DOUBLE TENNIS

WORLD ROBOT OLYMPIAD™

WRO®

PHILIPPINES

Table of Contents

Updates on the general rules from 2022 to 2023

Important Note:
The PRO season 2022 has been the first year for RoboSports with Double Tennis. During this season, we noticed different situations that lead to a change and improvement of the general rules. There are many little changes were already announced as Q&As in the 2022 season. Please make sure you read this document carefully before you start with the 2023 season.

In addition, please note that during the season there might be clarifications or additions to the rules, which can be found in the official WRO Questions & Answers section of the WRO website. The answers are supplementary to the rules.

You can find the WRO 2023 Q&A on this page:
https://wro-association.org/competition/questions-answers/

IMPORTANT: Use of this document in national tournaments
This rule document is made for all PRO events around the world. It is the basis for the judging at International WRO events. For the national competitions, a PRO National Organizer has the right to adapt these international rules to suit local circumstances. All teams participating in a national WRO competition should use the General Rules as provided by their National Organizer.

1. General information

Introduction

In the PRO RoboSports category teams design robots that compete with robots of another team.
In a match two teams each have 2 robots on the field. The robots are coded to play the game autonomously and collaborate with each other where possible. The sport that is played by the robots changes every 2-3 years.

Focus Areas

Every PRO category and game has a special focus on learning with robots. At the PRO Double Tennis Game, students will focus on developing in the following areas:

- More advanced coding skills (repeating algorithms for a good game play).
- Communication between robots and planning collaborative actions.
- Orientation of the robot on the field in an environment with other robots that move.
- General engineering skills (building robots that can push/shoot objects of certain sizes) and advanced kinematics (omni-directional robots).
- Strategy and tactics changing depending on the opponent's robot's behavior.
- Teamwork, communication, problem solving, creativity.

Learning is most important

PRO wants to inspire students around the world into 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 to all our competition programs:

- ❖ Teachers, parents or other adults can help, guide and inspire the team, but they are not allowed to build or code/program the robot.
- ❖ Teams, coaches and judges accept our PRO Guiding Principles and WRO Ethics Code to ensure a fair and rewarding competition for all.
- ❖ On the competition day it is down to the teams, coaches and judges together to deliver a fun and fair event.

More information on the WRO Ethics Code can be found here:
https://wro-association.org/wp-content/uploads/2021/08/WRO-Guiding-Principles-and-Ethics-Code-2022.pdf

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 PRO 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 as students aged 11 up to 19 years. (In season 2023: born years 2004-2012)
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 PRO, teams and coaches accept the WRO Guiding Principles that can be found at: https://wro-association.org/wp-content/uploads/2021/08/WRO-Guiding-Principles-and-Ethics-Code-2022.pdf.
3.2. Every team and coach need to sign the W RO 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 the 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. Any instructions to the robot to win the match can be provided only in form of the program. No data are allowed to be entered by interacting a team member/coach/peopleoutside of the competition with the physical parts, sensors or other electronic components of the robot.
3.7. Destruction or tampering with competition courts/tables, materials, or the robots of other teams is prohibited.
3.8. 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 from the same institution and/or country.

3.9. If there is a suspicion in relation to rule 3.3 and 3.8, the team will be subjected to investigation and any of the consequences mentioned in 3.10 can apply. Where appropriate rule 3.10.2 may be used to prevent the team under investigation from progressing to the next competition stage, even if the team would win the competition stage where the potential rule breaking has been identified.

3.10. 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 thepossible violation of the rules. The interview can include questions about the robot or theprogram.

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

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

4. Game documents and rule hierarchy

4.1. Every year, PRO publishes a new version of general rules for this category including the definitive description of the PRO Double Tennis Game. These rules are the basis for all international WRO events.

4.2. During a season, PRO may publish additional Question & Answers (Q&As) that can clarify, extend or re-define rules in game and general rule documents. Teams should read these Q&As before the competition.

4.3. The general rule document and Q&As may be different in a country due to local adaptations through the National Organizer. Teams need to inform themselves about the rules that apply in their country. For any international PRO event, only the information PRO has published is relevant. Teams that qualified for any international PRO event should inform themselves about possible differences to their local rules.

4.4. At the competition day, the following rule hierarchy applies:

4.4.1. General rule document provides the basis for the rules in this category.

4.4.2. Questions & Answers (Q&As) can override rules in game and general rule documents.

4.4.3. The judge on the competition day has the final word in any decision.

5. PRO Double Tennis – Game Description & Game Field

Each match of the challenge is for two teams of students. Each team of students prepares two robots. Both robots operate on the same half of the field and their goal is to collaborate on the common task - push all the balls from their half to the other team's half.

Initially each half of the field contains 4 balls. During the match, balls will be pushed from one half to another. As well as pushing their own balls, a team's robots must constantly continue to find new balls delivered from the other half by the robots of the opposing team. As soon as these balls from the opposition are found the robots must plan and perform actions to push these balls back.

A match takes maximum 2 minutes and at the end of the match the winner is the team with the least amount of balls on their half of the game field.

At RoboSports, judges have a more active role as they need to decide on certain situations during the match as well. This is part of playing sports.

The following graphic shows the game field with the game objects.

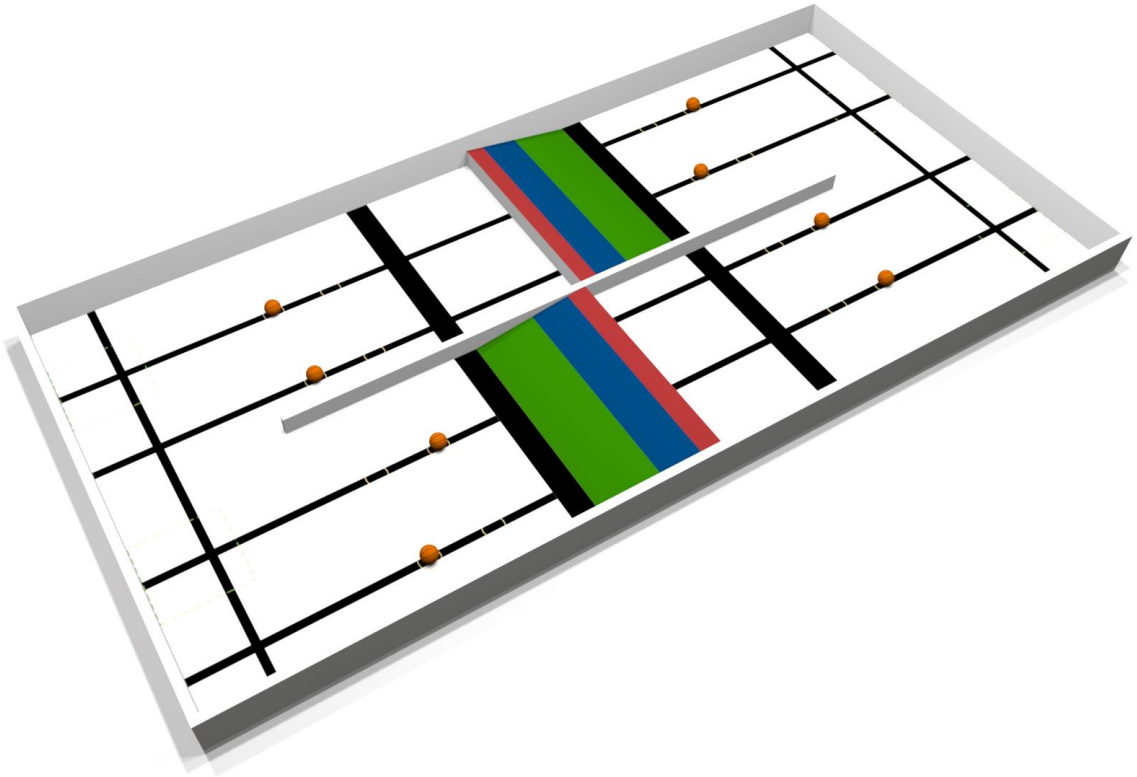

Figure 1. Detailed game field.

The game field consists of two halves. Each half contains one ramp. A barrier separates each half.

The game field halves

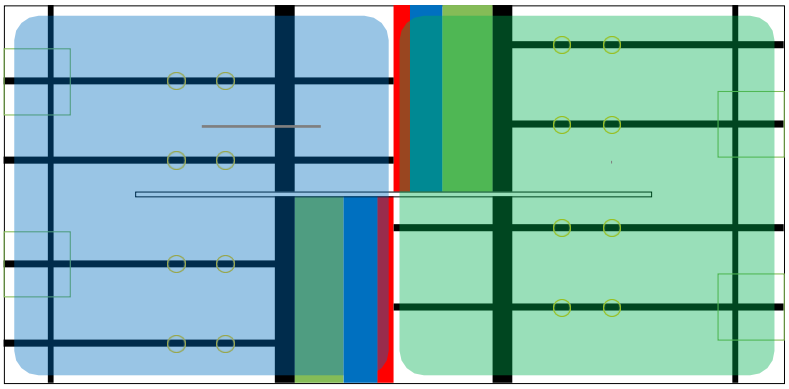

Figure 2. Two halves on the game field.

There are eight positions for the balls on every half: two randomizable positions of a ball on each black line. Two intersections of the black lines are used as starting positions of the robots.

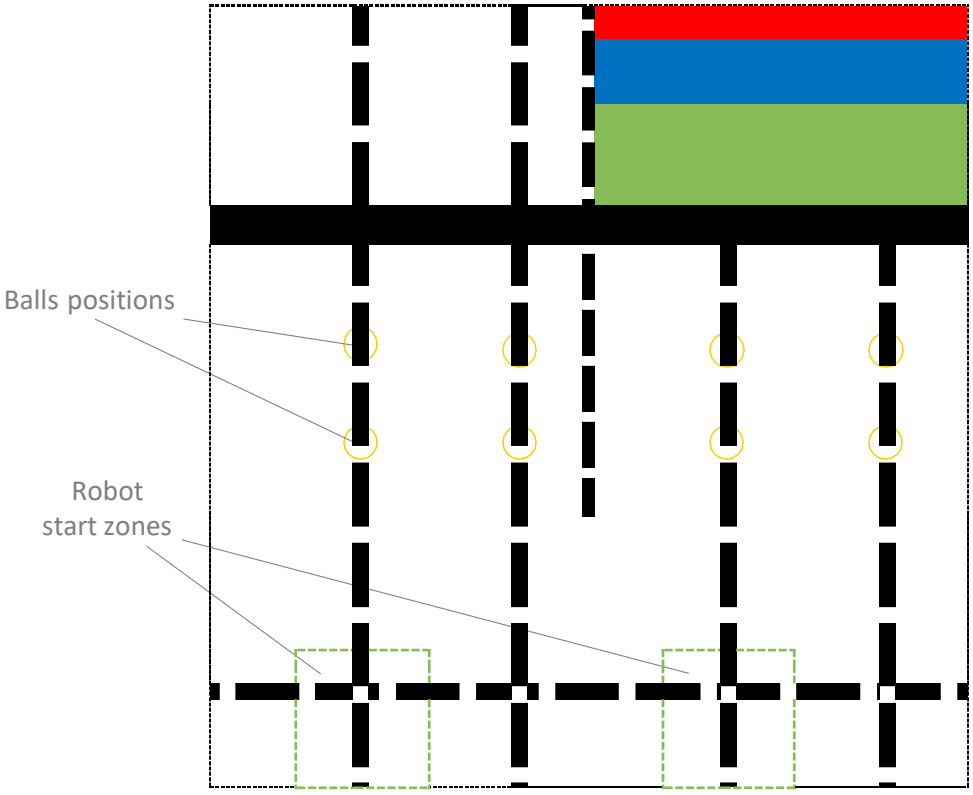

Figure 2. Start positions for the balls and robots

6. PRO Double Tennis – Specific Game Rules

WRO Double Tennis Tournament

6.1. The **tournament** consists of:

6.1.1. **Practice time:** During practice time, the contestants may practice in their team area, 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 robots mechanically.

6.1.2. **Check Time:** During check time, the robots will be checked based on the requirements for robot materials, as mentioned in section 3 above. If a robot does notpass the check, the judges may provide a team up to 3 minutes to address issues found. Only one three-minute period can be provided by judges for a team as part of the check after the first practice time slot. If, eventually, one of the team's robots doesnot pass the robot check by the judges, the team will not be allowed to participate in the game and as a consequence loses all three matches of that game 8-0. The winning team achieves the total points of 3 for that game. The incompliant team will not be disqualified entirely from the competition as they have time to correct their robot before the next game.

6.1.3. **Games:** A game consist of three matches of the same two teams in a row.

6.2. A typical competition day may look like this:

6.2.1. Opening Ceremony

6.2.2. 60 minutes practice time (first time slot)

6.2.3. Games, including a check time before each new game. During the game time, teams can modify the robots or practice on other tables (if available) when they are not competing.

6.3. Each team plays every other team or as many other teams as possible. Pairing of the teams is random. 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.

6.4. Teams should prepare and bring all the equipment, software and portable computers they need for the tournament.

6.5. Teams are not allowed to share portable computers and/or the program for the robots on the competition day.

6.6. On the day of the competition, there will be a minimum of 60 minutes of practice time before the start of the first match.

6.7. Teams cannot touch the designated competition areas before the start of the firstpractice time slot is announced.

6.8. Each team must work during practice time in their specified place until the check time, when the team's robots must be placed in a designated area (checking area). No mechanisms or programs may be modified after this time.

6.9. Robots may take part in the game only after they have passed the check.

6.10. The team cannot exceed 90 seconds for preparation as soon as they are called by judges for participating in a particular game. If a team does not show up 90 seconds

after announcement of the judges, it loses that match of the game by 8-0. If the team fails to show up for an additional 90 seconds for the second match, it loses the whole game with all three matches 8-0.

6.11. After the end of a particular game, the practice time for two teams continues. Shouldthey wish, they may modify their robots and programs until the judges call for the next game. After this call the check time for such robots starts again.

Starting Configuration:

6.12. After check time and before the match starts, the team is ready to start the robot with one push of a button on the robot. Before this robot start, the location of the balls on the field is determined. The following procedure can be used for this:

1. Toss a coin to determine the location of the first ball. Heads mean the ball location A (see the figure 3), tails mean the ball location B.

2. Repeat the coin toss three more times for the rest of balls on one half of the field.

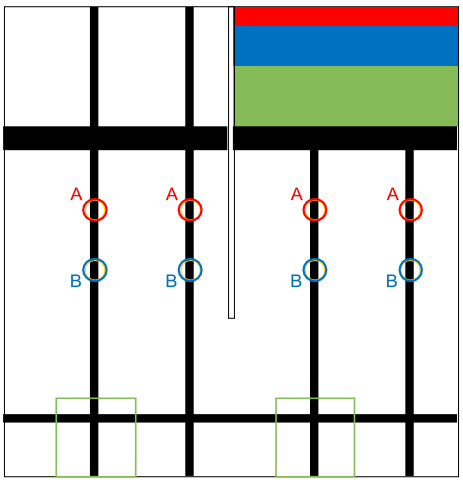

Figure 3. Possible balls' locations

3. The arrangement of the balls identified on the step 1 and 2 is applied to another half of the field so one half of the field is a rotational symmetry of the other.

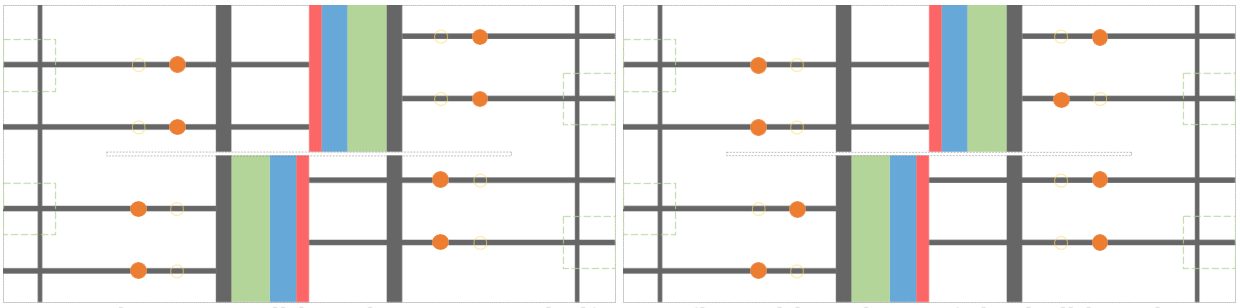

Figure 4. Ball locations on one half are reflected locations of the ball location on another half

- *For example, heads, heads, tails and tails were tossed for the left scheme on the figure 4 whereas tails, tails, heads and tails were tossed for the right scheme.*

Matches – Start Configuration:

6.13. Every match is maximum two minutes in length.

6.14. Each of two team's robots are located in the starting zones on one half of the field with every robot on the field being completely within the zones and no part of any robot is projecting beyond its zone. One starting zone must contain only one robot.

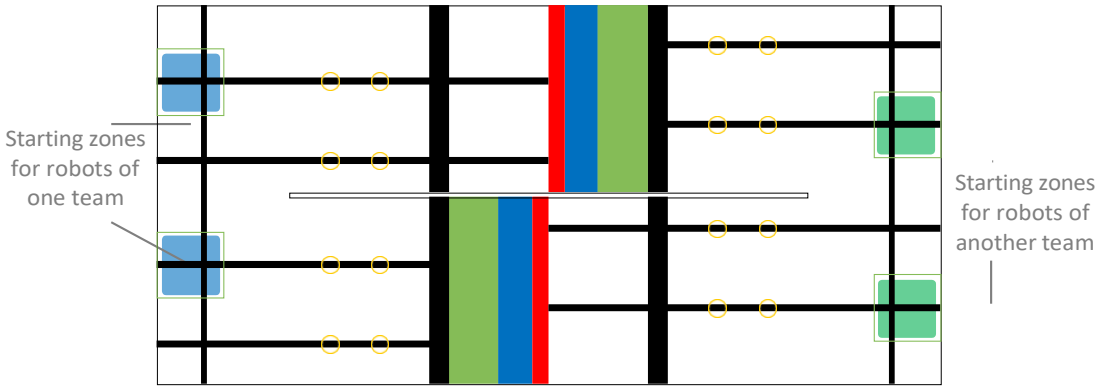

Figure 6. Starting zones of the robots

6.15. The position of the robot in the starting zone must be so that the projection of the robot on the game mat is completely within the start zone.

6.16. Physical adjustments can be made and team members can choose the one program they want to run (this is part of the preparation time); however, teams are not allowed to enter data to a program by changing positions or orientation of the robot's parts or to make any sensor calibrations on the robot. Teams may not enter data by changing the configuration of the switches, if any. If a team does enter data through physical adjustments, it will be disqualified for that game.

6.17. The robots should then be in a waiting state. Waiting for a Start button to be pressed. A separately installed Push Button can be considered as the Start button. Only one Start button is allowed.

6.18. Judges proceed with the randomization and then give the signal to start the robots. The starting buttons are pressed and the timing for the attempt begins simultaneously, after which the robots will commence their attempt to win the match.

6.19. If a robot is motionless and does not leave the starting zones 10 seconds after the start signal, the judge will remove the robot from the field and the robot must stay off the field the full match. If both robots of a team are not moving after 10 seconds the team will lose that match immediately. (Loses the match with 8-0 balls, without any violations)

6.20. If the robot overturns and is unable to move, it will be left in the same position until the end of the match. Team can decide to remove the robot from the field with the permission of the judge. Removing both robots from the field results in a lost match with 8-0 result.

Matches – During the Match:

6.21. Robots must be autonomous and it participates in the matches entirely by itself.

6.22. The robot is allowed to leave any parts of the robot that are not containing main units (controller, motors, sensors) on the field, if needed. As soon as the part is touching the field or its game element and is no longer touching the robot it is considered a free element not part of the robot. If the part prevents balls to be delivered from one half of the game field to another, the match is stopped and the team with the robot that left the part on the field loses the match by 8-0. If the part left by one robot moved to the half dedicated for another team's robots, the match is stopped and the team with the robot that left the part on the field loses the match by 8-0.

6.23. Participants are not allowed to interfere with or assist the robots. This includes entering data to a program by giving visual, audio or any other signals to the robots during the match. Team that violates this rule loses the match by 8-0.

6.24. The robot is allowed to push, kick and throw balls.

6.25. The robot is allowed to drive on to the ramp on its field half.

6.26. The robot is not allowed to touch the ramp's red area on its field half. If any part of the robot touches the red area, the match is stopped and the team with the robot that violated the rule loses the match by 8-0.

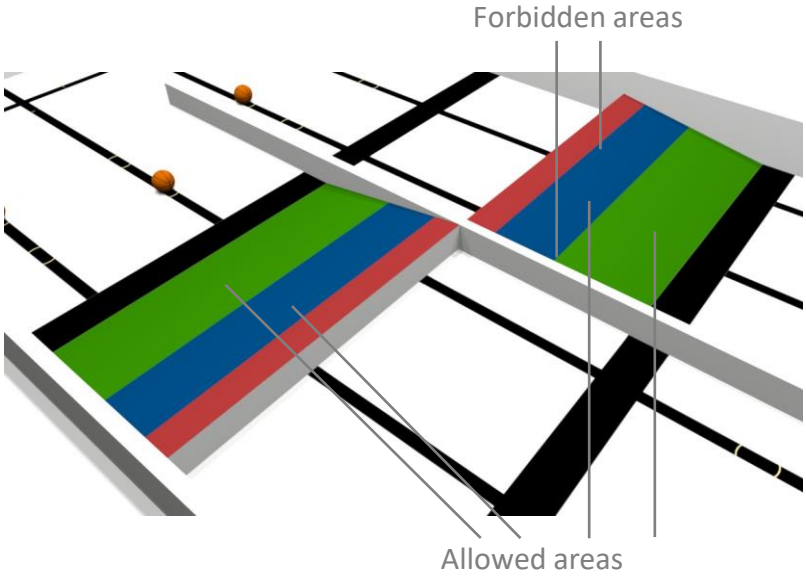

Figure 6. A buffer zone (red area) on the ramp cannot be visited by the robots

6.27. In case a robot touches one of the opponents' robots the match is stopped and judges decide if it was intentional or not. If it was by accident, the number of the balls on each half is calculated to get the score. If it was on purpose, by any team, that team will lose the match by 8-0.

6.28. A team's robot is not allowed to touch the surface (mat and the ramp's slope) on the opponent's half of the field. If such situation happens the match is stopped and the team that violated the rule will lose the match by 8-0. The robot is allowed to touch the face of the ramp which is perpendicular to the main plane of the game field.

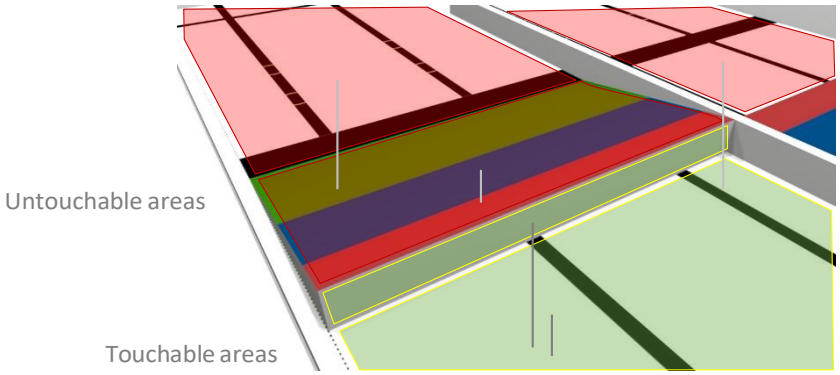

Figure 7. Areas that cannot be touched on the opponent's field half

6.29. The situation when both robots of one team operate simultaneously with more than 4 balls at the same time is not allowed. The operation with the balls assumes pushing by arobot, holding by parts of a robot above the field surface or keeping balls surrounded by parts of one or two robots of the same team. If such a situation happens the teams have5 seconds time to change it otherwise the match will be stopped and the number of ballson each half of the field will be calculated to get the score, the judges will count down 5 seconds.

6.30. If the ball goes out of the game field, it will be returned to the half of the team that throw the ball out, and judges will put it in one of the corners (in any situation).

Matches – End of a match (Refer to the attached table for more details):

6.31. The match ends and the time is stopped if any of the following conditions occurs:

6.31.1. The match timer expires.

6.31.2. The robot of one team touches the robot of another team or the surface (mat and the ramp's slope) on the opponent's half of the field.

6.31.3. The robot changes its size as so dimensions exceed 200x200 mm and 200 mm in height. In case the dimensions of the robot exceed the allowed size because of a malfunction or accident the team can decide to remove the damaged robot immediately from the field and go on with only one robot.

6.31.4. If all balls are situated on the same half of the game field after the first 30 seconds of the match, the match is stopped and the score is counted. Judges will announce when the 30 second mark is reached.

6.31.5. Any team member touches a robot, a ball, the field mat, the ramp, the barrier or the wall. Only exception is if a team member removes a damaged robot from the field (6.31.5.).

6.31.6. The robot drives outside of the game field.

6.31.7. The robot damages a ball.

6.31.8. The robot or team member damages the field or a game element.

6.31.9. There are no balls on the game field.

6.31.10. Stop by agreement: if both robots of both teams get stuck in a program loop which does not lead to any further meaningful action, the two teams can decide toend the match and the scores are calculated. Important that to do this the clear consent of both teams are needed.

6.32. Team members must stop their robots when the judge signals that the match is stopped. The robots must stay on the field till the teams are given permission by the judge to take them off. Team members must not move the balls either from one half of the field to another or outside of the field. If a team violates the rule, they will forfeit the match by 8-0.

6.33. A ball (or balls) pushed, kicked or thrown by the robots after the judge's signal that the match is stopped must be returned to those halves of the field where the robots moved them from If there is uncertainty as to whether a ball was moved before or after the signal, the judge is allowed to return it back to that half of the field where the robot responsible for the ambiguous movement of the ball is located.

6.34. The judges will base their decisions on the rules and fair game play. They have the final decision on the competition day. Please be aware that, as this is a team versus team competition, should a dispute happen the decision of a judge could result in one of the teams losing.

7. PRO Double Tennis – Scoring

7.1. The official score will be calculated at the end of each match by the judges. The winner in the group of two teams is identified after three matches.

7.2. The winner of a particular match is decided as follows:

7.2.1. number of balls on the half of one team (T1) -- BT1

7.2.2. number of balls on the half of the other team (T2) -- BT2

7.2.3. if T1 has less balls on its half it wins (BT1 < BT2), if T2 has less balls on its half it wins (BT1 > BT2), if they have equal number of balls, they are tied (BT1 = BT2).

7.3. The decision as to whether a ball is on one half or another is made based on the ball's position on the field. So, even if the ball is in contact with a robot the determinant is which side of the field it is on. If a ball is in contact with the robot and there is uncertaintyas to which side of the field it is on then it will be decided according to which half of the field the robot is touching with, its wheels.

7.4. If the match is stopped due to the actions of a member of one of the teams (e.g., a team member touches a robot), the team which this participant belongs to loses the match by 8-0.

7.5. The team which won the most matches of the game wins and gets 3 points, the other team gets 0. Winning 2 matches is an obvious win, but also if a team wins 1 match and the other two is a tie then the team wins the game.

7.6. If all three matches are a tie, then the game result is a tie as well with both teams getting 1 points.

7.7. The team must verify and sign the score sheet after the game, unless they have a fair complaint.

7.8. The teams' rankings for tournament (with teams in a table) are based on the sum of each team's points received in the games. If two teams have the same sum of points the following criteria are then considered (listed in the priority order):

7.8.1. number of violations: the team with fewer violations has a better ranking, more details on possible violations you can find in the chapter 12, the table of violations and end of matches situation.

7.8.2. The sum of the balls on the **opponent's** half of the field in each match: across all the matches each of the drawn team plays, the team whose opponents have, collectively, got the greater number of balls wins.

7.8.3. If the ranks of two teams are still the same, judges can consider to have additional set of matches until one team has two wins more (in additional matches) thananother team.

7.9. If the tournament mode uses (in addition to a table) a knock-out mode, it is necessary to determine a winner for each game. If a game would result into a tie because of match results, then the winner is determined by violations first (as in 7.8.2) and by balls secondly (as in 7.8.3). If the two teams are still ranked the same, one or more additional matches needs to be played to determine the winning team of the game.

Scoring Example for a table ranking:

The following example shows the final ranking of 4 teams (A, B, C, D) playing against each other. Every team had 3 matches. You can see that team A and B got the same points (7), but team B scored more balls. Because of that, team B wins (rank 1).

	A	B	C	D	Points	Scored Balls	RANK
A		**1** 4:4/2:6/4:4	**3** 6:2/3:5/7:1	**3** 8:0/5:3/6:2	**7**	45	**2**
B	**1** 4:4/6:2/4:4		**3** 6:2/7:1/6:2	**3** 4:4/5:3/8:0	**7**	50	**1**
C	**0** 2:6/5:3/1:7	**0** 2:6/1:7/2:6		**0** 0:8/3:3/3:5	**0**	19	**4**
D	**0** 0:8/3:5/2:6	**0** 4:4/3:5/0:8	**3** 8:0/3:3/5:3		**3**	28	**3**

8. Robot material & regulations

8.1. Teams must build two robots. Each robot's dimensions must not exceed 200x200 mm and 200 mm in height during the match.

8.2. The controller, motors and sensors used to assemble robots must be from the LEGO® Robotics platforms: LEGO® Education MINDSTORMS® EV3; LEGO® Education SPIKE™ PRIME; LEGO® MINDSTORMS® EV3 or Robot Inventor

8.3. The allowed controller for the robot is LEGO® Education MINDSTORMS® EV3; LEGO® Education SPIKE™ PRIME; LEGO® MINDSTORMS® EV3 or the hub of LEGO® MINDSTORMS® Robot Inventor.

8.4. Teams can use Bluetooth or Wi-Fi for their robots' communication during the matches.

8.5. Any kind of communication between robots and any other device apart from the team's other robot is forbidden. The judges can inspect the code and the robots in order to confirm that it is not used by any means.

8.6. Teams can use any cameras of their choice. PRO recommends use of Pixy2 forLEGO® MINDSTORMS® EV3 and OpenMV for LEGO® SPIKE PRIME.

8.7. Teams can also use processing boards as part of the camera but both the camera and the board can only process the image. It is not allowed for these devices to handle any other logic. Teams can also use small displays on their robots at all times as far as it fits in the dimensions of 200 x 200 x 200 mm.

8.8. For the PRO National Final, the only allowed battery for SPIKE/EV3 must be an official LEGO rechargeable battery (no. 45610 or no. 6299315 for SPIKE/Robot Inventor, no. 45501 for EV3,). Cameras and processing boards are not allowed to have their own batteries.

8.9. Additional optical elements like lens kits or mirrors can be used together with cameras.

8.10. The use of SD cards to store programs is allowed. SD cards must be inserted before check time and may not be removed until the next practice time starts.

8.11. Only LEGO branded elements may be used to construct the remaining parts of a robot. PRO recommends use of the Education versions of LEGO® MINDSTORMS®.

8.12. Teams can use 3D printed elements, elements prepared with a CNC machine, elements cut from acrylic/wood/metal to fix a camera, a lens kit or a mirror on to the robot.

8.13. It is not allowed to use screws, glues or tape or any other Non-LEGO material to fasten LEGO components on robots. The teams are not allowed to make any changes to the original LEGO parts (e.g. controller, engine, sensors etc.). The only exceptions are original LEGO ropes or tubes, that can be cut to size. Failure to comply with these rules will result in disqualification.

8.14. Teams should bring enough spare parts. In the case of any accidents or equipment malfunction, PRO (and/or organizing committee) is not responsible for their maintenance or replacement.

8.15. The teams can bring the robots assembled.

8.16. Contestants may prepare the program for the robots beforehand.

8.17. Control software can be written in any programming language – there are no requirements to use a specific language.

8.18. Teams can only have a maximum of two controllers with themselves in the competition area.

9. Game table and equipment

Game Table & Field

9.1. In this category, the robots play double tennis. Every field consists of a game table (an even ground with borders) and a printed mat that is put into the game table.

9.2. The dimensions of a PRO mat in any age group are 2362 mm x 1143 mm. All Game Tables are the same size, though a tolerance of +/- 5mm in length and width is given. The official height of the borders of a game table is 100mm, higher borders can be used as well. The borders are a bit higher than those of the RoboMission category tables, but in every other respect they are the same size. Due to the use of the balls, the higher borders are necessary for a better game play. The higher borders can be added (e.g. attached to) a RoboMission table. The thickness of the walls is not defined.

9.3. The inner color of the walls is white. The outer color of the walls is not defined.

9.4. The game mat must be printed with a matt finish/overlay (without reflecting colors!). The preferred printing material is a PVC tarp with around 510 g/m² (Frontlit). The material of the game mat should not be too soft (e.g. no mesh banner material).

9.5. The width of the thin black lines is 20 mm, the width of the thick black lines is 60 mm.

9.6. The diameter of the ball location areas is 50 mm. The color of the line is orange (RGB: 250, 204, 0).

9.7. The size of robot starting zones is 200 x 200 mm. The color of the dashed lines surrounding the zones is green (RGB: 133, 188, 87).

9.8. Two ramps 300 x 563 x 50 mm are fixed on the field. The material of the ramps is wood, laminated chipboard or styrofoam. The main color of the ramp slope is green (RGB: 133, 188, 87). The width of the blue (RGB: 0, 112, 192) area is 100 mm. The width of the red (255, 0, 0) area is 50 mm. The color of the rest of the ramp is white.

9.9. The barrier size is 1562 x 17 x 50 mm. It is rigidly fixed to the field.

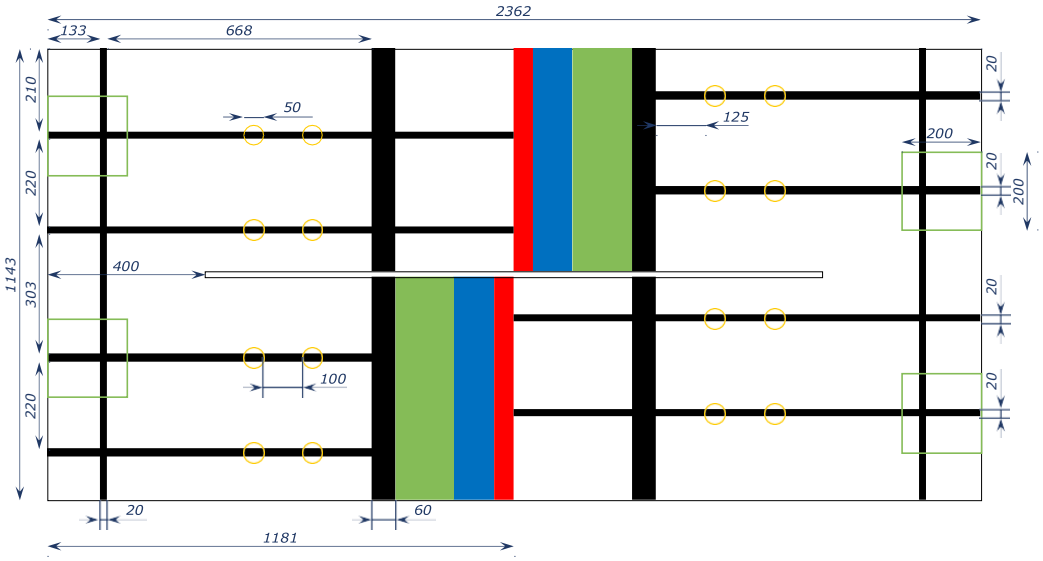

Figure 8. The game field map with sizes

Balls

9.10. Every ball is a standard ping pong ball with a diameter of 40mm.
9.11. The color of the ball is orange.
9.12. 8 balls are required per game field.
9.13. The national and regional competition could use balls of another color but they must be different from the other elements of the field. The event organizers could consider changing the colors of the field mat in order to make the balls distinguishable. They need to inform the teams about the changes from the beginning.

10. Ideas for simplification

Note: As mentioned at the beginning, these rules are made for all Natioanl PRO events. National Organizers can decide to change the rules for local needs. Here, are two ideas that could make the game easier.

Idea 1 – Larger Game Objects

The competition with ping pong balls mostly focuses on the robots with cameras. Somenational organizers could consider to adapt the challenge for the robots without cameras by using LEGO® plastic 52 mm balls (Element ID: 4156530) or tennis balls with the diameter 65- 68 mm.

Idea 2 – Simplified game field

There is the option of having the game field without the ramps:

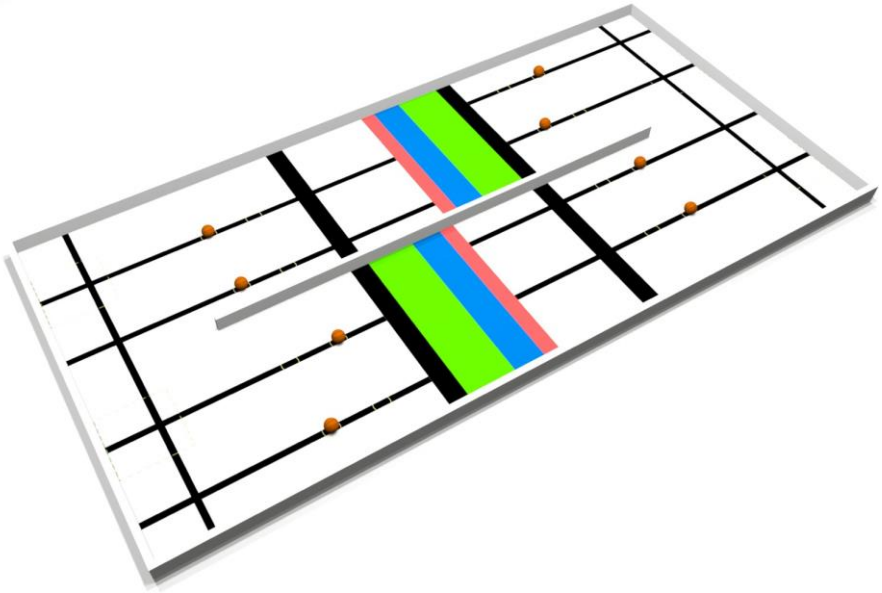

Figure 9. Field without the ramps

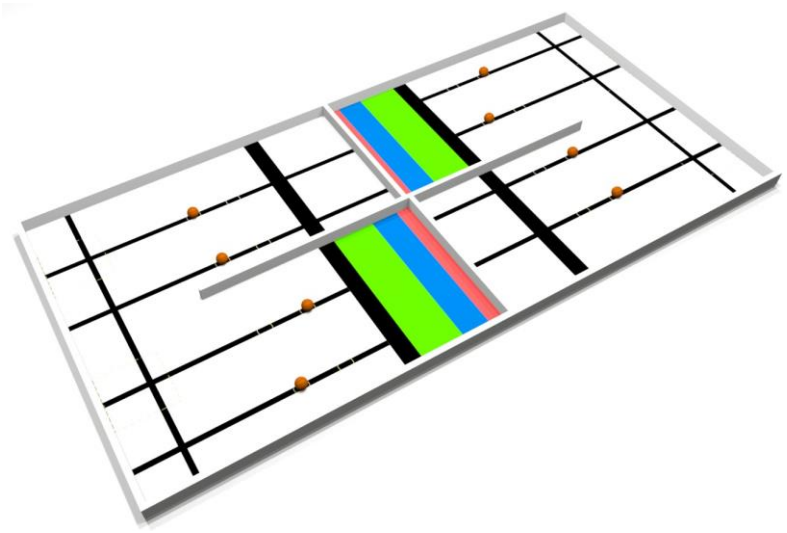

Figure 10. Field without the ramps but with barriers

11. Glossary

Check Time	During the check time, the judge will take a look at the robot and check the measurements (e.g. with a cube or a folding rule) and other technical requirements. A check needs to be done before every game.
Coach	A person assisting a team in the process to learn different robotics aspects, teamwork, problem solving, time management, etc. The role of the coach is not to win the competition for the team, but to teach them and guide them through the problem identification and in discovering ways to solve the competition challenge.
Competition organizer	The competition organizer is the entity that hosts the competition a team is visiting. This can be a local school, the National Organizer of a country that runs the National Final or a PRO Host Country together with PRO Association running the National PRO Final.
Game	A game consists of three matches of the same two teams in row. A team wins a game if it wins two or more matches.
Match	Two teams play, with two robots each, a match that is scored. A team wins a match if less balls are on the own part of the field at the end of the match.
Practice Time	During the practice time, the team can test the robot on the field and the team can change mechanical aspects or the coding of the robot.
Team	In this document the word team includes the 2-3 participants (students) of a team, not the coach who should only support the team.
PRO	In this document, PRO stands for Philippine Robotics Olympiad, non-profit organization running PRO world-wide and that prepares all the game and rule documents.

12. Appendix – Table of Violations and End of Match Situations

Row	Rule	Rule Description	The result of the Match/ Game	Remarks
1	3.1 ~ 3.10	Violation of Ethics Code and unfair behavior.	The violating team loses that Game 0-3 or gets disqualified from the entire tournament depending on how serious is the violation.	[Violation] Losing a Game means all 3 Matches have the result of 8-0.
2	6.1.2	If one of the team's robots does not pass the robot check by the judges, the team will not participate in that Game.	The violating team loses that Game 0-3.	[Violation] Losing a Game means all 3 Matches have the result of 8-0.
3	6,17	If a team enters data through physical adjustments, the team will not participate in that Game.	The violating team loses that Game 0-3.	[Violation] Losing a Game means all 3 Matches have the result of 8-0.
4	6,22	If the part left by one robot prevents balls to be delivered from one half of the game field to another, or the part left by one robot is moved to the half dedicated for another team's robots, the Match is stopped and the team with the robot that left the part on the field loses that Match.	The violating team loses that Match 8-0.	[Violation]
5	6,23	Entering data to a program by giving visual, audio or any other signals to the robots during the match is a violation and the violating team loses that Match.	The violating team loses that Match 8-0.	[Violation]
6	6,26	If any part of the robot touches the red area on the ramp, the Match is stopped and the team with the robot that violated the rule loses that Match.	The violating team loses that Match 8-0.	[Violation]
7	6,27	If the robot of one team touches the other team's robot on purpose, the violating team loses that Match. The judges have to decide if the touch was on purpose after taking all circumstances into consideration.	The violating team loses that Match 8-0.	[Violation]
8	6,28	A team's robot touches any surface (mat, the ramp's slope, wall) on the opponent's half of the field.	The violating team loses that Match 8-0.	[Violation]
9	6.29	The situation when both robots of one team operate simultaneously with more than 4 balls at the same time for more than 5 seconds is not allowed	The violating team loses that Match 8-0.	[Violation]

10	6.31.1	The match timer expires.	The teams have to stop their robots when the judge calls out STOP. Then scoring takes place.	All balls that are passed over to the opponents game field after call of the judge must be placed back to where it was when the judge called STOP.
11	6.31.2	The robot of one team touches the robot of another team or the surface (mat, the ramp's slope, wall) on the opponent's half of the field.	This is considered a violation and the violating team loses the Match 8-0.	[Violation]
12	6.31.3	The robot changes its size as so dimensions exceed 200 x 200 x 200 mm.	The violating team loses that Match 8-0.	[Violation] Losing a Match 8-0.
13	6.31.4	After the first 30 seconds of the match is passed, there is a situation when all in-game balls are on the same half of the game field for more than 10 seconds. The balls loaded to the robots on this half are counted as well. This means that the teams must not control all in-game balls for more than 10 seconds, and the judge announce this situation by counting down 10 seconds and the violating team loses the Match 8-0.	The violating team loses that Match 8-0.	[Violation]
14	6.31.5	Any team member touches a robot, a ball, the field mat, the ramp, the barrier or the wall.	The violating team loses that Match 8-0.	[Violation]
15	6.31.6	The robot drives outside of the game field.	If one robot drives outside the game field, the match continues. If both robots does it, it is considered a violation and the violating team loses the match 8-0.	[Violation]
16	6.31.7	The robot damages a ball.	The violating team loses that Match 8-0.	[Violation]
17	6.31.8	The robot or team member damages the field or a game element.	The violating team loses that Match 8-0.	[Violation]
18	6.31.9	There are no balls on the game field.	The match is stopped and considered a tie.	A tie for a Match means 0-0, and a tie for the final result of a game means 1-1.
19	7.8.2	**The Violations in this table should be taken into consideration.**		