Annex to the Regulations for the VI International Festival of
Robotics, Programming and Innovation Technologies
"RoboLand 2021".

REGULATION OF ROBOT COMPETITIONS “FOOTBALL WRO”

Age of participants: 10-19 years old.
Team: 2 people.
Robots: 2 autonomous robots. Equipment used: LEGO Mindstorms (NXT or EV3) and HiTechnic sensors (colors, compass, IR radiation detector).
Programming language: at the team’s discretion, no restrictions.
Competition order: group games in a circle, group winners play in one circle to determine the winner and the winners of the competition.

Game description

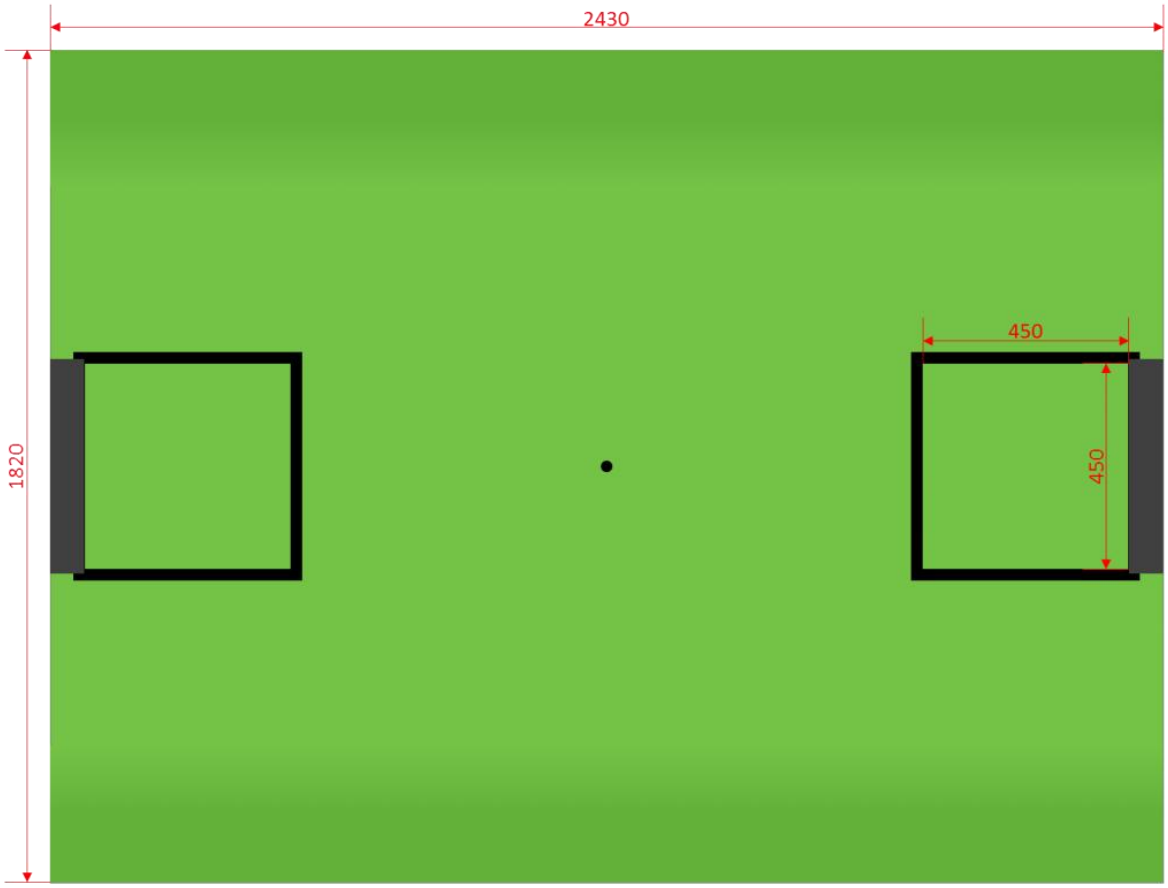
Two teams of two autonomous robots are chasing an infrared ball through a standard WRO-sized field to score as many goals as possible.

Purpose

Robotics is an excellent platform for learning skills relevant to the 21st century. Solving robotic problems develops in students an innovative approach, creativity and problem-solving skills, and since robotics combines several disciplines of the curriculum, students must acquire and apply knowledge in science, technology, mathematics and computer programming. The greatest benefit in robot design is that students have fun, work together as a team, and learning happens naturally.

Field for Football WRO

The standard WRO field will be used in the competition in full accordance with the specifications. If changes are required locally, all competitors should be informed before the day of the competition.



Code of Rules Changes

3.6 If a team leads with 5 scores in a 5-minute round or 10 scores in a 10-minute round, the game will be stopped according to the Mercy rule and the current results will be recorded.

4.12 If a robot is touched or removed from the field without the referee's permission, a 2-minute penalty time will be awarded.

8.17 A handle must be provided in the design of the robot so that the referees can easily take it. This handle is not subject to any restrictions in height or weight of the robot.

8.7 The use of other materials in the design is not permitted, including glue, adhesive tape, screws, etc. An exception to this is the minimum use of adhesive tape to protect the IR sensor from external light sources.

8.9. A maximum of three LEGO omni-wheels are permitted. The use of a ball impact mechanism in the remaining output port EV3 is highly recommended.

8.18 Battery selection is limited to the grey LEGO battery or 6 AA batteries with a rating of only 1.5 V. The maximum individual AA voltage is 1.83 V.

11.1 The ball grip zone is any internal space defined by the result of the vertical surface being applied to protruding parts of the robot that may touch the ball.

Rules and regulations for the conduct

1. Teams

1.1 There must be two robots in a team: either the goalkeeper and the forward or two forwards.

1.2 Replacing robots is strictly prohibited. The team that replaced the robots will be exempted from the competition.

1.3 Teams must include two contestants.

2. The score

2.1 A goal is scored if the ball hits the back of the goalposts, i.e. when the ball has completely crossed the goalpost line.

2.2 The team that scores the most goals wins the match.

2.3 A draw is only counted in group stage matches.

2.4 A penalty goal is awarded only if the referee is sure that the ball clearly rolled into the gate and hit a defending robot, which was partly behind the goalpost line and in the inner part of the goalposts.

2.5 Auto goals count as goals in favour of the opponent.

3. Duration of the match

3.1 Matches consist of two rounds of 5 minutes.

3.2 Teams are given a maximum of 5 minutes between rounds to debug the robot design and program.

3.3 The timer will continuously count down the time without any pauses during the whole match.

3.4 The referee may take a break to clarify a rule point or allow the robot to be repaired that has been damaged by drag or collision.

3.5 It is the responsibility of the teams to be present before the match starts. The team will be awarded a penalty goal for each minute of delay, up to 5 minutes.

3.6 If a team leads with 5 scores in a 5-minute round or 10 points in a 10-minute round, the game will be stopped according to the Mercy rule and the current results will be recorded.

3.7 If time allows, the final games may be played in 10-minute rounds.

4. Holding the Match

4.1 At the beginning of the match the referee will flip a coin. The team that wins the toss may choose to take the first kick at the beginning of the first or second round.

4.2 The team that takes the first kick must kick the ball, which is in the center of the field of play.

4.3 All other robots must have some of their own part inside the penalty area they are defending.

4.4 The team taking the first kick places their robots first. It is not allowed to change the position of the robots after their initial placement. The team not casting the ball places its robots second.

4.5 The match starts on the referee's command. All robots must be started immediately. The wheels of the robots may rotate before the start, but the robots must be held stationary above the field.

4.6 Robots that have started or been released to the referee's team will be removed from the field for one minute.

4.7 Robots that are absent from the field or have started late are declared "damaged" and removed from the field for one minute.

4.8 If a goal is scored, the team that concedes the goal takes the first shot to continue play.

4.9 If two opposing robots clash with each other, the referee may divide them in a minimum movement.

4.10 The referee immediately declares a “Push” as soon as the robot uses more force to 'push' the ball towards the goal. The referee then places the ball in the center of the field of play and the match continues uninterrupted. If the referee declares a “Push” and a goal is scored as a direct result of the robot “pushing” the ball, the goal will not be scored.

4.11 Team captains shall not touch robots without the referee's permission. Any robot that is held in the hands is declared to be damaged. If a goal should have been scored as a result of the robot's movement but the contestant took the robot off the field or touched it and the goal did not take place, the goal will still be counted.

4.12 If the robot is touched or removed from the field without the referee's permission, a penalty time of 2 minutes is awarded.

4.13 If the ball hits the back wall outside the goalposts, the play will not be stopped and the ball will return directly to a central point in the field. If this place is occupied by a robot, the ball is placed as close as possible, but not just before the robot.

4.14 If both robots of the defending team are in their penalty area, and their actions are considered to have the least effect on the game, the referee declares “Double Defense”, and moves the robot with the least effect on the game to the center of the field. There should be no goalkeeper.

5. Restart

5.1 A "restart" is declared if the ball is trapped between several robots within a reasonable period of time and has no chance of being released, or if the robot has no chance of approaching the ball within a reasonable period of time. Any period of time of up to 15 seconds is accepted as a "reasonable time".

5.2 Any robot that is stuck must be moved to its penalty area immediately. A part of the robot shall be inside the penalty area.

5.3 The robots may be kept switched on and held in the handle.

5.4 The referee launches the ball from a place to the center of the long wall of the field towards the center of the field.

5.5 Robots may be released once the referee has released the ball.

5.6 Any robot that cannot start immediately will be declared 'damaged'.

5.7 Any robot that is released before the ball is released will be removed from the field for one minute.

6. Damaged robots.

6.1 The robot will be declared by the referee to be damaged if it has serious damage, moves incorrectly or does not react to the ball.

6.2 Players may remove robots from the field as soon as the referee gives permission after a team captain's request. Such a robot will be considered to have been damaged.

6.3 The damaged robot shall remain off the field for one minute or until the first goal is scored.

6.4 If the robot is touched or removed without the referee's permission, the robot will be awarded a penalty time of two minutes.

6.5 The damaged robot must be repaired before it can be returned to the field. If the robot is not repaired or cannot be repaired, it will be removed before the match is over.

6.6 A damaged robot may only be returned to the field of play after the referee has given permission. The robot must be placed in the penalty area of its team and in a position that does not give the robot a clear advantage, i.e. not in the direction of the ball.

6.7 If the robot is rolled over through its own fault or as a result of an encounter with the robot by its team, it will be deemed to have been damaged.

6.8 If the robot is rolled over by impact with an opponent's robot, it will not be considered to be damaged and may be placed by the referee and the match must continue.

7. Explanation of the rules

7.1 During the match the referee’s decision is final.

7.2 If opponents demand clarification of the rules, they must do so immediately by asking for a "Referee's break". The match timer will be stopped.

7.3 If the team captain is not satisfied with the referee's explanation, he may ask to contact the chief referee of the match.

7.4 Coaches must not be involved in any discussion of the rules.

7.5 Video recordings are not accepted.

7.6 Once the chief referee of the competition and the match referee have reached a common decision, no further discussions will be accepted.

7.7 Any further objection will result in the presentation of a Yellow Card, and then the Red Card if the team captain or coach continues to object.

7.8 The red card will cause that person to leave the competition area before the end of the competition.

7.9 Non-compliance with the Red Card will result in the final exclusion of a person from any football tournament.

7.10 The Chief Referee of the competition may need to make changes to the rules due to local conditions or the circumstances of the competition. Participants will be notified of this at the earliest opportunity.

8. Robot Provision

8.1 Robots shall be designed and programmed exclusively by students.

8.2 The robots shall only be assembled using LEGO parts.

8.3 The controller, motors and sensors used to assemble the robots shall be LEGO® MINDSTORMS and HiTechnic kits (one HiTechnic V2 infrared sensor, one HiTechnic color sensor and one HiTechnic compass sensor).

8.4 Only one NXT or EV3 ultrasonic sensor may be used in robots. The sensor should be placed in the rear half of the robot and facing right when the robot is looking at the opponent's goalposts.

8.5 The WRO Organizing Committee recommends using educational versions of Lego Mindstorms kits in view of the extended service provided by LEGO Education distributors.

8.6 LEGO parts cannot be modified in any way.

8.7 The use of other materials in the construction is not permitted, including glue, adhesive tape, screws, etc. An exception to this is the minimum use of adhesive tape to protect the IR sensor from external light sources.

8.8 Omni-wheels of the finished assembly are not permitted.

8.9 A maximum of three LEGO omnibus wheels are permitted. The use of a ball impact mechanism in the remaining output port EV3 is strongly recommended.

8.10 Cable ties or tape may be used to reinforce wires.

8.11 Any software may be used as control programs.

8.12 Robots shall be measured in an upright position and shall not rest on anything and their movable parts shall be extended to the maximum extent possible.

8.13. The robot shall be placed in an upright position in a vertical cylinder 22 cm in diameter.

8.14 The robot shall be below 22 cm in height.

8.15 The weight of the robot shall not exceed 1 kg.

8.16. If the robot has a part that can be extended in two directions, the robot shall be inspected during operation of that part. The robot shall not touch the measuring cylinder during this process.

8.17 The design of the robot shall include a handle that can be easily taken by the referee. This handle shall not be subject to any restrictions in height or weight of the robot.

8.18 The choice of battery is limited to a grey LEGO battery or 6 AA batteries of only 1.5 V rating. The maximum individual AA voltage is 1.83 V.

8.19 Competitors shall design their robot (marked, decorated) so that it is visible that the robot belongs to the same team. This should not affect the gameplay. The design of the robot also does not fall within the height limit.

8.20 Colouring robots or the light they emit should not interfere with the sensors of other robots.

9. Robot assembly

9.1 Robots must be assembled in advance.

9.2 Teams may do the program in advance.

9.3 Robots may be modified during the "event opening" or the period of the competition, i.e. no quarantine before or between matches.

9.4 Competitors are responsible for ensuring that the robot complies with the rules throughout the competition period. If, after the match, it is found that the robot did not comply with the rules, the scores awarded to the team in matches involving such a robot will be cancelled.

9.5 The robots shall be designed to take into account possible surface irregularities up to a height of 5 mm and tilt.

9.6 Teams shall design and program their robots to take into account changes in lighting, ball intensity and magnetic conditions, as they may differ from one another at different locations, and may change over time.

10. Robot control

10.1 Robots must operate autonomously.

10.2 The robots shall be provided with manual start-up.

10.3 No remote control of any kind shall be permitted.

10.4 Robots shall be capable of moving in any direction.

10.5 Communication between robots via Bluetooth is acceptable as long as it does not interfere with other robots.

10.6 It shall be possible to disable communication between robots at the referee's request.

11. Driving the ball

11.1 The ball tackle area is any internal space defined by applying a vertical surface to protruding parts of the robot that may touch the ball.

11.2 The ball may not go more than 2 cm into the catching area of the ball.

11.3 A robot cannot "hold" the ball. To hold the ball is to take full control of the ball, excluding any freedom of movement of the robot. Examples are locking the ball into the robot's structure, hiding the ball by the robot, or blocking it by any part of the robot. If the ball stops rotating while the robot is moving, or if the ball does not bounce when it hits the robot, it is a good indication that the ball is blocked and it is a violation of the rules.

11.4 It is not permitted to keep the ball under the robot, in other words, no part of the robot may hang over the ball by more than half the diameter of the ball.

11.5 If the robot has a mechanism to hit the ball, the robot shall measure the edge of that mechanism, fully extended.

12. Goalkeepers

12.1 If a team uses a goalkeeper, the goalkeeper may not be restricted in movement and may only move in one direction on the field. It must be programmed to move in all directions.

12.2 The goalkeeper must react by moving forward to intercept the ball before it hits the goal. If necessary, the goalkeeper's robot may extend some distance beyond the penalty area (up to 45 cm from the goalposts).

12.3 A reaction to the ball by moving to the side and then forward is not permitted.

12.4 If the goalkeeper's robot does not respond to the ball signals by moving forward, the goalkeeper is deemed to be "damaged" (see section 6).

13. Authentication of student work

13.1 Students will be asked to explain how their robots work during the survey to ensure that they have assembled and programmed the robots themselves.

13.2 Students will be required to answer questions about their participation in the preparation process.

13.3 Students will be shown to have a complete understanding of the program.

13.4 The organisers are expected to conduct a survey prior to all events.

13.5 If the expert committee determines that the mentor has provided substantial assistance or work on the robots was mainly done by students, the team will be disqualified from the tournament.

14. Selection for the final

14.1 During the Round Phase, teams will be awarded three scores for victory, one score for draw and 0 score for defeat.

14.2 The teams will be selected for the finals based on the following criteria:

- Received scores
- Scored goals
- Head difference
- Winner in a match between two teams that have the same position on the previous criteria
- The strongest opponent, determined by the teams with the highest rating in their group

15. Drawing in the playoffs.

15.1 If there is a drawing in the final match, the match does not stop and the game continues until the first goal.

15.2 If a goal is not scored after 3 minutes of extra time, the goalkeepers will be removed. In the case of two forwards, the team may choose the robot that was removed.

15.3 If a goal is not scored after 3 minutes, the team with the highest rankings in the qualification round will be awarded.

16. The ball

16.1 The game shall use a 7.5 cm diameter balanced electronic ball.

16.2 All official WRO tournaments will use Hitechnic infrared electronic ball (IRB 1005) in pulsed mode - MODE D (pulsed). In bright outdoor lighting conditions, it is recommended to program with the IRV2 unit set to "Alternating" mode.