GENERAL RULES

WRO®
WORLD ROBOT OLYMPIAD ™

ROBO
SPORTS

TEAMS COMPETE
WITH 1 ROBOT
IN A FUN GAME

AGE GROUP:
UP TO ORGANISER

ENTRY LEVEL GAME
DODGE BALL

WRO INTERNATIONAL PREMIUM PARTNER

LEGO education

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IMPORTANT: Entry Level Game only at national events

This rule document is made for all WRO events around the world and it is made to attract new teams for WRO Sport Games. A WRO National Organizer has the right to adapt these rules to suit local circumstances. There is no international tournament in this entry level game. This gives more freedom in addition / changing rules locally.

1. General information

Introduction
In the entry level game of the WRO RoboSports category, teams design a robot that competes with the robot of another team. The goal is to hit the other robot with a ball, and the robots are coded to play matches autonomously.

This entry level game is only offered at a National Level, there is no international tournament.

Focus Areas
Every WRO category and game has a special focus on learning with robots.

At the WRO Dodge Ball Game of the WRO RoboSports category, students will focus on developing in the following areas:

- General coding skills & basic robotics concepts (perception of environment, control, navigation).
- Orientation of the robot on the field in an environment with another robot that moves
- Computational Thinking (e.g., tinkering, debugging, collaboration etc.).
- Teamwork, communication, problem solving, creativity.

Learning is most important

WRO wants to inspire students around the world for STEM related subjects and we want the students to develop their skills through playful learning in our competitions. This is why the following aspects are key for all our competition programs:

- ❖ Teachers, parents or other adults can help, guide and inspire the team, but they are not allow to build or code/program the robot.
- ❖ Teams, coaches and judges accept our WRO Guiding Principles and WRO Ethics Code to ensure a fair and rewarding competition for all.
- ❖ On a competition day, Teams and Coaches respect the final decision judges take and work with other teams and judges on a fair competition.

More information on the WRO Ethics Code you find here: link.wro-association.org/Ethics-Code

2. Team and Age Groups definitions

2.1. A team consists of 2 or 3 students.
2.2. A team is guided by a coach.
2.3. 1 team member and 1 coach are not considered a team and cannot participate.
2.4. A team may only participate in one of the WRO categories in a season.
2.5. A student may only participate in one team.
2.6. The minimum age of a coach at an international event is 18 years old.
2.7. Coaches may work with more than one team.
2.8. The age group for this category is defined for students in the age of [to be decided by the National Organizer] old.
2.9. The maximum age indicated represents the age that the participant turns in the calendar year of the competition, **not** his/her age on the competition day.

3. Responsibilities and team's own work

3.1. A team should play fair and be respectful towards teams, coaches, judges and competition organizers. By competing in WRO, teams and coaches accept the WRO Guiding Principles that can be found at: link.wro-association.org/Ethics-Code
3.2. Every team and coach need to sign the WRO Ethics Code. The organizer of the competition will define how the Ethics Code is collected and signed.
3.3. The construction and coding of the robot may be done only by the team. The task of the coach is to accompany them, help them with organizational and logistical matters and support the team in case of questions or problems. The coach cannot be involved in the construction and programming of the robot. This applies to both the day of the competition and the preparation.
3.4. A team is not allowed to communicate in any way with people outside of the competition area while the competition is running. If communication is necessary, they should ask the permission of a judge who may allow team members to communicate with others, under a judge's supervision.
3.5. Team members are not allowed to bring and use mobile (cell) phones or any other communication device into the competition area.
3.6. Destruction or tampering with competition courts/tables, materials, or robots of other teams is prohibited.
3.7. It is not allowed to use a solution (hardware and / or software) that is (a.) the same or too similar to solutions sold or posted online or (b.) the same or too similar to another solution at the competition and clearly not the team's own work. This includes solutions from teams of the same institution and/or country.
3.8. If there is a suspicion in relation to rule 3.3 and 3.7, the team will be subjection for investigation and any consequences as mentioned in 3.9 can apply. Especially in these cases rule 3.9.2 may be used to not allow this team to progress to the next competition, even if the team would win the competition with the solution that is likely not their own.

3.9. If any of the rules mentioned in this document are broken or violated, the judges can decide on one or more of the following consequences. Before a decision is reached, a team or individual team members may be interviewed to find out more about the possible violation of the rules. The interview can include questions about the robot or the program.

3.9.1. A team may not be allowed to participate in a game and gets 0 points, the other team gets 3 points.

3.9.2. A team may be disqualified completely from the competition.

4. WRO Dodge Ball – Game Description & Game Field

Each match of the challenge is for two teams of students. Each team of students prepares a robot as so it plays against another team's robot. Both robots operate on the same field. The task of every robot is to hit the opponent with a ball.

Before the start every robot is equipped with 2 balls. After the start signal, the robots should discover the opponent's robot without leaving the yellow area and roll at least one ball as so the ball touches the body of another robot. But the opponent is doing the same at the same time so the winner is that robot which hits the opponent earlier.

A match takes 60 seconds.

The following graphic shows the game field.

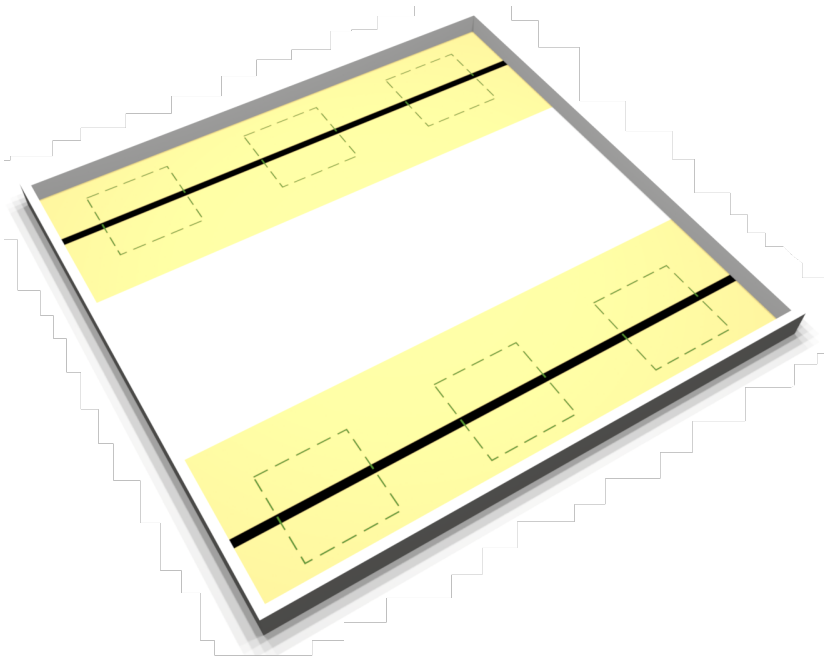

Figure 1. Game field

5. WRO Dodge Ball – Specific Game Rules

WRO Doge Ball Tournament

5.1. WRO Dodge Ball tournament is a set of games.
5.2. Each team plays every other team once. For example, if there are 10 teams, 45 games will be played. Another tournament scheme (for example, the swiss-system tournament https://en.wikipedia.org/wiki/Swiss-system_tournament or the double elimination tournament https://en.wikipedia.org/wiki/Double-elimination_tournament) can be used for the International Final.
5.3. Every game consists of three matches of the same two teams in row.
5.4. The teams can bring the robots assembled.
5.5. Contestants may make the program for the robot beforehand.
5.6. Teams should prepare and bring all the equipment, software and portable computers they need during the tournament.
5.7. There will be a minimum of 60 minutes of maintenance time before the start of the first match. During maintenance time, the contestants may perform practices in their specified places, or may queue with their robots to have one practice game on the game field, or may take measurements in the game field in so far as this does not interfere with other teams' practice. Teams are allowed to make changes to the program or to adjust the robot mechanically.
5.8. All robots must be placed on in a designated area (dock area) for the size check after the end of the maintenance period. All controllers of the robot must be powered off. No mechanisms or programs may be modified after this time.
5.9. The robot may take part in the competition only after it has passed the size check.
5.10. If a robot does not pass the size check by the judges, the judges may provide a team up to 3 minutes to address issues found. Only one three minutes period can be provided by judges for a team.
5.11. After the end of a particular game, the practice time for two teams continues. They could modify their robots and programs until a call of the judges for the next game. After this call the check time for such robots starts again.

Starting Configuration:

5.12. Before the match position of the robots is determined by drawing a dice twice. A dice's face defines the position of the robot: 1 and 2 on the dice corresponds to the position A, 3 and 4 on the dice – the position B, 5 and 6 on the dice – the position C. The first draw is for the one robot, the second draw is for another robot.

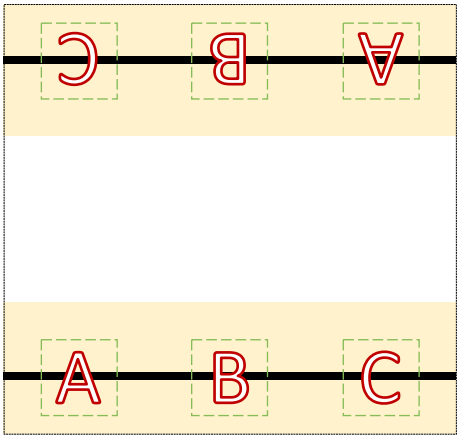

Figure 2. Start positions of the robots

Matches – Start:

5.13. Every match is 60 seconds in length.
5.14. If a robot already participated in matches (it is not the first match after the size check) and the team identified necessity to repair the robot, the judges may provide the team up to 3 minutes to address issues found. It is forbidden to upload a new program to any controller of the robot.
5.15. Each robot is equipped with maximum two 40 mm ping pong balls. The color of the balls does not matter.
5.16. Each robot is located in the starting zones as so the projections of the robot on the field are completely within the zones.
5.17. The robot is placed in the starting zone totally SWITCHED OFF!
5.18. The team is not allowed to enter any data to the robot by choosing a program specific for this particular robots' allocation or by changing positions/orientation of mechanical or electronical parts.
5.19. The robot is then switched on. If the robot has several controllers – all of them must be switched on. The robot should then be in a waiting state. Waiting for a start button to be pressed. The start button could be on a controller or a separately installed Push Button. Only one start button is allowed.
5.20. The match timer starts when the judge gives the signal to start. The start button is then pressed and the time for the attempt is started.

Matches – During the Match:

5.21. The robot is allowed to start moving just after the start.
5.22. The robot is allowed to roll several balls at once.
5.23. The robot is allowed to pick up balls located in its yellow area. It is assumed that these balls are previously rolled by this robot or by the opponent.
5.24. The robot cannot leave its yellow area: the projection of any element of the robot must be within the area during the match.
5.25. The robot is not allowed to roll any ball during the first 3 seconds of the game.
5.26. The robot is not allowed throw or shoot the balls. It means that as soon as the ball is released by the robot it must touch the field until don't touch another robot's yellow area.

Matches – End of a match:

5.27. The match ends and time is stopped if any of the following conditions occurs:
5.27.1. The match timer expires.
5.27.2. A ball actively hits a robot:
a) A ball rolled by one robot hits another robot. The second robot loses the match.
b) A ball rolled by a robot returns and hits the robot itself (e.g. when a spinner returns to the robot). This robot loses the match.
The following rules are applicable for the both cases described above:
- The hit is successful only if the rolling ball touches any element of the robot. if the ball does not move but the robot touches it, it is not considered as a hit.
- If the ball rebounded from the wall and touches the robot after that, it is not considered as a hit.

5.27.3. The robot rolls a ball in the first three seconds of the match. This robot loses the match.
5.27.4. The robot leaves its yellow area. This robot loses the match.
5.27.5. The robot throws or shoots the ball or removes the ball intentionally from the field. This robot loses the match.
5.27.6. Any team member touches a robot, a ball, the field mat. This team loses the match.
5.27.7. The robot drives outside of the game field. This robot loses the match.
5.28. Teams' members must stop their robots when the judge makes the signal that the match is stopped. The robots must stay on the field till the permission from the judge to take them off. Teams' members must not move the balls. The team which violates the rule loses the match.
5.29. The judges will base their decisions on the rules and a fair game play. They have a final decision on the competition day. If there is any uncertainty to during the match (whether the ball hits the robot, whether the robot does not operate with balls properly etc) decisions can result into a negative result for a/one team.

Matches – Re-run:

5.30. If two robots hit each other by balls at the same time (as per judge decision) the match will re-run.
5.31. If none of the robots hit the opponent by a ball during 60 seconds the match will re-run.
5.32. New robots' positions are chosen for the match re-run.
5.33. Maximum three re-runs of matches are allowed in one game (normal no. of matches: 3, maximum number including re-runs: 6). Once it is decided that a match will be re-run, the result of the re-run will count.

6. WRO Dodge Ball – Scoring

6.1. If a team wins two or more matches, the team will win the game and gets 3 points, the other team gets 0 points.
6.2. In all other situations, the game is considered as a tie and both teams get 1 point.
6.3. The teams' ranks for tournament are built based on the sum of each team's points received in the games. If two teams have the same sum of points, the judges can consider to have additional set of matches till one team has two wins more (in additional matches) than another team.

7. Robot material & regulations

7.1. A robot can be built from any robotics kits or with usage of 3D printed elements, elements prepared with a CNC machine, elements cut from acrylic/wood/metal or any elements from any material.
7.2. There is no limitation on the controller, sensors, motors and batteries brand.
7.3. The robot's dimensions must not exceed 200x200 mm. The height of the robot must not be less than 100 mm but cannot exceed 200 mm. The size check for the robot is made with the robot equipped by the balls.
7.4. Control software can be written in any programming language – there are no restrictions on a specific language.
7.5. The robot must be autonomous and operates during the matches by itself. Any radio communication, remote control, and wired control systems are not allowed while the vehicle is running. Teams in violation of this rule will be disqualified.
7.6. Participants are not allowed to interfere with or assist the robot while it is running. This includes entering data to a program by giving visual, audio or any other signals to the robot during the match. Teams that violate this rule will be disqualified at that match.

8. Game table and equipment

Game Table & Field

8.1. Size of the game mat is 1200 x 1140 mm (+/- 5 mm).
8.2. The main color of the field is white.
8.3. The field is surrounded by walls with inner height 50 mm.
8.4. The inner color of the walls is white. The outer color of the walls is not defined.
8.5. The thickness of the walls is not defined.
8.6. The width of the black lines is 20 mm.
8.7. The width of the yellow (RGB: 255, 242, 204) areas is 350 mm.
8.8. The size of robot starting zones is 200 x 200 mm. The color of the dashed lines surrounding the zones is green (RGB: 72, 161, 0).

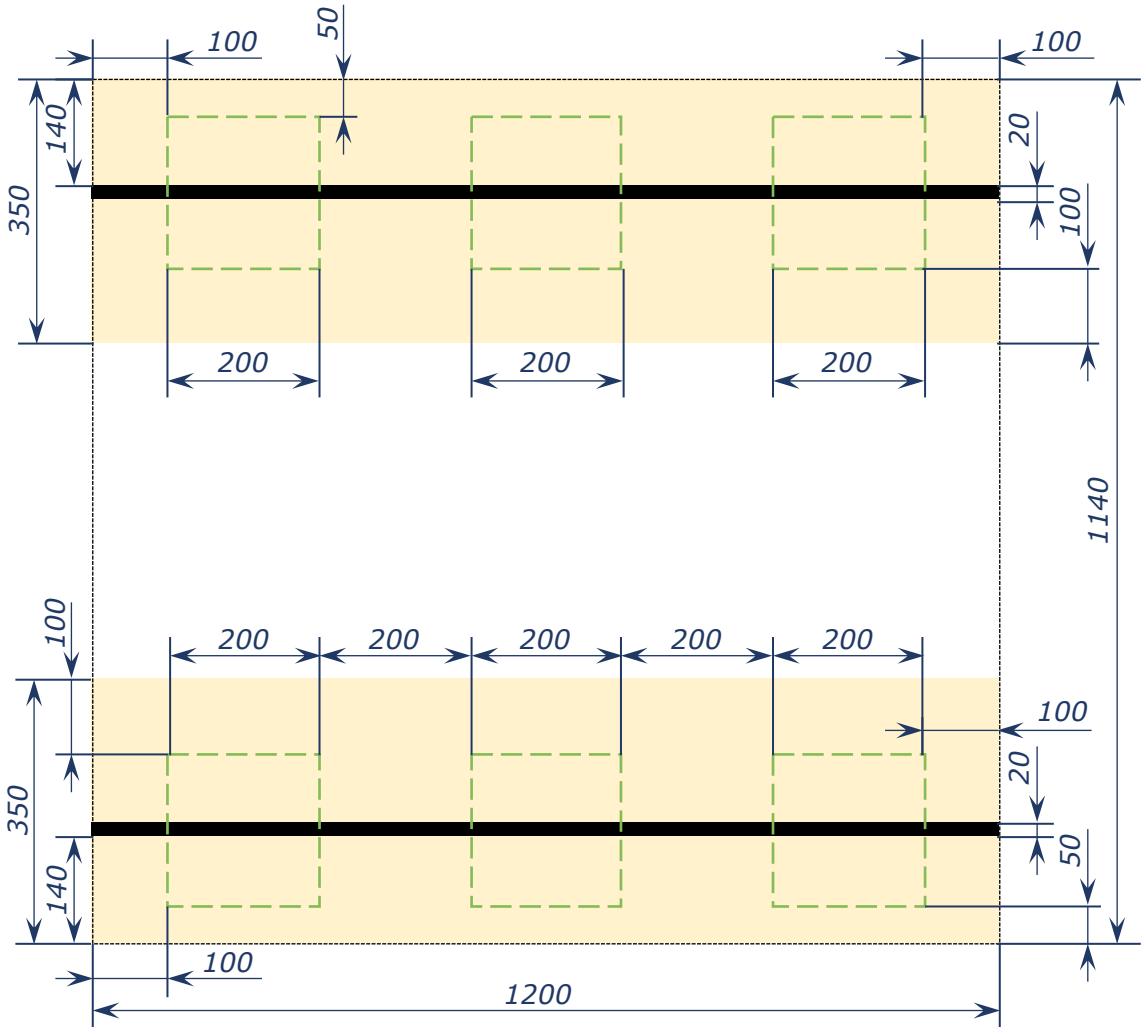

Figure 3. The game field map with sizes