



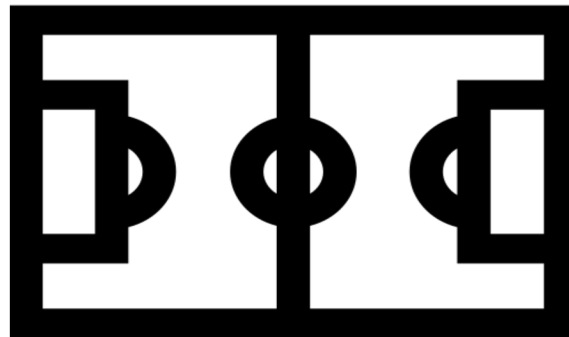
HELLAS

Panhellenic Educational Robotics Competition 2022

Parallel Elementary Class:

Football 2x2

Game description and rules



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A. Brief Description of the Game

2x2 Football is aimed at Primary School students. In this game 2 opposing alliances consisting of 2 remote-controlled robots each, chase a ball, on a specially designed table (soccer field). The goal of each alliance is to win the game by scoring more goals than their opponents.

B. Participants

- **Ages:** 3rd – 4th grade (up to 10 years old)
- **People per group:** 2-3 children
- **Coach** (from 20 years and older)

C. Educational objectives

Educational Robotics is a wonderful learning tool that helps students acquire all those necessary skills that our times require. Students who try to complete tests are trained to solve problems, cultivate their creativity, take initiative, experimentally test 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 synthesize and apply in practice the theoretical knowledge they have acquired from Mathematics, algorithms, programming, engineering and Natural Sciences.

Perhaps the most important contribution of Educational Robotics to education is that it combines learning with entertainment (playful learning), promotes collaboration as students learn to work in teams and, in general, fosters learning in a way that is both experiential and natural. , as long as our breath is.

In particular, the specific 2X2 football competition is designed in such a way that it gives the opportunity to apply the above pedagogical principles of Educational Robotics in practice. Specifically, its added pedagogical value is summarized as follows:

1. It gives an opportunity for children to engage with Educational Robotics in a smooth way, as the participation in the competition does not require robots with automations, but focuses more on the construction part. Just a rudimentary robot with minimal equipment is required as the ultimate goal is to create a positive attitude and demystify Educational Robotics.
2. It largely ensures that building and programming are children's own work, as the requirements for building skills and knowledge of (visualized) programming are simple enough for elementary school children to meet (do not require complex connections or algorithms).
3. Readiness, decision-making and initiative-taking are present throughout the game - and not only during the pre-match preparation - sharpening the perception of the participants, keeping the interest undiminished and forming an enjoyable atmosphere of action, full of surprises and emotions.

4. A climate of cooperation and teamwork (through group communication) is created, which nowadays is a key component of creativity, but also promotes a spirit of noble competition.

D. General Principles of the Game

According to the educational objectives, the following general principles should be applied irrevocably:

1. Robots should be built and programmed solely by the students.
2. As in real football, the decisions of the referees are final. The result of a match cannot be changed unless an error has been made in the counting of the score.
3. Students and their coaches should work together in such a way that the educational goals of the game are not compromised. Both should also help in the smooth running of the matches.
4. What counts the most is not victory or defeat, but the participation itself and the emotions that a football match has in store.
5. The organizing committee has the right at its discretion to disqualify a team from the competition if it finds that it is attempting to use unfair means that are contrary to the spirit of healthy competition on equal terms that are not expressly provided for in these rules.
6. The rules of the game may be modified by decision of the officials of the category and the organizing committee before the start of the tournament and announced to the players, in order to maintain the pedagogical spirit and the smooth running of the games. They also have the right to instruct the judges to intervene on the track or the fire pits in case they are damaged or moved.

E. 2x2 Soccer Rules

1. Group of Students

- 1.1. Each team of students taking part in the competition will have to build and program **a single** robot.
- 1.2. Substitution of a robot for any reason is prohibited. Teams that replace any of their robots during the matches are kicked out of the tournament.
- 1.3. Each team can 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 opposing alliances collide.

- 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 whistle "**push**", as soon as it is determined that a robot, trying to claim the ball behind an opposing robot, pushes it with such force as to drag it into the field. After the whistle, the ball is placed in the center of the court and play continues, without stopping time. It goes without saying that if a goal is scored due to pushing, it is disallowed.
- 5.6. "**Deliberate pushing**" is prohibited by a robot on an opponent when, for example, the ball is out of phase, with the intention of preventing its approach. If it is determined that there is no intention to claim the ball, the robot causing the push is placed on the referee's instruction in the right corner (corner) of the defensive area (if the conflict is on the left side of the field) or on the left (if the conflict is on the right side of the field) and continues the game from there (see 6.2 for how to return).

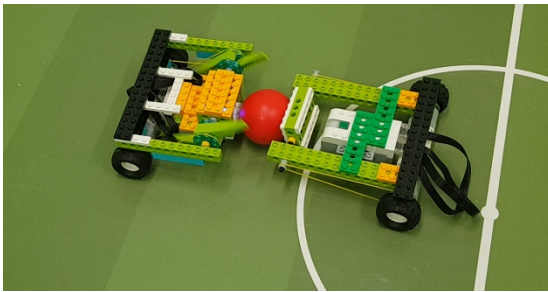


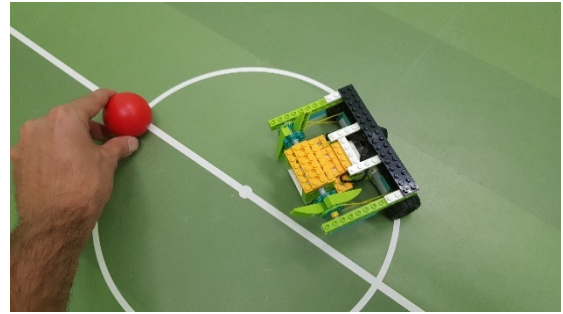
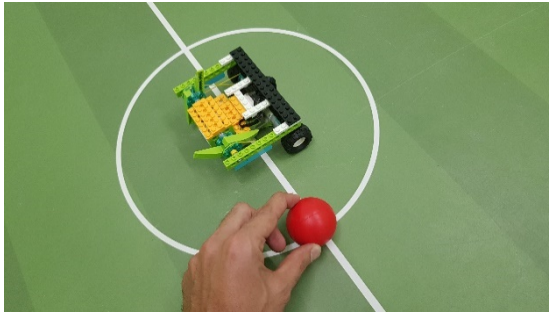
Figure 3 Pushing an opponent to claim the ball



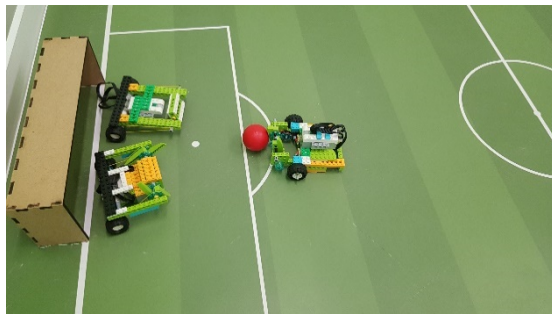
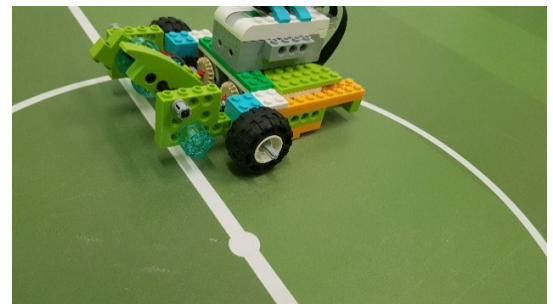
Figure 4 Deliberately pushing an opponent

- 5.7. Players are not allowed to touch their robots throughout the match, without the referee's permission.
- 5.8. If the ball goes out (outside the boundaries of the field behind the goals), it is immediately returned by the referee to the white ball located in the center of the field. If there is a robot on the cue ball at that time, then the ball is placed as close as possible to the cue ball, but not directly in front of the robot located there. Preferably placed to the right or left of the center line at the intersection with the center circle, so that no robot is given an advantage

Pictures 5 & 6: Alternative ways to center the ball



- 5.9.** There is no side out. The track will slope to the sides and the ball will roll back into the field of play on its own.
- 5.10.** If both 2 robots of the defending alliance are inside their area and their position affects the game, then the referee will whistle "double defense". 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 Indicative case of double defense*Figure 8 Indicative placement of the robot in the center, due to the double defense penalty*

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

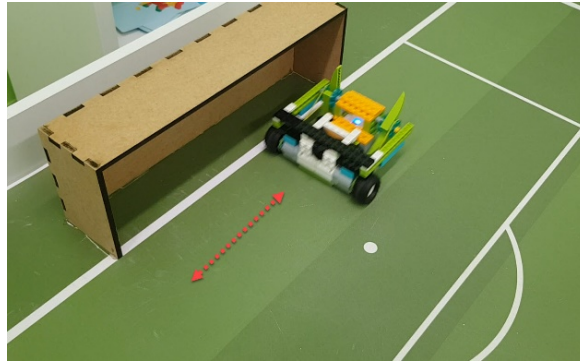


Figure 9 Movement parallel to the focus for a long time is penalized by expulsion for 1 minute

6. Broken Robots

- 6.1.** A robot will be marked "**damaged**" by the referee when:
- some part of it has been disassembled,
 - remains stationary (lost communication with H/Y or tablet)
 - 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 playing field until repairs are completed by the students. Immediately after and after permission is given by the referee, he returns to the match. The robot returning to the match is placed in the corner corner of the defense area, right or left at the players' choice. It is forbidden, however, to place himself in a position that gives him an advantage in possession of the ball, e.g. right in front of her. The referee may indicate which side the robot will return from, if he judges that such an advantage is being created.
- 6.3.** If a robot falls over for any reason, with the help of the referee it stands up again and continues the game.
- 6.4.** If both robots from an alliance are marked as "damaged" and exit the game, the match proceeds as normal. The timer stops when all four robots are destroyed and restarts when even one robot returns to the playing field.
- 6.5.** If during the process of restoring the robots one of them is damaged due to the fault of the referee who untangles 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 where it was if it was moved after the stoppage. The timer starts again and the race continues as normal.



Figure 10 Positioning the robots for return to the match, after being marked as damaged

7. Robot Specifications

- 7.1. Only LEGO pieces may be used to build the robots.
- 7.2. Wheels (tires and rims) should be exclusively from the Wedo 2.0 package or equivalent package versions.
- 7.3. Teams must use two Smarthubs and motors from the LEGO WeDo 2.0 Robotic Kit or equivalent pack versions.
- 7.4. Each robot must have at least one shooting mechanism, ie, a structure in the front (only), that gives the ball a boost.
- 7.5. One Smarthub will be connected to 2 motors and will drive the robot and the other Smarthub will be connected to motor(s) that will exclusively control the shooting mechanism. **In each team one player should handle the shot and another the movement of the robot.**
- 7.6. Modification or alteration of LEGO pieces is prohibited.
- 7.7. No other materials such as glues, tapes, screws, etc. may be used to assemble the robots.
- 7.8. The red LEGO Mindstorms – Part Number 41250 (diameter 52mm) balls will be used as soccer balls.
- 7.9. The robots will not be autonomous, but they will be controlled remotely. In this year's competition movement and shot control should be done in one or a combination of the following ways:
 - A) with **Scratch** and keyboard or remote control
 - B) with the **Microbit board** in conjunction with a fully programmable **remote control**. The Microbit connects to the controller and then the Microbit connects to the **scratch/Mind+** to control the WeDo
- 7.10. It is possible to make pre-programmed movements in the program with Microbit.
- 7.11. Each robot must measure no more than 17cm long, 15cm wide and 15cm high.

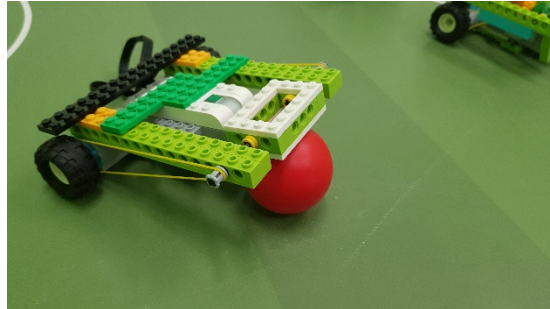
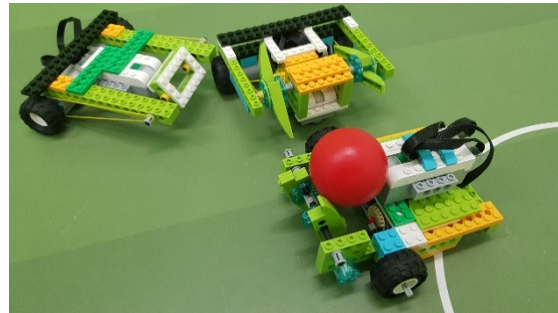
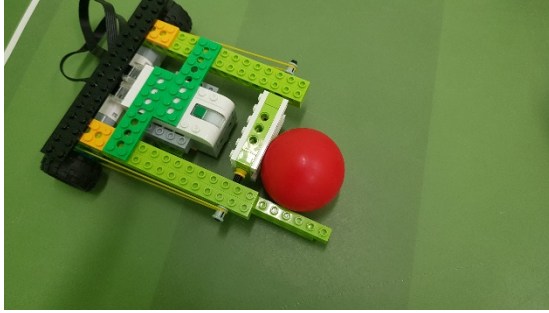
- 7.12. The measurement of the dimensions of the robots is done when they are in an upright position and have all their moving parts fully open.
- 7.13. Cables are counted in the dimension measurement.

8. Assembling the Robots

- 8.1. The assembly of the robots will take place during the assembly time given to the teams on the day of the competition.
- 8.2. All robots must be completely disassembled before the assembly time starts counting. E.g. a tire should not be around a wheel.
- 8.3. The total time the teams will have to complete the assembly and test their robots on the field will be **60 minutes**.
- 8.4. Competing students should not use any type of aid, such as instructions or drawings on paper, photos stored on the computer, etc.
- 8.5. Competing students are allowed to use programs that they have written earlier (before the day of the competition).
- 8.6. Students are allowed to modify their builds or programs from the time they enter the competition area or in the gap between competitions. That is, there will be no quarantine before or during the games.
- 8.7. It is the responsibility of the teams to ensure that their robots meet all specifications and restrictions set by the rules at all times. If, after a match, a robot is found to be structurally in violation of a rule, then the points earned in that match will be deducted from the alliance.

9. Ball control

- 9.1. "**Ball Capture Zones**" are defined as all the hollow surfaces that are created if we tightly wrap the entire robot with a plastic wrap.
- 9.2. The ball may not enter more than 2cm into any 'Ball Catching Zone'.
- 9.3. A robot is not allowed to hold the ball. This means that it should not remove any of its degrees of freedom. For example, the ball cannot be fixed in some way on the robot, the ball cannot be surrounded by the robot, nor can it be trapped by any part of it (eg on it). If the ball stops rolling and begins to drag 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 can protrude above the ball by more than half its diameter.
- 9.5. In the event that a robot captures the ball, the referee places it in the center, without stopping time.



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

THE BALL IS PLACED IN THE CENTER	THE BALL KEEP ROLLING, WITHOUT INTERFERENCE
When the ball crosses the entire end line parallel to the goals (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 "pushing" an opponent is credited (5.5)	When a "double defense" is awarded by the referee inside the area
When the ball gets stuck between two robots	When two robots get stuck together and are unblocked by the referee
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 does "deliberate pushing" (5,6)

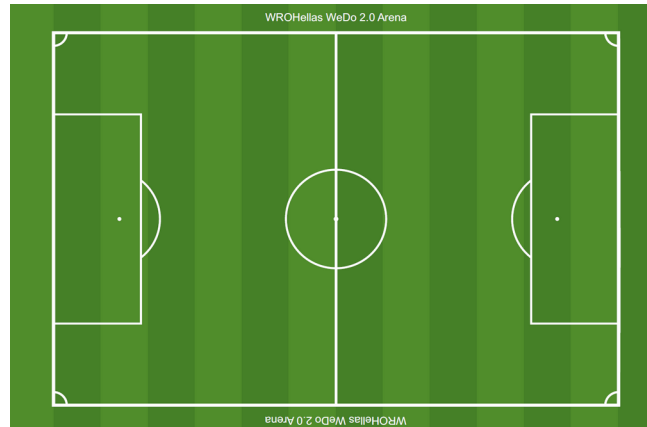
	When the robot intentionally remains stationary in front of the goal line or moves parallel to the goal line for more than 3 seconds (5,11)
	When a bot that was marked as destroyed returns to play (6.2)

10. Procedure for conducting the tournament

- 10.1.** The tournament will be held in two phases: preliminary and final.
- 10.2.** The qualifying phase will be held in 4 competitive rounds. In each competitive round of this phase, alliances will be formed by random draws.
- 10.3.** In each game the teams of the winning alliance will share 3 points each. In games ending in a draw, all teams will share 1 point each.
- 10.4.** In the qualifying phase, the teams are ranked in a single ranking table.
- 10.5.** In the event of a tie, the following criteria will apply in order of priority:
- Goal difference
 - Number of goals scored
 - The winner of the match between them
 - Which team won first runner-up (next strongest)
 - Draw
- 10.6.** The first 16 teams from the preliminary stage advance to the final stage.
- 10.7.** The final phase alliances are fixed until the end of the tournament and result as follows: 1st team is allied with 16th, 2nd with 15th, 3rd with 14th and so on.
- 10.8.** Alliances compete in knockout games until the grand final.
- 10.9.** In the event that a knockout match ends in a draw, the teams go to a **4-minute** extra time, where the **golden goal** applies (whichever alliance scores first during extra time wins the match).
- 10.10.** If no goals are scored during extra time, then the game goes to the penalty shootout. Each alliance will take 4 penalty kicks in turn (2 each robot required) as follows: The ball is placed by the referee on the center white bullet and each robot takes a turn and heads towards the ball to shoot into an empty net. The robot's wheels are not allowed to touch or cross the center line. Therefore, players should hit the brakes in time. Otherwise, their penalty will be canceled and not repeated.
- 10.11.** All robots shoot at the same target, which is chosen by the 2 alliances. If they do not agree, the referee draws lots.
- 10.12.** The teams of the alliance that will win the tournament jointly share 1st place.

- 10.13.** If a team withdraws, the game is played normally with the alliance competing with only one robot. The opposing alliance competes normally with its two teams.
- 10.14.** In the event that both alliance teams withdraw, the opposing alliance wins the match with a score of 2-0 in their favor.

11. Football field



- 11.1.** The floor will be printed on canvas from a high resolution file that you will find on the WRO Hellas website.
- 11.2.** The tarpaulin has 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 stoves will have the following dimensions:
- Length: **35 cm**
 - Height: **12 cm**
 - Depth: **8 cm**
- 11.6.** To improve the quality of the game, inclined planes measuring **75mm x 10mm** (eg 10 pieces x 210mm long each) will be placed on the long sides of the court. The purpose of the inclined planes is not to let the ball stick to the side walls of the court, but to push it towards the center. The height of the inclined planes can vary from court to court depending on the material to be used as a carpet. Ideally, when the ball is released from the top of the incline, it should come to rest in the center of the court.

