomous operation reward: in the whole process of the competition, 0 restarts, reward 40 points; 1 reboot, reward 30 points; 2 restarts, 20 points; 10 points for 3 restarts; No reward for 4 or more restarts.

5.3.4.3 There is no limit to the number of restarts of the robot in each competition, but the bonus points shall be implemented according to 5.3.4.2.

5.3.4.4 Timing does not stop or restart during restart.

5.3.5 The robot returns to base autonomously

5.3.5.1 The robot can autonomously travel to and from the base several times, regardless of restart.

5.3.5.2 The standard for autonomous return of the robot to the base is that any driving wheel of the robot is within the range of the base, and the team members can contact the robot that has returned to the base.

5.3.5.3 After the robot autonomously returns to the base, the team members can change or repair the structure of the robot.

5.3.6 End of the game

5.3.6.1 The duration of each match is 180 seconds.

5.3.6.2 After completing some tasks, if the team is not ready to continue the game or has completed all tasks, it should signal to the referee, and the referee will stop the time accordingly, record it as a single round time, and end the game; Otherwise, wait for the referee's final whistle.

5.3.6.3 After the referee blows the final whistle, the players shall immediately turn off the power supply of the robot and shall not contact the robot or any object on the field.

5.3.6.4 The referee fills in the score sheet and informs the players of the score.

5.3.6.5 The participants shall restore the venue to the pre-start state and immediately move their robots back to the debugging area.

6 points

6.1 At the end of each game, the score will be calculated according to the completion of the task. The scoring criteria for completion of tasks are set out in section 3.

6.2 The order in which tasks are completed does not affect the score of individual tasks.

6.3 Some tasks need to bring the model back to the base to calculate the score, which must meet the following requirements: (1) The accuracy of the robot's autonomous return to the base; (2) The projection of the robot partially or completely coincides with the projection of the model; Or the robot makes contact with the model.

7 Foul and disqualify

7.1 Teams that fail to show up on time will be penalized 10 points for each minute they arrive late. If the team fails to show up after more than 2 minutes, it will be disqualified.

7.2 The first false start will be warned by the referee, the robot will return to the standby area to start again, and the timing will start again. A second false start will result in disqualification.

7.3 Separating parts for competitive gain is an offence and may result in disqualification depending on the severity of the circumstances.

7.4 A warning will be given if damage to the competition model is caused by a participant or robot, whether intentionally or unintentionally. The field does not score for the task, even if the task has been completed.

7.5 During the competition, the participants shall not touch the competition model outside the base and shall not touch the robot outside the base, otherwise, it will be handled by "restart".

7.6 Failure to follow the referee's instructions will result in disqualification.

7.7 Players who contact their instructor or parents without the permission of the referee will be disqualified.

8 Results Ranking

Each team will be ranked based on their scores in total of both rounds, the higher the score is, the higher the ranking will be. If there are teams which scored the same, see followings to determine the ranking:
1)The team who used less time for all rounds will be ranked higher;
2)The team who restarts less will be ranked higher;
3) The number of completed single tasks (full marks) in all sessions ranked first;

Appendix score sheet

WER 2023 Brick Educational Robot Contest (4+3) Scoring Sheet	——

No.		Division		Round		Team	

Tasks		Max Pts	#	Score
Departure	The vertical projection is outside the base	20		
Launch a rocket	The rocket is in a vertical position, and the platform contacts the limiter	80		
Docking station	Docking module and core module adsorbed connection	60		
Time machine	The object enters the time tunnel and passes through the time window below	70		
Energy core	Unlock both sides of the fixtures away from the model	20/per		
	Bring the energy frame with the block back to base	60		
Back	The point of contact between any drive wheel and the field is within the base	30		
Field task	See venue announcement for details	100		
Field task	See venue announcement for details	100		
Field task	See venue announcement for details	100		
Autonomous operation reward	40- (number of restarts) x 10. The value must be greater than or equal to 0			
Total points				
Single round time				

umpire: _ _ _ _ _ _ _ _ _ _ _ _ _ **scorekeeper:** _ _ _ _ _ _ _ _ _ _

Team members: _

notes: _