



## Ball Fighting RC robot

### GAME RULES



## Section 1 Participants

### Article 1

1.1 Each team comprises 4 members, including at least one Junior participant. Additionally, a mentor from the team is permitted to participate as well. See the Table 1.

Team formation	Junior	Senior	Mentor	
#1	4	-	-	ALLOWED
#2	3	1	-	ALLOWED
#3	3	-	1	ALLOWED
#4	2	2	-	ALLOWED
#5	2	1	1	ALLOWED
#6	1	3	-	ALLOWED
#7	1	2	1	ALLOWED
#8	-	4	-	DISALLOWED
#9	-	3	1	DISALLOWED

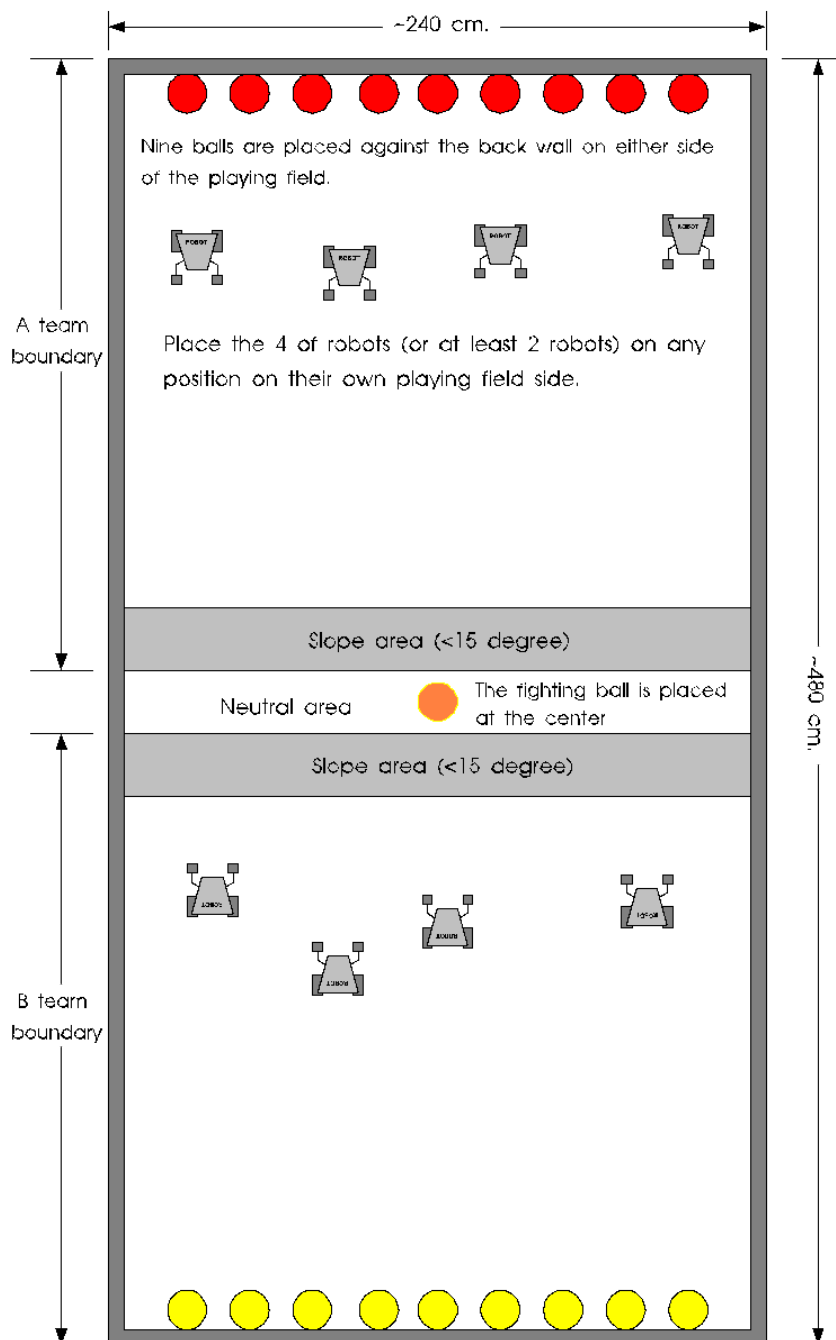
Table 1 : Team formation of Ball Fighting RC robot

1.2 Every team may or may not have teacher/mentor by each team must have only 1 person (1 teacher or mentor cannot supervise multiple team in Ball fighting RC).

1.3 Each participant can play only one team.

## Section 2 Competition field

### Article 2 Competition field information



The field is flat. It is divided into 2 sides and surrounded by a wall. In the center of the field, there may be slopes with a slope of not more than 15 degrees on either side. Additionally, there is the Neutral area between the team boundary. A fighting balls are placed on this Neutral area. The approximate size of the field is 2.4 x 4.8 meters. It may change without prior notice depending on the actual competition area, while maintaining the overall form of the field.

## **Section 3 Robot requirements**

### **Article 3 Technical features**

- 3.1 The robot size must not exceed than 25 x 25 cm before the competition.
- 3.2 For microcontroller rules, the sole decision rests with the individual country representative or the committee in the absence of a country representative. Please contact your individual country representative/committee for more information.
- 3.3 The weight of each robot must not exceed 1 kg.
- 3.4 The robot used in the competition must move on the floor without any restrictions on movement patterns.
- 3.5 Robot must use 4 motors maximum. The external motor driver board is allowed. **The use of brushless motors and any fans that aid in robot movement is prohibited.** Maximum of sensors is 4 pieces ( elements).
- 3.6 Robot cannot be separated or expanded while competing.
- 3.7 The robot used in the competition can be either an autonomous or remote-controlled mobile robot, and there are no restrictions on the format of the remote control.
- 3.8 Participants must be prepared for possible interference with radio waves or infrared light from the remote-control during training and competition.
- 3.9 No limit on the source of mechanical parts and accessories. It can be hand-made, formed from 3D printer, or modified from toy.

- 3.10 Fixing screws and nuts or any fixation device in the robot must be securely firmly. If during the competing have any piece dropped or broken onto the competition field, the referees will not remove it and allowed to continue the competition. Referees cannot hold responsible for consequences during removal of a loose piece from the competition field.
- 3.11 No limit for the computer properties used to program the robot.
- 3.12 Participants must securely install batteries and ensure they are protected from potential damage caused by robot collisions.
- 3.13 The robot should be capable of moving the ball.
- 3.14 The robot should be sturdy and robust since collisions with the wall may occur at any time.

#### **Article 4 Prohibition of creating the robot**

There must not installed any parts or equipment that can any way damage the competition field.

### **Section 4 Mission**

The objective is to move your own ball into the opponent's boundary as much as possible. The winner is determined by the team that has moved more balls by the end of the time limit.

Alternatively, in a Knockout case, the winner is the team that can get all balls including fighting balls to be on the opposite side before time runs out.

The movement of the ball is not limited method. However the robot must not cross into the opponent's boundary with full body.

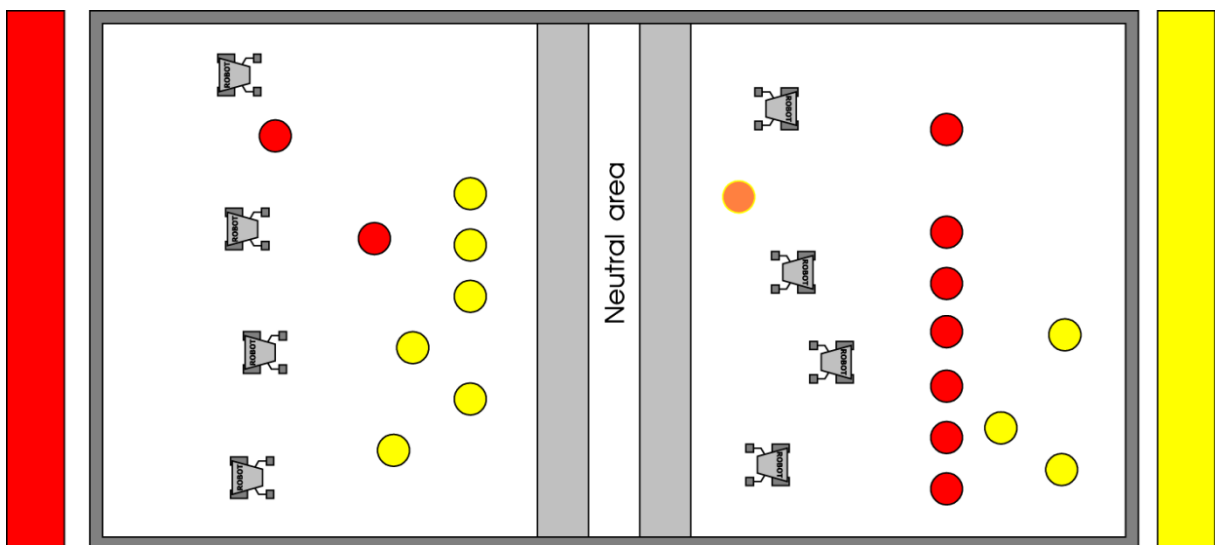
#### **Article 5 The competition time**

Total time is 3 minutes.

## Article 6 Scoring

- 6.1 Unofficial scoring occurs continuously with a regular ball worth 1 point and a fighting ball worth 3 points.
- 6.2 Official scoring takes place at the end of the playing time.
- 6.3 Balls on the Neutral area will not be counted towards scoring.
- 6.4 Balls that go out of boundary at the end of time do not count towards scoring.
- 6.5 A Knockout occurs when all balls including 19 balls and fighting Balls are on either side before time runs out.
- 6.6 The team with the higher score at the end of the time is the winner.
- 6.7 In case of equal scores, the team in possession of the fighting ball after the time has expired will be declared the winner.

### Example 1



#### **Red team**

Remove the red ball 7 pieces = 7 points

Remove the fighting ball = 3 points

Total scores are  $7 + 3 = 10$  points

#### **Yellow team**

Remove the yellow ball 6 pieces = 6 points

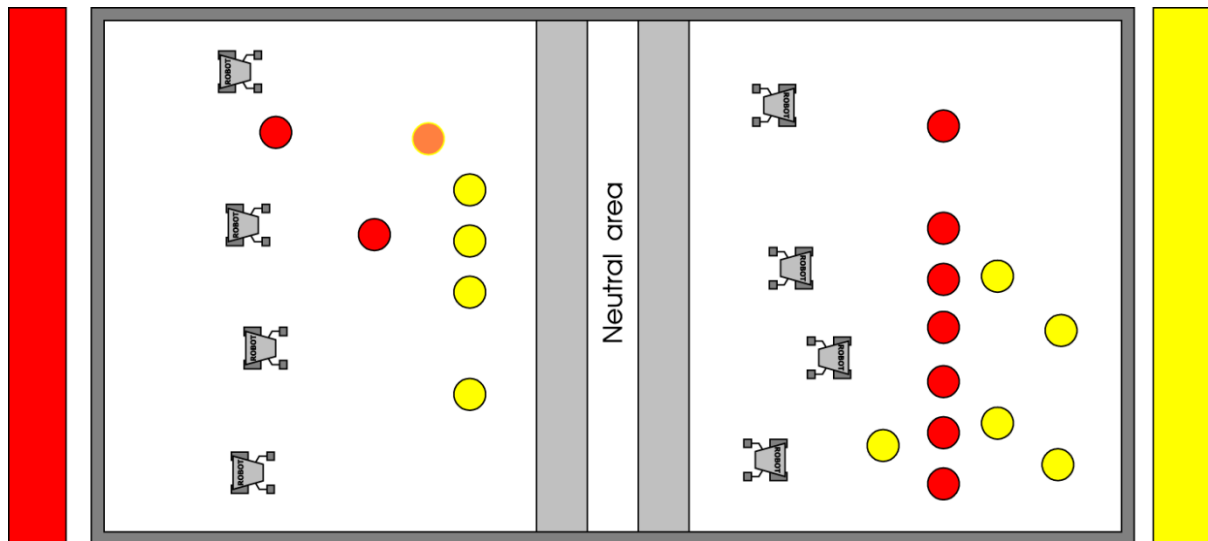
No remove the fighting ball = 0 points

Total scores are  $6 + 0 = 6$  points

**The Red team wins because they have more points.**

The Red team gets 3 accumulated points and Yellow team get none.

## Example 2



### Red team

Remove the red ball 7 pieces = 7 points

No remove the fighting ball = 0 points

There are 3 robots using the microcontroller board in the STEM2 specification in Table 1 acts as the remote control. Get 3 points

Total scores are  $7 + 0 + 3 = 10$  points

### Yellow team

Remove the yellow ball 4 pieces = 4 points

Remove the fighting ball = 3 points

There are 4 robots using the microcontroller board in the STEM2 specification in Table 1 acts as the remote control. Get 3 points

Total scores are  $4 + 3 + 3 = 10$  points

The Yellow team wins because they remove the fighting ball to the red side. The Yellow team gets 3 accumulated points and Red team get 1 accumulated points.

## Article 7 Ball's information

7.1 Balls used in the games may be made of rubber, cloth, or synthetic fiber. They should be soft and not bounce excessively.

7.2 The balls should have a diameter not exceeding 70 mm.

## Section 5 Competition system

### Article 8

8.1 The competition system in the first round is divided into groups. Each group consisting of 3 or 4 teams that will compete in round-robin format. The winning team in each match will receive 3 accumulated points. The team with the same number of points at full time will receive 1 accumulated point.

- 8.2 The first round will qualify either the 1st place or the 1st and 2nd places into the 2nd round, depending on the number of participating teams.
- 8.3 From the 2nd round until the final, the competition will be paired in a knock-out format by drawing lots before the competition. The robot team that scores more points in each match will advance to the next round, and the losing team will be eliminated.
- 8.4 From the second round onwards, if the competition ends in a draw, the game is extended for 1 minute. The team that scores more points during the extension wins. If the match is still tied after the extension, the result must be decided by a coin toss or other methods as deemed appropriate by the referees.
- 8.5 The teams that are defeated in the quarterfinals will be awarded the 3rd runner-up distinction, amounting to a total of 4 teams.
- 8.6 The teams that are defeated in the semifinals will be awarded the 2nd runner-up distinction, amounting to a total of 2 teams
- 8.7 In the final round, the winning team will be declared the Champion and the losing team will be awarded the 1st runner-up.

## **Section 6 Start, stop, continue and end of the competition**

### **Article 9 Start of the competition**

- 9.1 Before the start of the match, the Referee shall place the fighting ball in the center of the Neutral area at the middle of the playing field.
- 9.2 The Referee shall place the 9 balls on each side against the back wall of each team's boundary at the predetermined spot.
- 9.3 Participants shall position their robots on their side of the field and wait for the signal to start the competition. The robots can turn in any direction. Then, they switch on the power supply to the robot. The competition will test whether the robot can be operated or controlled remotely.

- 9.4 When the referees give the signal, the participants must initiate the robot to start the match.
- 9.5 Participants must use a remote control to control the robot only within the CONTROL AREA. Any infringement of this rule will result in the referee adding 1 point to the opponent for each violation.

## **Article 10 The game format of the match, stopping and continuing**

- 10.1 When the referee signals the start of the game, the competitor should command the robot to gain possession of the ball and move it to their side as quickly and skillfully as possible. The robot must not fully cross into or enter the opponent's boundary.
- 10.2 If any robot enters the opponent's boundary completely, it will be considered out of bounds and immediately out from the match competition. The participant who controls that robot will also be retired from the match. The ball brought over by the offending robot will be returned to the Neutral area.
- 10.3 When the robot encounters a problem that prevents it from continuing the task, it must be taken out for repairs. Each team has 2 Request for the Repair cards. When repair is needed, the card must be handed over to the referee and the robot must be immediately removed from the field without interfering with the ongoing competition.
- 10.4 If any ball leaves the sidelines, the referee will place it at the Neutral area as fast as possible.
- 10.5 All robots from both teams must be in motion at all times. If any robot fails to move, it must be promptly removed from the field. Removed robots may or may not be repaired by the competitors, and the team can use 1 Request Repair card per event. If a robot has used all its Request for Repair cards and is subsequently removed from the competition, it cannot resume the competition.



## **Article 11 Finishing the match**

The competition will end when:

- 11.1 Both teams of robots are completely damaged to the point of being unable to compete before the end of the competition.
- 11.2 The end of the game time is reached.
- 11.3 Both teams are ordered to stop playing.
- 11.4 Knockout occurs.
- 11.5 At the end of the competition, the referee will immediately record the result of the match.

## **Section 7 Fouls**

### **Article 12**

Those any participants do the action following the Article 4, 13 and 14 will be ordered to fouls.

### **Article 13**

The participant who act insulting, abusing an opponent, whether verbally or physically or lets the robot make noises, express messages, or act in a disrespectful manner, will be disqualify.

### **Article 14**

If the participant does any of the following, it will also be considered a violation of the rules:

- 14.1 Do any act that interferes with the opponent's robot.
- 14.2 Enters the competition field during another team's game.
- 14.3 Take any action that causes the competition to be stopped without justifiable reason.

## **Section 8 Punishment**

### **Article 15**

Those any participant does the action following the Article 12 will be ordered to stop the competition. If a team repeatedly makes mistakes, the team will be disqualified.

### **Article 16**

If the mentor does the action following the article 13 and 14, all the team that mentor supervised will be disqualified.

## **Section 9 Damages and accidents in the competition**

### **Article 17 Request to stop the competition**

The referee will make the final decision.

### **Article 18 Repairing the robot**

- 18.1 Participants can repair and modify the robot program at any time after obtaining permission from the referee.
- 18.2 Each repair request must be accompanied by a request for a repair card sent to the referee.
- 18.3 Participants can repair the robot at any time during the competition while the timer continues.
- 18.4 It is strictly forbidden to change the robot body and any competitor during the repair of the robot.
- 18.5 The repair or improvement of the robot must be carried out in the designated area only.
- 18.6 Repairs must be conducted at the designated repair area using light tools only. Heavy tools such as bench drills and cutting machines are not allowed.
- 18.7 After being repaired, the robot can return to the field again by informing the referee.

