

Rules of WER 2017 Australia Open—Industrial Age

1. Introduction

In the early 1760s, mankind entered an extremely important period in the course of scientific and technological development: First Industrial Revolution. With the emergence of the steam engine, machines started to replace humans while large factories started to replace individual hand workshops. The rapid growth of productivity stimulated demands for transportation, and correspondingly canals, hard pavements and even railways appeared. Meanwhile, the replacement of charcoal with coal reduced the cost of iron making, while the growth in iron and steel output made the construction of large-scale steel structures possible.



In the WER contest, robots designed by competing teams will impersonate miners, architects and workers of that age to carry out mining, road building, transportation, smelting, building and other tasks, or even help Watt to improve the steam engine, so as to propel human beings entry into the Industrial Age.

2. Venue and Environment

2.1. Venue

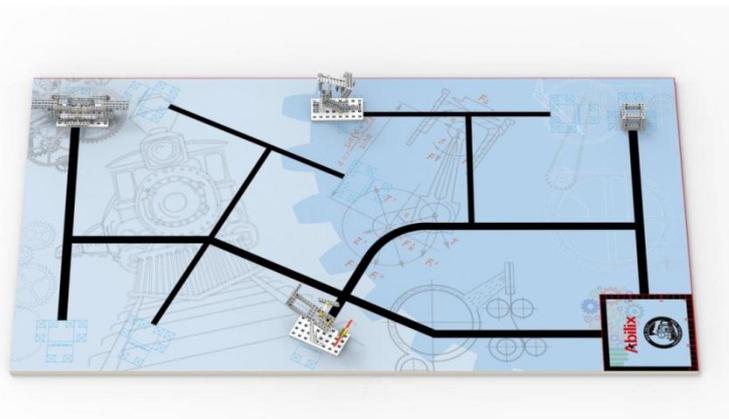


Figure 1 Venue

The size of the arena map is 220*120 cm and the material is PU cloth or inkjet cloth. The width of black leading lines is 2-3 cm, and locations of the task models are placed are marked at the end of the black leading lines with thin line (the model area). However, locations of the task models are not fixed, i.e., model locations and directions may change. There is a 30*30 cm base in the arena, and robots can return to the base repeatedly and independently.

2.2. Environment

The arena features cold light sources, low illumination, and no magnetic interference. However, there may be uncertain factors common to general competition environment, such as lines on the surface or uneven surface, changes in lighting conditions, etc. Therefore, teams should take countermeasures into consideration when designing the robot.

3. Tasks and Scoring

The competition comprises 4 preset tasks and 3 additional tasks. Contents of the preset tasks will be released later in this document, but the model location and direction may change, which will be announced during the preparation period of each competition. The additional tasks will be released at the beginning of competition. The following preset tasks are only simulations of certain scenarios in real life, so please do not compare them with real life.

3.1. Obtaining Energy Block

3.1.1. 2 energy blocks will be placed on the task model, as shown in Figure 2.

3.1.2 The robot should remove the energy block from the task model and the vertical projection of any part of the robot should fall into the base. Wherein, 30 points will be awarded for each satisfactory energy block.

3.1.3 The front projection of the robot carrying the energy block can be scored as long as it enters the base, and the energy block without any contact with the robot is not scored at this time.

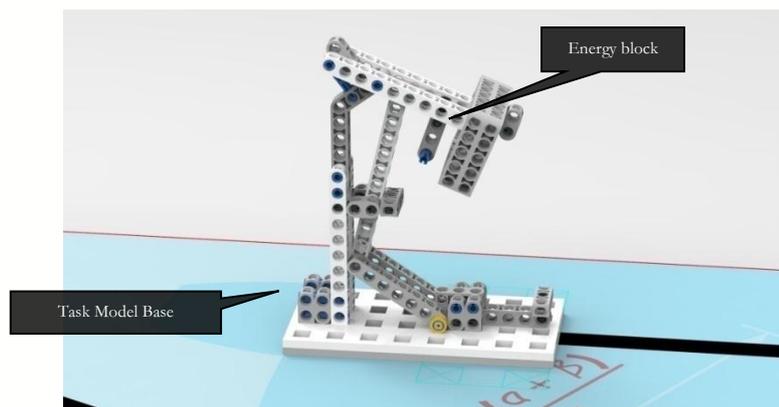


Figure 2 Energy block on the task model

3.2 Bridge construction

3.2.1 There is a model of a bridge to be constructed on the site, as shown in Figure 3.

3.2.2 The robot needs to turn the handle to connect the decks. Wherein, 40 points are given as long as the gap between the two decks is less than 5 mm. Figure 4 shows the completion standards.

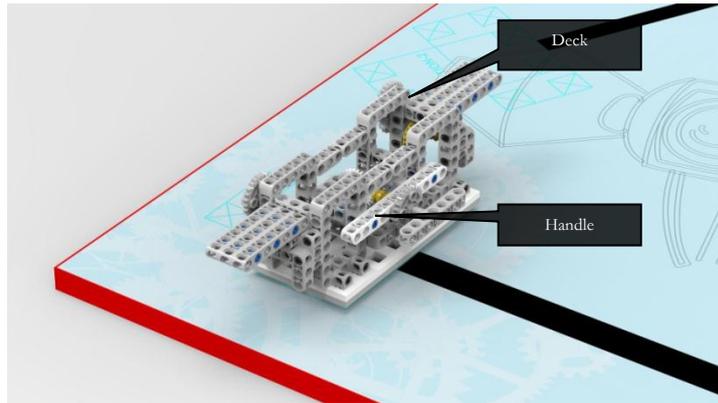


Figure 3 Initial State of the Bridge

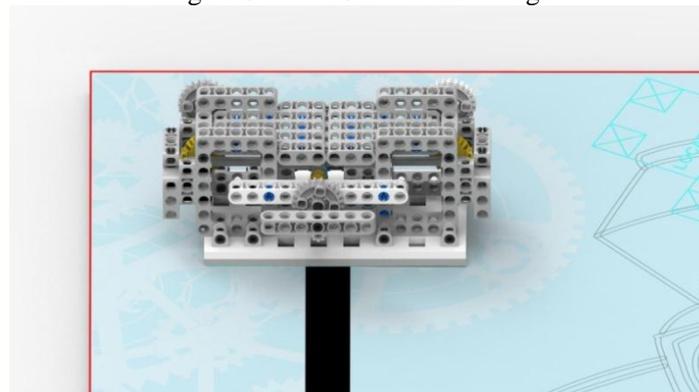


Figure 4 Competition Status of the Bridge

3.3 Fan Repairing

3.3.1 There is a model of a fan to be repaired on the site, with the handle parallel to the site, as shown in Figure 5.

3.3.2 If the robot can erect the fan perpendicular to the site, 40 points are given, as shown in Figure 6.

3.3.3 If the robot can erect the fan perpendicular to the site and then turn the handle to rotate the fan blades for more than 1 circle, 60 points are given.

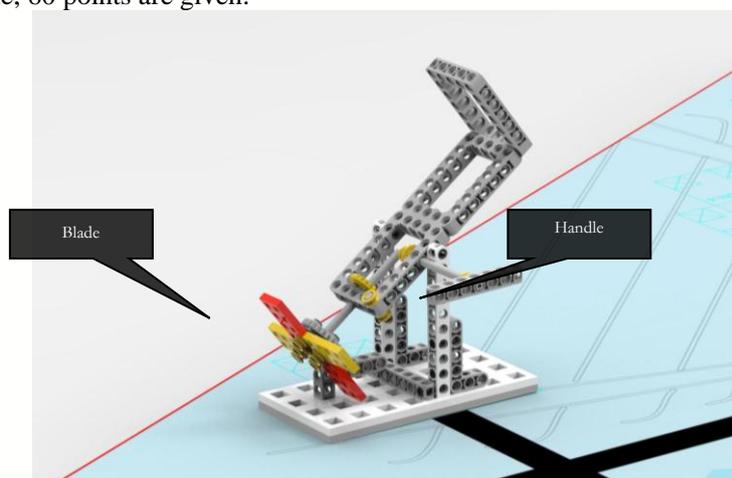


Figure 5 Fan model before repair

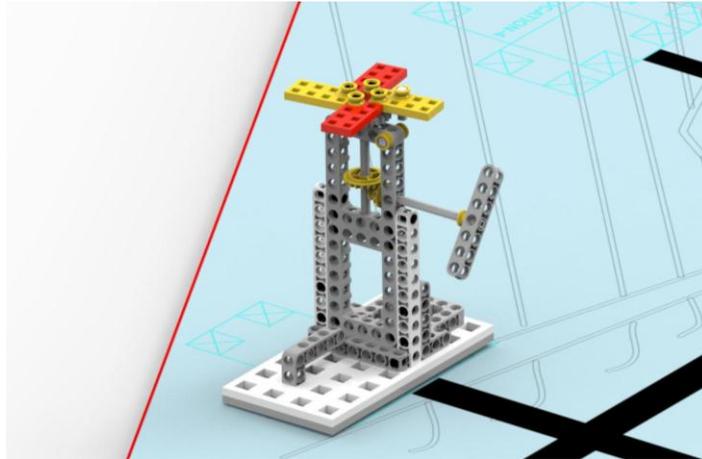


Figure 6 Fan model after repair

3.4 Iron ore mining

3.4.1 The iron ore task model is placed in the middle of the model area, as shown in Figure 7.

3.4.2 **If the robot can move the iron ore out of the model area and the vertical projection of the iron ore is completely beyond the model area, 20 points are given.**

3.4.3 If the robot can move the iron ore out of the model area and back to the base, as long as the projection of the iron ore enters the base, 40 points are given.

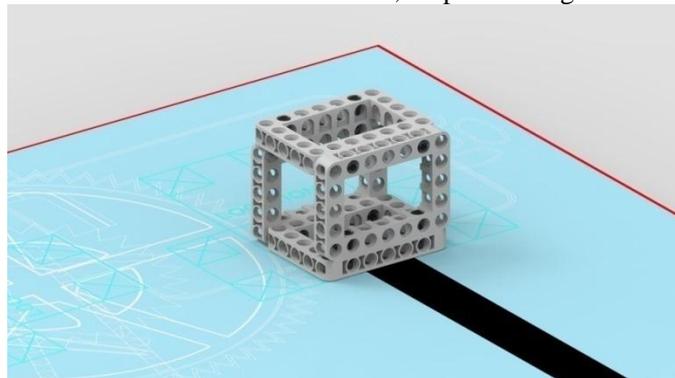


Figure 7 Iron ore model

4 Robots

This section specifies principles and requirements for the design and building of robots. All robots must pass inspection before competition. To ensure fairness, judges may randomly check the robots during the competition. Robots not up to relevant standards should be adjusted as required by the specifications, and those still not qualified after adjustments will be cancelled of qualification.

4.1 Size: The size of the robot prior to each departure should be no larger than 30*30*30 cm (L*W*H); after leaving the base, the robot's body can stretch.

4.2 Controller: **Only one controller can be used in a single round match. Replacement of controller is**

not permitted.

4.3 Actuator: Each robot can use no more than 4 DC motors (digital servos are not permitted).

4.4 Sensor: Each robot can use unlimited types and numbers of sensors, but cannot use integrated transducer that is made of several same or different sensor probes.

4.5 Structure: Each robot must use plug-in structure made of plastic materials, and cannot use auxiliary connection materials such as cable ties, screws, rivets, glues, or tapes.

4.6 Power supply: Each robot must be equipped with separate battery rather than external power supply. The battery voltage cannot be higher than 9V, while boost, buck, stabilization and other circuits are prohibited.

5 Competition

5.1 Teams

5.1.1 Each team consists of 2-4 student players and 1 coach.

5.1.2 Team members should face and deal with all the problems encountered in the competition with a positive and initiative attitude. They should respect teammates, opponents, volunteers, judges and all those who have worked hard for the competition, and strive to be players with sound personality and healthy psychology.

5.2 Competition System

5.2.1 WER Brick Robot contest is divided into primary school division, middle school division and high school division.

5.2.2 There are 2-3 rounds in the contest, without the division of a preliminary and final round. The debugging period for a single round match should not exceed 2 hours. Each team has 180 seconds to compete in each round.

5.2.3 After all the rounds are finished, points of all matches are summed up to calculate the total score of each team, and all teams are ranked based on the total score.

5.2.4 The Organizing Committee may change competition system hereof according to actual enrollment and venue situations, which should be subject to the notification of the Organizing Committee.

5.3 Competition Process

5.3.1 Robot building and programming

5.3.1.1 Robot building and programming can only be carried out in the preparation area. To test the program, players may go to the competition area.

5.3.1.2 Student players of each team can enter the preparation area only after registration. Judges will inspect equipment carried by each team. Teams are allowed to carry already built robot into the preparation area. If the robot is not up to relevant requirements, teams will be

asked to make adjustment based on requirements set forth in this document; otherwise, they will be rejected of entry into the preparation area. In addition, players should not carry storage and communication devices such as USB drive, CD-ROM, wireless routers, mobile phones, cameras, etc. After all student players are seated in the preparation area, the judge will inform them of the task model distribution map and game instructions.

5.3.1.3 Teams should bring their own laptops and may also bring maintenance parts. Players are not allowed to access the Internet and download any programs at the preparation area, nor are they allowed to use cameras and other equipment to shoot the venue or contact the coach or parents in any way.

5.3.1.4 There is 2-hour debug time for teams before each match to design the structure and programs of robots based on environment of the venue and carry out simple maintenance operations.

5.3.1.5 The venue has ordinary lighting facilities, and players may calibrate sensors. However, the Organizer does not guarantee that lighting of the venue will never change. As the match progresses, sunlight of the venue may change. In addition, the venue may also be under the influence of camera or camcorder flashlight, supplemental light, or other unknown light from other matches, for which players should solve on their own. Players must carry out commissioning and make preparations in an orderly manner, while coaches should not intervene in any manner. Teams that do not follow orders may be subject to disciplines such as being given a warning up to being canceled of qualification. Upon end of the preparation period, teams should place their robots at the designated location of the preparation area and have the robots closed.

5.3.2 Pre-match preparations

5.3.2.1 Right before the match, players should collect their robot and enter the competition area by following the ushers. Failure of any team to be present at the site within the prescribed time will be considered as a renunciation.

5.3.2.2 Players put their robots in the base. No part of the robot as well as the projection of the robot can exceed peripheries of the base.

5.3.2.3 Players should make preparations before start-up as quickly as possible (no more than 2 minutes). After completing preparations, players should make a gesture to the judge.

5.3.3 Start-up

5.3.3.1 After the judge confirms that all teams are ready, he/she will start the countdown by saying "3, 2, 1, go". Upon hearing the "Go" order, players can press buttons or send a signal to the sensor to start the robot.

5.3.3.2 If a player starts the robot before the "Go" order, it will be considered as a "false start", and the team will be given a warning or punished accordingly.

5.3.3.3 The robot, once started, can only be controlled by programs embedded in the controller. Players are not allowed to touch the robot (except for restart).

5.3.3.4 Once started, robots should not intentionally drop mechanical parts on the site. Accidentally fallen parts will be cleared out of the site by the judge. Dropping parts out of intentional strategic purposes is considered as a foul.

5.3.3.5 If a robot, after start, throws any item it has carried out of the site due to fast speed or program errors, the item cannot be returned to the site.

5.3.4 Restart

5.3.4.1 If a robot has errors or fails to finish a task during operations, players may bring the robot back to the base for restart, which will be recorded as one "restart". Points received for completing relevant tasks before the restart are still valid, but models carried by the robot at the time of restart will become invalid and be kept by the judge until the end of the match. In this process, the timing will not be suspended.

5.3.4.2 Robot Autonomous Operation Reward: During the whole process of the match, 40 points are given if the robot has 0 restarts, 30 points for 1 restart, 20 points for 2 restarts, 10 point for 3 restarts, and 0 points for 4 or more restarts.

5.3.4.3 The number of restarts per match is not limited.

5.3.4.4 Timing is neither suspended nor recounted during a restart.

5.3.5 End of match

5.3.5.1 **Each round takes 3min.**

5.3.5.2 If a team does not intend to continue after finishing certain tasks or if the team has finished all tasks, players should make a hint to the judge, who will stop the timekeeping; under such a circumstance the match finishes and the recorded time serves the time used by the team for the match. Otherwise, teams should wait for the whistle of the judge.

5.3.5.3 After the judge blows the whistle, all players must cut the power of their robot immediately, and should not touch the robot or any items on the site.

5.3.5.4 The judge fills in the scoring sheet and makes it signed by each team.

5.3.5.5 Players restore the site to pre-start state and immediately move their robot to the preparation area.

6 Scoring

6.1 Points are calculated based on tasks performed at the end of each match. Scoring criteria for

tasks are listed in Section 3.

6.2 Robots may return to the base repeatedly and independently, which is not counted as a restart. The sequence in which tasks are performed will not affect the points of individual tasks.

6.3 If for some tasks it is required that points are given after the model is brought back to the base, then the following criteria must be met at the same time: 1) the robot returns to the base independently and part of its projections is in the base; and 2) projection of the robot and that of the model are overlapped in whole or in part, or the robot is in contact with the model.

7 Fouls and Disqualification

7.1 Where teams show up late for a match, 10 points will be deducted for each minute late. If the team does not arrive after 2 minutes, it is disqualified.

7.2 A warning is given for the 1st false start, under which circumstance the robot must return to the standby area to wait for the restart and timekeeping will also restarted. For the 2nd false start, the team is disqualified.

7.3 Dropping parts out of intentional strategic purposes is considered as a foul, and the team is subject to a punishment up to disqualification depending on the severity of the circumstance.

7.4 Where player or robot damages task model, whether intentionally or unintentionally, the team is given a warning. Meanwhile, no points are given for the task, even if the task has been completed.

7.5 During the match, players are not allowed to contact the task model or the robot outside the base; otherwise it will be handled as a "restart".

7.6 Players not following instructions of the judge or intentionally contradicting the judge will be warned. Any team who commits a gross violation will be disqualified.

7.7 Players are not allowed to get in touch with coach or parents without the permission of the chief judge. Any team who commits a gross violation will be disqualified.

8 Ranking

Teams are ranked based on the overall score within each group. The higher the total score is, the higher the ranking will be.

Where teams have the same total score, the rank will be decided based on the following factors in the descending order:

- (1) the less the time used for competition is, the higher the ranking will be;
- (2) the less the number of contacts with the robot outside the base is, the higher the ranking will be;
- (3) the more the number of tasks finished in the matches is, the higher the ranking will be;

9. Miscellaneous

9.1 Any modifications to this Rule Book will be posted as "Important Notice" on the WER official website (<http://www.wercontest.org/>).

9.2 During the contest, the Judge Panel will determine any issues not address in the rulebook. Contest

Organizing Committee entrusts the Judge Panel to interpret and revise the rules.

9.3 The contest rules will be guidelines for the Judge Panel. During the contest, judges should have the final ruling rights. The judges won't replay the recorded matches. Should there be any questions concerning the judges, a student participant will present a written appeal to the chief judge after the round is completed. The Organizing Committee will not address complaints made by coaches or parents.

Extended task

1. Tasks

The task will be published before the extended task competition start.

2. Team ranking

2.1 The competition will run as the knockout rounds.

2.2 Each arena will have one group winner.

3. Prizes

The first, second and third prizes, and first prizes of each site will be generated.

Team show

1. Display area layout

The participating team should arrange the area to display and welcome other teams, as well as the visit of judges. The competition is just a small part of activity. Importantly, players should show ourselves and make friends.

The organizer of this competition encourages the team members to wear some garments that embody the theme to show personality or interest, or they can wear striking clothes which might deepen the impression of judges and other teams.

Some crafts, gifts or visiting cards can be granted to your new friends.

2.WER video

With the development of science and technology, the robots is coming to our life. I believe that you've already known about the film "Big Hero 6". In that future world everyone has their own robot friend. These robots play important roles in traffic, medical and community.

Try to imagine that, 20 years later, you've grown up, having an dream job. Which role will your robot partner play in your life?

Make a video themed "My Robot Partner"

1. Contents of videos

In the video, you should display your own identity and the role your robot partner plays in your dream life in the future.

2. Requirements of making videos

Time of video should be no less than 60 seconds and no more than 90 seconds.

Formats:16:9 landscape, MPEG-4、 AVI、 MOV, no more than 100MB;

The name of videos should be the full name of school plus the name of team(conform to the table), for example:

(School____Team____)

If the video does not meet the above-mentioned requirements, it may be filtrated by the system and results in no grade .

3. Selection rules

1) The players should provide personal original and unissued works. Plagiarism and copying other people's works are strictly forbidden.

2) The works shall conform to the theme of the competition with healthy contents, and shall

not violate the provisions of the laws and regulations of the state. It shall not be subject to any reactionary, pornographic or other contents, otherwise they shall be deemed invalid.

3) All the selected works, the organizer has the right to public welfare undertakings for publicity, brand column publicity and publicity contest and other purposes, not pay royalties and portrait royalties. The Organizing Committee sees all competitors following the rules.

4) The score is included in the team's total score.

4. Selection criteria

1) Selection criteria for entries (total points:50)

(1) Theme: prominent theme and distinct conception. (fifteen points)

(2) Originality: the content of video shoot is unique with prominent characteristics. (twenty points)

(3) Appeal: high visibility, attraction and influence.(fifteen points)

2) Conditions for selection of category awards (works that meet the following conditions shall be selected by the evaluation experts of the Organizing Committee)

(1) Best Team Award: demonstrate the idea of theme, team work and team players possess outstanding performance.

(2) Best Lens Award: present themes with the most unique perspective.

(3) Best Creative Award: present the innovative works highlighting the robot features.

5. Delivery method

1) For domestic teams, please upload the videos to youku; for international teams, please upload the videos to youtube and send the link to mailbox: wer_video@wercontest.org.

2) The deadline of video delivery is July 15,2017. The project will not be evaluated in the case of overdue delivery.

6. Notes

Outstanding entries will be displayed on the day of the contest.

Annex 1: Scoring Sheet

WER Contest Scoring Sheet			Round#	
No.		Team Name		
Task		Points	Score	
Obtaining Energy Block	The robot takes 1 energy block back to the base.	30		
	The robot takes 2 energy blocks back to the base.	60		
Bridge construction	The robot turns the handle to connect the decks and the gap between the two decks is less than 3/16" (5 mm).	40		
Fan repairing	The robot tilts the fan back to perpendicular position in relative to the ground.	40		
	The robot tilts the fan perpendicular to the ground and then turns the handle to rotate the fan blades for more than 1 cycle.	60		
Iron ore mining	The robot moves the iron ore out of the model area.	20		
	The robot moves the iron ore out of the model area and back to the base, and the projection of the iron ore enters the base.	40		
Additional Task 1	See announcements during the competition.	100		
Additional Task 2	See announcements during the competition.	100		
Additional Task 3	See announcements during the competition.	100		
Autonomous Operation Reward	40 – (number of restarts) * 10. The score should be no less than 0.			

Total Score	
Single round completion time	

Remarks on disqualification:

Judge: _____ **Scorekeeper:** _____

Players: _____

Chief Judge: _____ **Data Entry By:** _____