STEM education
ORGANIZATION OF EDUCATIONAL ROBOTICS, SCIENCE, TECHNOLOGY & MATHEMATICS

STEMATHLON 2026

Game Description and Rules

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Version: September 2025

A. Brief Description of the Game

Soccerbot is aimed at primary school students. In this game 2 rival alliances consisting of 2 remote-controlled robots each, chase a ball on a specially designed table (football field). The goal of each alliance is to win the game by scoring more goals than its opponents.

B. Participants

- **Ages:** 1st - 4th grade class
- **Persons per team:** minimum 2 / maximum 3 players
- **Coach:** ((from 20 years old and above)

C. Educational Objectives

Educational Robotics is a wonderful learning tool that helps students acquire all the necessary skills that our times require. Students who attempt to accomplish tasks, are trained in problem solving, cultivate their creativity, take initiative, experiment with solutions and generate innovative ideas. A special feature of Educational Robotics is that it connects many different fields of knowledge in a unique way. Thus, through it, students synthesise and put into practice the theoretical knowledge they have acquired from mathematics, algorithms, programming, engineering and science.

Perhaps the most important contribution of Educational Robotics in education is that it combines learning with entertainment (playful learning), promotes collaboration as students learn to work in groups and, in general, fosters learning in a way that is as experiential and natural as breathing. Thus, this football competition is designed in such a way that it gives the opportunity to put into practice the basic pedagogical principles of Educational Robotics. In particular, its added pedagogical value can be summarized as follows:

1. It gives children the opportunity to engage with Educational Robotics in an informal way, as participation in the competition does not require robots with automation, but focuses more on the construction part. All that is required is a rudimentary robot with minimal equipment, as the ultimate goal is to form a positive attitude and demystify Educational Robotics.
2. It largely ensures that building and programming is the personal work of the children themselves, as the requirements in terms of building skills and (visual) programming knowledge are simple, so that it is feasible for primary school children to respond (no complicated connections or algorithms are required).
3. Preparedness, decision-making and initiative are present throughout the game - and not only during the pre-match preparation -, sharpening the participants' perception, keeping

them interested and creating a pleasant atmosphere of action, full of surprises and excitement.

4. A climate of cooperation and teamwork is created, not only between members of the same team, but also through communication between the teams that form an alliance. Undoubtedly, cooperation nowadays is a key component of creativity, but it also promotes a spirit of fair play.

D. General Principles of the Game

In line with the educational objectives, the following general principles should be applied irrevocably:

1. The robots should be built and programmed exclusively by the students.
2. As in real football, the referees' decisions are final. The result of a match cannot be changed unless there has been a mistake in the scorekeeping.
3. Students and their coaches should cooperate in such a way that the educational objectives of the game are not violated. Both should also assist in the smooth running of the games.
4. What matters most is not the win or lose, but the participation itself and the excitement of a football match.
5. The Organising Committee has the right, at its discretion, to exclude a team from the competition if it finds that it attempts to use unfair means contrary to the spirit of healthy competition on equal terms not expressly provided for in these rules.
6. The rules of the game may be modified by decision of the category managers and the organizing committee before the start of the tournament and communicated to the players, in order to maintain the pedagogical spirit and the smooth running of the games. They shall also have the right to instruct the judges to intervene on the course or the hearths in case of damage or movement.

E. Game Rules

1. Students Team

1.1. Each team of students taking part in the competition must build and program a **single** robot.

1.2. Replacement of a robot for any reason is prohibited. Teams that replace any of their robots during the matches will be eliminated from the tournament.

1.3. Each team may consist of 2 or 3 students and a coach.

2. Team Alliances

2.1. An alliance consists of 2 groups of students

2.2. In every football match 2 rival alliances collide.

2.3. Before each match the alliances will be given time to discuss and determine their in-game strategy.

3. Scoring

3.1. A goal is scored when the ball crosses the entire goal line.

3.2. The alliance that scores the most goals wins the game.

3.3. If the ball, while moving towards the goal, touches a defending robot whose part is inside the goal, then the referee will award a goal to the defending alliance.

4. Duration of the Match

4.1. The match has a total duration of 8 minutes.

4.2. There is no half-time. The teams keep the same goals for all 8 minutes of the game.

4.3. During the match, time runs continuously, without stopping the clock.

4.4. When teams are not competing, they can repair and reprogram their robots.

5. Game Action

5.1. At the start of the match, the ball is placed on the white dot in the centre of the pitch. All robots must have some part of their team behind the white line of the area they are defending.

5.2. The match starts on the referee's command. All robots must be put into operation immediately after the referee's command.

5.3. If an alliance scores a goal, then, without stopping time, the ball is placed in the center of the pitch and given to the team that scored the goal. The robots of the alliance that scored the goal are positioned so that some part of them is behind the white line of the area they are defending. The alliance that scored a goal places one of its robots in its territory, with a part of it behind the white line. The second robot is placed in the center, directly behind the ball, to make a new attack.

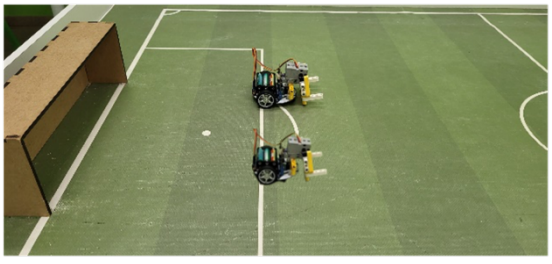


Figure 1 Indicative positioning of the robots at the start of the race

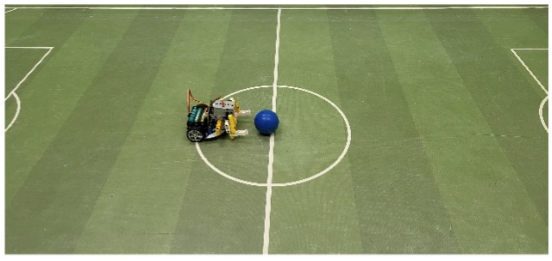


Figure 2 Indicative positioning of the robots after reaching the goal

5.4. If 2 opposing robots get stuck together, then the referee can separate them by moving them as little as possible.

5.5. The referee will blow the **"push"** whistle as soon as it is determined that a robot, in attempting to claim the ball behind an opposing robot, pushes it with such force as to drag it into the field. After the whistle blows, the ball is placed in the center of the field and play continues, without stopping time. It is understood that if a goal is scored because of a push, it is disallowed

5.6. **"Deliberate pushing"** by a robot to an opponent is prohibited when, for example, the ball is out of phase, in order to prevent it from approaching. If it is established that there is no intention to claim the ball, the robot causing the push is placed, at the referee's suggestion, in the right corner (corner kick) of the defensive area (if the dispute is on the left side of the field) or in the left corner (if the dispute is on the right side of the field) and continues play from there (see 6.2 for how to return).

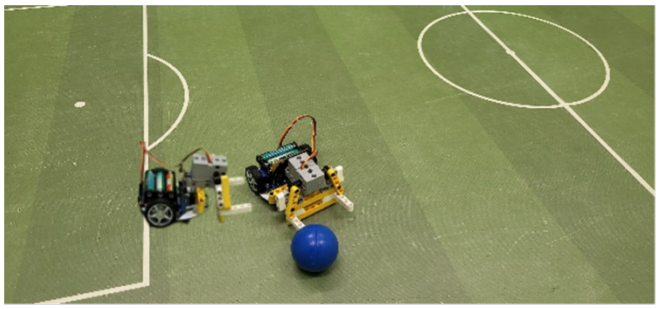


Figure 3 Pushing an opponent to claim the ball

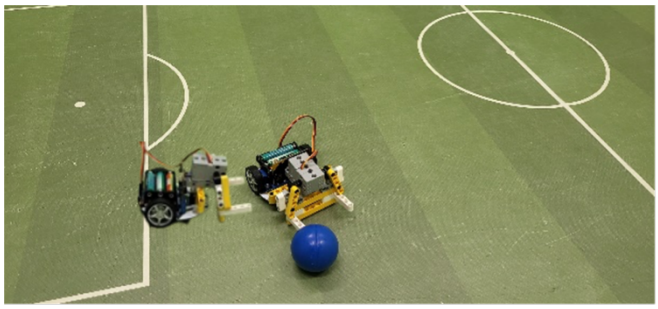
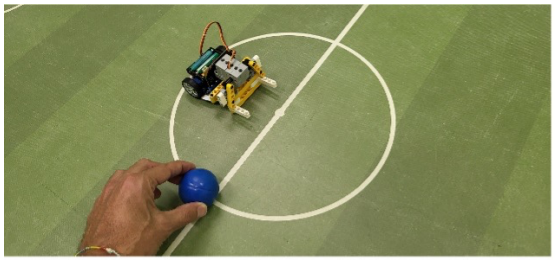
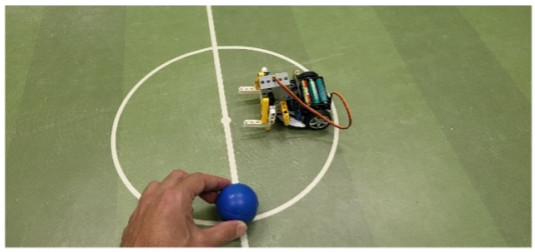


Figure 4 Deliberate pushing of an opponent

5.7. Players are not allowed to touch their robots during the entire match without the referee's permission.

5.8. If the ball goes out (outside the boundaries of the field behind the goal posts), it is immediately returned by the referee to the white ball in the center of the field. If there is a robot on the white dot at that moment, the ball is placed as close as possible to the white dot, but not directly in front of the robot there. It is preferably placed to the right or left of the center line at the intersection with the center circle, so as not to give a robot an advantage.





Figures 5 & 6 Alternative ways of placing the ball in the center

5.9. There is no side out. The track will be sloped on the sides and the ball will come back into the field of play on its own.

5.10. If both robots of the defending alliance are within their territory and their position affects the game, then the referee will whistle **"double defence"**. In this case, the robot that affects the game the least - according to the referee's suggestion - will be moved to the center of the field by the players of the team, so that a part of the robot touches the center line of the field.

Figure 7 Illustrative case of double defence

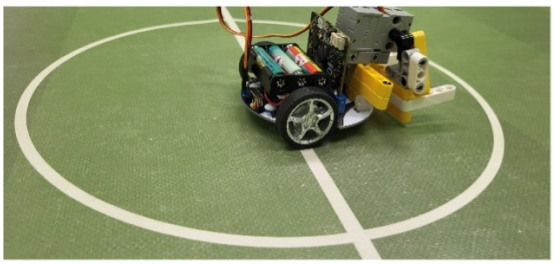


Figure 8 Indicative placement of the robot in the centre, because of the double defence penalty

5.11. It is forbidden for any robot of the defending alliance to be stationary in front of its goal intentionally or to move parallel to the goal line for more than 3 seconds. If it is determined by the referee that the ball was prevented from heading towards the goal in this way, the robot is sent off as "damaged" and is returned to the field of play after a 1-minute penalty from the corner (see 6.2 for how to return).

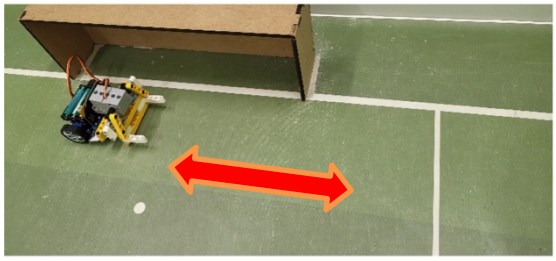


Figure 9 Movement parallel to the goal for a long period of time is penalized with a 1-minute suspension

6. Destroyed Robots

6.1. A robot will be declared **“damaged”** by the referee when:

- a part of the robot has been disassembled,
- remains stationary (communication with the computer or the tablet is lost)

- if the alliance wants to take one of its own robots out of the match for any reason

6.2. A "damaged" robot remains off the field until the repair is completed by the students. Immediately afterwards and after permission is given by the referee, it returns to the game. The robot returning to the game is placed in the corner of the corner of the defensive area, to the right or left at the players' discretion. However, it is prohibited to place it in a position that gives it an advantage in possession of the ball, e.g. directly in front of it. The referee may indicate which side the robot will return from if he considers that such an advantage is created.

6.3. If a robot rolls over for any reason, with the help of the referee it gets up again and continues the game.

6.4. If both robots from an alliance are declared "destroyed" and are eliminated from the game, the match proceeds as normal. The timer is stopped when all four robots are destroyed and restarted when even one robot comes back onto the field.

6.5. If during the process of resetting the robots one of them is damaged due to the referee untangling them, then the timer stops, and the team is given time to repair the robot. In this case, no robot is moved until the damaged robot is also returned to its original position. The ball is placed in the position it was in if it was moved after the stop. The timer starts again and the match continues as normal.

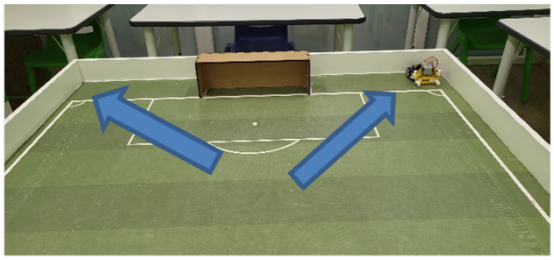


Figure 10 Positioning the robots for return to the race, after they have been marked as damaged

7. Specifications of the Robots

7.1. Teams will be required to use a **micro:bit Smart Cutebot robot** of **ELECFREAKS**, **2 microbit**.

7.2. Each robot may **optionally** have a **shooting mechanism**, i.e. an integrated structure on the front (only), to give the ball a push. This mechanism shall be built with an **ELECFREAKS Geekservo 360 Degrees** motor and LEGO building blocks or their equivalent packages.

7.3. The use of any kind of sensor motor or other mechanical material from another package is not allowed.

7.4. Modification or alteration of the tracks is prohibited.

7.5. For the assembly of robots, the use of other materials, such as glues, tapes, screws, etc.

7.6. **The red and blue ELECFREAKS balls** (weight approximately 2.3 - 2.5 gr) will be used as soccer balls.

7.7. The robots will not be autonomous, but will be controlled remotely. The operation is carried out through the microbit connection, in conjunction with a fully programmable **ELECFREAKS micro:bit Joystick:bit remote control**. The first microbit is connected on the controller and then connected to the robot's microbit via software (e.g. **makecode**). Attention must be paid to the number of microbit communication frequency, so that they do not coincide with other robots and create interference.

7.8. It is possible to make pre-programmed movements in the program.

7.9. Each robot should have at least the following dimensions: Length = 13 cm, Width = 9 cm, Height = 10 cm. (the accurate dimensions will be validated soon)

7.10. The dimensions of robots shall be measured when they are in an upright position with all moving parts fully open.

7.11. Cables are counted in the measurement of dimensions.

8. Assembly of the Robots

8.1. The robots must be ready at the time of arrival at the competition.

8.2. Competing students should not use any kind of assistance, such as instructions or drawings on paper, photos stored on the computer, etc.

8.3. Competing students are allowed to use previously written programs (before the day of the competition).

8.4. Students are allowed to modify their constructions or programs from the time they enter the competition area or in the gap between the competitions. That is, there will be no quarantine before or during the competitions.

8.5. It is the responsibility of the teams to ensure that their robots meet all specifications and restrictions set out in the rules at all times. If, after a race, a robot is found to be in breach of a rule, then the points gained in that race will be deducted from the alliance.

9. Control of the Ball

9.1. **"Ball Capture Zones"** are defined as all hollow surfaces created by tightly wrapping the entire robot with a plastic wrap.

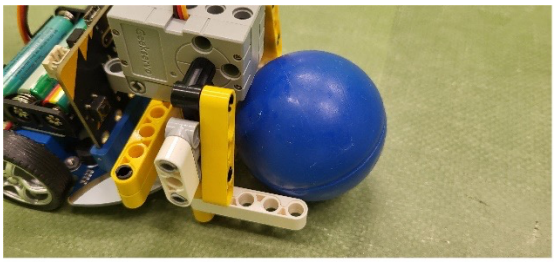
9.2. The ball is not allowed to penetrate more than 2cm into any "Ball Capture Zone".

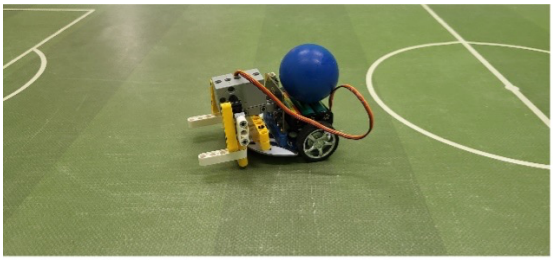
9.3. A robot is not allowed to hold the ball. This means that it must not remove any of its degrees of freedom. For example, the ball cannot be fixed in any way on the robot,

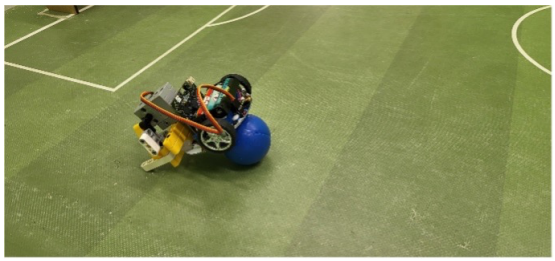
the ball cannot be surrounded by the robot, nor can the ball be trapped by any part of the robot (e.g. on the robot). If the ball stops rolling and begins to crawl while the robot is still pushing it, or if the ball does not bounce as it hits the robot, these are indications that the robot is holding the ball.

9.4. The ball cannot be under a robot. More specifically, no part of the robot may protrude above the ball by more than half of its diameter.

9.5. If a robot captures the ball, the referee places it in the center without stopping the clock.







Figures 11, 12 & 13 Cases where the ball is "captured by the robot"

THE BALL IS PLACED IN THE CENTER	THE BALL KEEPS ROLLING, WITHOUT INTERFERENCE
When the ball crosses the entire end line parallel to the goal posts (5,8)	When the ball crosses the sidelines of the court with the inclined plane
When the match starts (5.1)	
When a goal is scored (5,3)	
When an opponent is charged with "pushing" (5,5)	When a "double defence" is called by the referee in the area
When the ball gets stuck between two robots	When two robots get stuck together and the referee unblocks them
When a robot captures the ball (9,5)	

THE ROBOT IS PLACED IN THE CENTER	THE ROBOT IS PLACED IN THE CORNER
When robots do "double defense" (5,10)	When the robot makes a “deliberate push” (5,6)
	When the robot deliberately remains stationary in front of its goal or moves parallel to the goal line for more than 3 seconds (5,11)
	When a robot that was marked as damaged returns to the game (6.2)

10. Tournament Procedure

10.1. The tournament will be conducted in two phases: the qualifying and the final.

10.2. The qualifying phase will be played in 4 rounds. In each round of this phase, alliances will be formed by random draws.

10.3. In each match, the teams of the winning alliance will share 3 points each. In games that end in a tie, all teams will share 1 point each.

10.4. In the qualifying phase, teams shall be ranked in a single league table.

10.5. In the event of a tie, the following criteria will apply in order of priority:

- Goal difference
- Total number of goals scored
- Total number of goals conceded
- Highest number of goals scored in a game
- Draw

10.6. The top 16 teams in the qualifying phase qualify for the final phase.

10.7. The alliances in the final phase are fixed until the end of the tournament and are determined as follows: The 1st team is allied with the 16th, the 2nd with the 15th, the 3rd with the 14th and so on.

10.8. The alliances compete in knockout games until the grand finale.

10.9. In the event of a knockout match ending in a tie, the teams shall go to a **4-minute** overtime period, where the **golden goal rule** shall apply (whichever alliance scores first during the overtime period wins the match)

10.10. If no goal is scored during the extra time, the game shall go to penalty kicks. Each alliance will shoot 4 penalties alternately (2 of each robot mandatory) as follows: The ball is set up by the referee at the white dot in the centre and each robot takes a run towards the ball to shoot into an empty goal. The robot wheels are not allowed to touch or cross the center line. Therefore, players must hit the brakes in time. Otherwise, their penalty will be cancelled and will not be retaken.

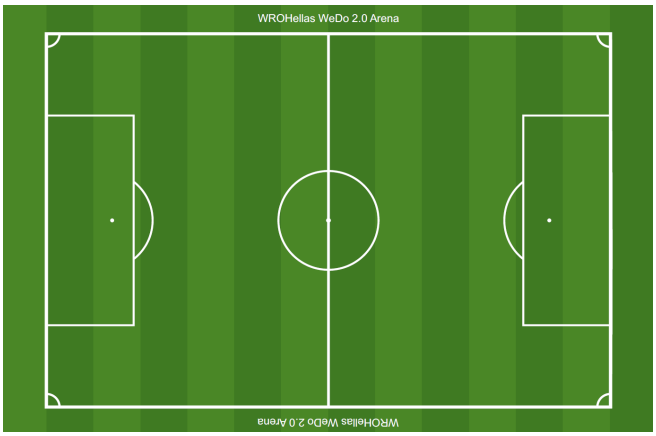
10.11. All robots shoot at the same goal, which is chosen by the 2 alliances. If they do not agree, the referee will draw lots.

10.12. The teams of the winning alliance shall jointly share 1st place.

10.13. In the event of a team withdrawing, the game is played as normal with the alliance playing with only one robot. The opposing alliance plays normally with both of its teams.

10.14. If both teams of the alliance withdraw, the opposing alliance wins the match with a score of 2-0 in its favour.

11. Football Stadium



11.1. The floor will be printed on canvas from a high-resolution file available on the STEM Education website.

11.2. The canvas has the following dimensions: **2100 X 1318 mm**

11.3. The playing field will be: **1815 X 1200 mm**

11.4. Large area dimensions: **287 X 645 mm**

11.5. The goals will have the following dimensions:

- Length: **35 cm**
- Height: **12 cm**
- Depth: **8 cm**

11.6. In order to improve the quality of play, sloping levels measuring **75mm x 10mm** (e.g. 10 pieces x 210mm long each) may be placed on the long sides of the court. The purpose of the inclined levels is to prevent the ball from sticking to the side walls of the court, but to push the ball towards the center. The height of the inclined planes may vary from court to court depending on the material used as carpeting. Ideally, when the ball is released from the top of the inclined plane, it should stop in the center of the field