Mini Sumo Rules

Short Description:

As in the traditional Japanese martial arts, the robots try to push the competitor off the ring.

For Mini Sumo category will compete only participants that are over 18 years old, including the ones that are part of robotic clubs, or participants on their own.

2. Requirements for Robots

2.1. General Robot Specifications

A. Any robot design is allowed, if is not subject to the limitations of section 2.2.

B. A robot must fit within a square with the side length of 10 cm (100 mm).

C. The total mass of a robot at the start of a match must be under 500g.

D. A robot may expand in size after a match begins, but must not physically separate into pieces, and must remain a single centralized robot. The robot's feet must not expand during the match. Robots violating these restrictions shall lose the match. Screws, screw nuts, washers and other robot parts with a total mass of less than 5 g falling off from a robot's body, shall not cause the loss of match.

E. All robots must be autonomous. Any control mechanisms can be employed, as long as all components are contained within the robot and the mechanism does not interact with an external control system (human, machine, or otherwise)

F. The robots must have displayed a number, offer by the organizers, on the outer casing of the robot in a visible place. The number it is used to identify the robot by the referee and can be found in the Team's Folder (details in appendix 2).

2.2. Robot Restrictions

A. For safety reasons the robot must be equipped with an IR kill switch to be operated by the judge. When the judge sends a kill signal the power to the motors shall be shut down. The robot builder is responsible for adding such a kill switch on the robot. The technical specifications for the IR receiver are given in the appendix 1. Contestants can either implement their on hardware or use a prebuilt module offered by the organizers. This module can supply the signal for activating the kill switch.

It is mandatory that the IR start module to function and the responsibility for is entirely of the team. If the module is not on the robot or is not working the team will be disqualified from the competition. If a problem occurs with the module during a fight it is recommended and allowed to be replaced. During the homologation and in the matches the module must function properly.

B. Jamming devices, such as IR LEDs intended to saturate the opponents IR sensors, are not allowed.

C. Parts that could break or damage the ring are not allowed. Do not use parts that are intended to damage the opponent's robot or it's operator. Normal pushes and bangs are not considered intent to damage.

D. Devices that can store liquid, powder, gas or other substances for throwing at the opponent are not allowed.

E. Any flaming devices are not allowed.

F. Devices that throw things at your opponent are not allowed.

G. Sticky substances to improve traction are not allowed. Tires and other components of the robot in contact with the ring, must not be able to pick up and hold a standard A4 paper (80 g/m2) for more than two seconds.

H. Devices to increase down force are permitted.

I. The blade and the expansion of the robot can not be white.

J. It is allowed the use of max 4 flags on the robot. The flags must be in vertical position and fit within the perimeter of the robot. After the start the flags can fall.

3. Requirements for the Dohyo (Sumo Ring)

3.1. Dohyo Interior

The dohyo interior is defined as the playing surface surrounded by and including the border line. Anywhere outside this area is called the dohyo exterior.

3.2. Dohyo Specifications

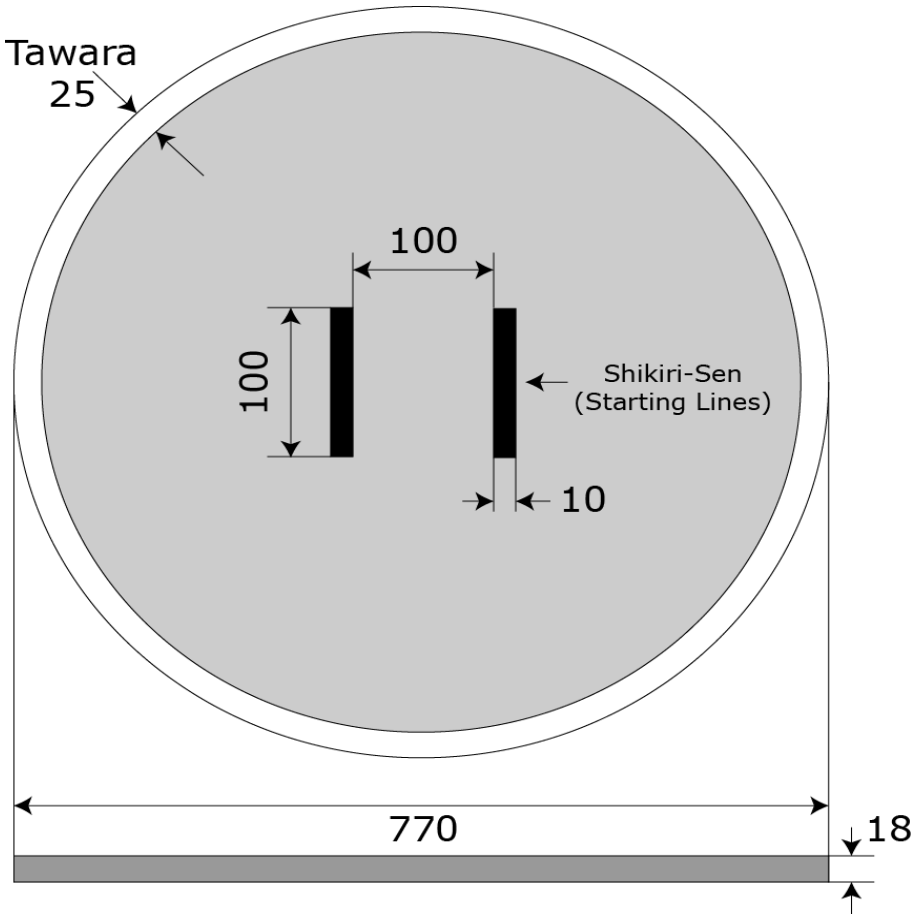
A. The ring shall be circular made from wood with a thickness of 2-3 cm, painted in black with a diameter of 77 cm (770 mm).

B. The border line is marked as a white circular ring with a width of 2.5 cm (25 mm).

C. The Doyho will be place on a wooden surface, height 70 - 100 cm (700 - 1000 mm)

D. For all given dohyo dimensions a tolerance of 5% applies.

E. Starting Lines (Shikiri-Sen) 10x1 cm (100x10 mm)



3.3. Doyho Exterior

There should be a space appropriate for the given class outside the outer edge of the ring. This space can be of any color, and can be of any material or shape as long as the basic concepts of these rules are not violated. This area, with the ring in the middle, is to be called the "ring area".

3.4. How to Carry Sumo Matches

A. One match shall consist of 3 rounds, within a time of 3 minutes, unless extended by the judges.

B. The team who wins two rounds or receives two "Yuhkoh" points first, within the time limit, shall win the match. A team receives a "Yuhkoh" point when they win a round. If the time limit is reached before one team can get two "Yuhkoh" points, and one of the teams has received one "Yuhkoh" point, the team with one "Yuhkoh" point shall win.

C. When the match is not won by either team within the time limit, an extended match may be fought, during which the team who receives the first "Yuhkoh" point shall win. Alternatively, the winner/loser of the match may be decided by judges, by means of lots, or by a rematch.

D. If the robots get stuck, the rules from the point 6.1 will be applied.

E. If one of the two robots won’t start, a restart will be done. If at this restart the same robot won’t start, the match will be won by the robot that moves.

3.5. Course of the Competition

Important!!! One person can be operator for maximum 2 robots.

A. The robots will be divided into groups according to the number of participants. The competition will take place in a groups/quarters/semifinals/finals system in order to allow as many rounds of play for each robot. Each match is played on the best out of 3 rounds system and will be supervised by 3 refs (a principal one and two assistants), excepting the finals where the match is disputed on the 5 rounds system. The decisions of the refs must be unanimous and are final; questioning these decisions leads to disqualification.

B. If two robots of the same team will advance to quarters/semifinals/finals and play one against the other, they must play the match, without demanding that one of them to advance without play, or to demand to arrange the matches or the opponents.

C. The order of the robots in the groups will be made random, it will be made after the official opening of the competition, will be available on the website for all the participants. The ones that pass the groups will play quarter/semifinals/finals.

If the number of the participants will not be enough for the groups the competition will be played from the beginning using the pyramidal system. The position in the pyramid will be random.

D. During the whole contest when playing a match no breaks are allowed. Between the matches, the changes, repairs and reprogramming are allowed.

E. Until the homologation, all the teams will stay in the room reserved for them (the room will be marked in the area map from the team's folder). Each challenge will have a room. The teams can leave the room only when they are called to the competition area. Each team will be called by a competition official, when they need to go to the waiting area which is near the competition area (details in appendix 1).

F. The homologation is made every time for the robots which will follow at start. They will remain in the competition area, in the waiting area. The teams will leave this area only if the referee agrees.

G. After a match is over, the teams must return in the room reserved for them.

H. Each team has the responsibility to follow the starting grid (schedule), displayed on the website and in the team's room. PLEASE DON'T BE LATE, WE WILL NOT WAIT!!!

If you are called to play and you don't come in 5 minutes the robot is desqulified!!!.

I. Each team will have one operator and, optional, one assistant. Only the operator and the assistant are allowed in the waiting area and in the game area. The rest of the team will remain in the room or will follow the game from the audience.

J. During a match there will be a short break max 1 minute between the rounds for cleaning the robot and wheels, configure the robot and the fight must resume.

K. The robot configuration must be done before placing the robot in the ring, or after it was placed without touching it.

L. Once placed in the ring the robot can't be touched.

M. The players can't touch or remove the robots from the ring after the fight is over until the judge gives them the sign. If the players touch or remove the robot before the judge gives the sign no objections can be raised.

3.6. Homologation

Each team will have to pass the homologation stage, in order to participate with theirs robots in the competition.

The stages of homologation process are:

At the begining of the competition

A. It will be checked if the number exists on the outer casing of the robot.

B. A photo will be taken to every robot in which the numer will be visible.

C. Checking the robot dimensions by placing a 10 cm x 10 cm (100mm x 100mm) box/frame, bottomless, over the robot.

D. Weighing the robot on a digital scale. The maximum value must be 500g.

E. Checking the operation of the IR sensor to start and stop the robot.

Before every match

A. Checking the robot dimensions by placing a 10 cm x 10 cm (100mm x 100mm) box/frame, bottomless, over the robot.

B. Weighing the robot on a digital scale. The maximum value must be 500g.

C. It will be checked if the number exists on the outer casing of the robot.

After homologation the first 4 teams will remain in the waiting area, near the game area. The rest of the teams will return to the room assigned for them.

4.Start, Stop, Resume, End a Match

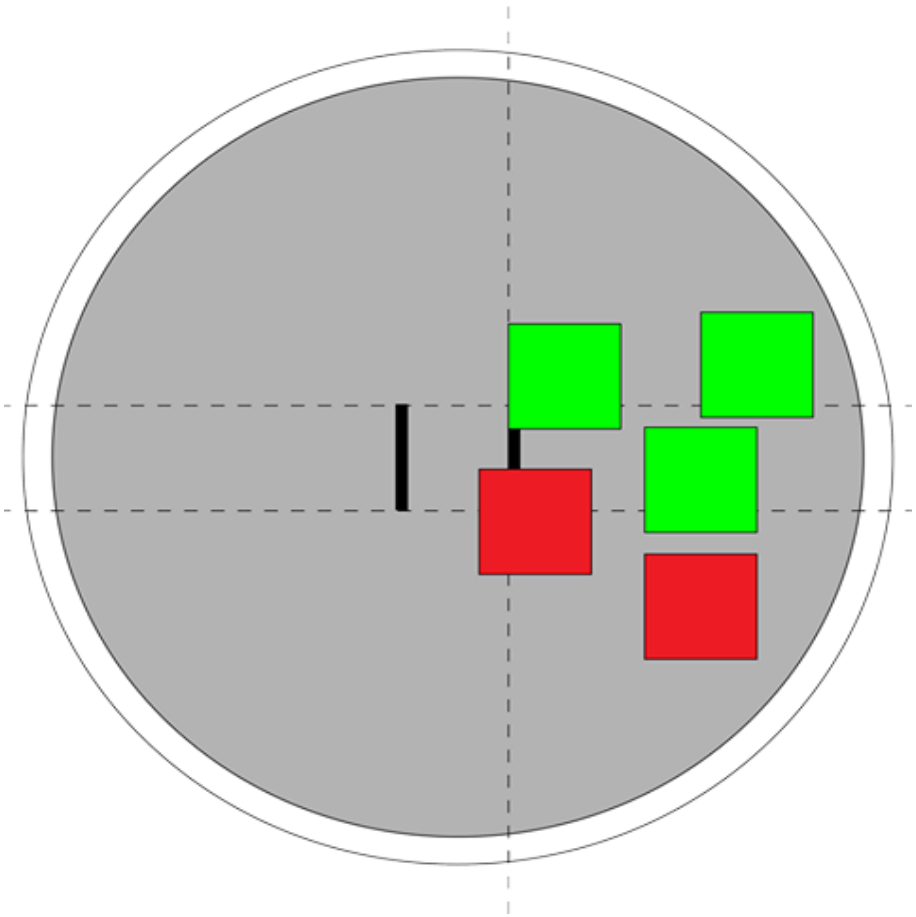
4.1. Robot Placing

Upon the judge's instructions, the two teams approach the ring to place their robots on the ring. The operators will place the robots in the same time on the ring. The Judge will give the signal. After placing, the robots may not be moved anymore.

Any part of the robots must be placed behind the Shikiri-Sen (staring lines). The robot shall not go over the starting line toward the oponent.

The robot should be placed on and within the extended lines verticaly from the both edges of Shikiri-Sen (starting line)

The referee will check if the robots are places ok. If the placement is not corect, the robot positioning will be made again.



4.2. Start

In Mega, Mini Micro and Nano classes the judge starts every round by sending a start signal with an IR transmitter. As soon as the robots receive the signal the round will start immediately, without any delay. The technical specifications for the IR receiver are given in the appendix. Contestants can either implement their own hardware or use a prebuilt module offered by the organizers.

The start will be made after the operator and/or the assistant will be in the safe area. If the operator and/or the assistant will leave the safe without referee approval the team can lose a point or can be disqualified.

4.3. Stop, Resume

The match stops and resumes when a judge announces so.

The judge announces the moment when the robots can be placed on the ring, the moment when the operator and/or the assistant to retreat in the safe area and the moment when they can take the robots from the ring.

4.4. End

The match ends when the judge announces so. The two teams retrieve the robots from the ring area.

After the robots are retrieved the decision is final and no objections shall be declared.

5. Time of Match

5.1. Duration

One Match will be fought for a total of 3 minutes, starting and ending upon the judge's command, after the operator and assistant will retreat to the safe area

5.2. Extention

An extended match, if called for by the judge, shall last for a maximum of 3 minutes

6. Scoring

One “Yuhkoh” point shall be given when:

A. A team legally forces the body of the opposing robot to touch the space outside the ring.

B. The opposing robot has touched the space outside the ring on its own.

C. The opposing robot has left the ring surface completely, even if the other robot has touched first the space outside the ring (after a contact between the robots).

D. The opposing robot gets damaged without being able to continue and the team’s representative announces it.

E. If both robots leave the ring at the same time, the robot that gets pushed outside will lose, even if the one that pushes touches first the space outside the ring.

When judges' decision is called for to decide the winner, the following points will be taken into considerations:

a. Technical merits in movement and operation of a robot

b. Penalty points during the match

c. Attitude of the players during the match

6.1. The match shall be stopped and a rematch started under the following conditions:

A. If one of the two robots doesn’t start there will be one restart.

If at restart the same robot doesn’t start, the point will be won by the robot that moves.

B. The robots are entangled or orbiting each other with no perceivable progress for 10 seconds there will be one restart.

If at restart the situation is repeating, the winner will be the robot that moves more and shows the willing to fight.

C. If one fast robot get stuck in a slow robot for more than 5 seconds, there will be one restart.

If the progress is none or the robots move very slow, after 5 seconds the judge stops the match. The teams can't make any objection.

If at restart the situation is repeating, the robot that moves faster and attack will be the winner of the round.

D. If two fast robots get stuck for more than 5 seconds, there will be one restart.

If the progress is none or the robots move very slow, after 5 seconds the judge stops the match. The teams can't make any objection.

If at restart the situation is repeating, the robot that moves faster and attack more will be the winner of the round.

E. If one robot has 1 point and in the next round there is no winner, there are allowed only 2 rematches. If in the 2 rematches allowed no one wins, the robot that has 1 point will be the winner of the match.

F. Both robots move, without making progress, or stop (at the exact same time) and stay stopped for 5 seconds without touching each other. However, if one robot stops its movement first, after 5 seconds it will be declared as not having the will to fight. In this case the opponent shall receive a “Yuhkoh” point, even if the opponent also stops. If both robots are moving and it isn't clear if progress is being made or not, the judge can extend the time limit up to 30 seconds.

G. If both robots touch the outside of the ring at about the same time, and it can not be determined which touched first, a rematch is called.

Important:

In the case the winner can't be declared in any of the above situations, there will be a special rule:

A bottle will be placed in the center of the Dohyo and the first robot that touches it with the robot case or blade is declared the winner. It's not considered a valid touch with the flag or other robot extension.

6.2. Repairs, modifications, unpredicted interruptions

From the moment a robot passes the homologation (and it is in the waiting area) until the match ends (all rounds are played), no changes can be made to the robot and no breaks are allowed for any of the conditions below.

- No repairs are allowed during a match.
- No battery change or charge is allowed during a match
- No blade change is allowed during a match
- No reprogramming is allowed during a match (the tactics selection before the fight is not considered programming)
- If the robot blade is detached from the robot during a round it's not allowed to put it back. The robot must continue fighting without the blade until the match is over

A. The robot must start and finish the match (all rounds played) without any modification (except the tactics selection for the robot) and can not leave the competition area for any reason.

B. During a match there will be a short break max 1 minute between the rounds for cleaning the robot and wheels, configure the robot and the fight must resume.

C. Battery change/charge, repairs or the replace of defective parts, blades can be made after the match is over until the next match involved.

D. If a robot gets broken during a match and can't continue, the match is won by the opponent robot. No repair is allowed.

7. Violations

7.1. Violations

Players performing any of the deeds described in Sections 2.2, 7.2 or 7.3 shall be declared in violation of these rules.

7.2. Insults

A player who utters insulting words to the opponent or to the judges or puts voice devices in a robot to utter insulting words or writes insulting words on the body of a robot, or performs any insulting action, is in violation of these rules.

7.3. Protective gear and the safe area

It is considered serious misconduct in regulation:

A. The operator and/or assistant doesn’t wear the protective gear during a match.

B. The operator and/or the assistant doesn’t retreat to the safe area or they don’t comply the indications of the referee.

C. If the start/stop module doesn’t work or is missing, the robot will be disqualified.

7.4. Minor Violations

A minor violation is punishable with a warning and is declared when:

A. The competitor enter the ring during the match , unless the referee stops the match after the grant of a " Yuhkoh " point and the contestant goes to pick up the robot. To enter into the ring means:

a. A part of the player's body is in the ring.

b. A player puts any mechanical kits into the ring to support his/her body.

B. Performs the following deeds:

a. Demand to stop the match without appropriate reasons.

b. Take more than 60 seconds before resuming the match, unless the judge announces a time extension.

c. Take action of any kind which are contrary to the spirit of fair-play of the game.

d. The operator and/or the assistant will leave the waiting area without announcing the official of the competition or the referee regarding the reason of leaving.

If a team has 2 warnings, a ”Yuhkoh” point will be given to the opposite team, or the team can be disqualified depending of the gravity of the action that they did.

8. Penalties

8.1. Penalties

A. Players who violate these rules by performing the deeds described in Sections 2.2, 7.2 and 7.3 shall lose the match. The judge shall give two “Yuhkoh” points to the opponent and order the violator to clear out. The violator is not honored with any rights.

B. Each occasion of the violations described in Sections 7.4 shall be accumulated. Two of these violations shall give one Yuhkoh to the opponent.

C. The violations described in Article 7.4 shall be accumulated throughout one match

9. Declaring Objections

9.1. Declaring Objections

A. No objections shall be declared against the judges' decisions.

B. The operator of a team can present objections to the Committee, before the match is over, if there are any doubts in the exercising of these rules. If there are no Committee members present, the objection can be presented to the judge before the match is over.

10. Flexibility of Rules

As long as the concept and fundamentals of the rules are observed, these rules shall be flexible enough to encompass the changes in the number of players and of the contents of matches. Modifications or abolition of the rules can be made by the local event organizers as long as they are published prior to the event, and are consistently maintained throughout the event.

11. Liability

A. Participating teams are always responsible for their own safety and for the safety of their robots and are liable for any accidents caused by their team members or their robots.

B. The RoboChallenge organization and the organizing team members will never be held responsible nor liable for any incidents and / or accidents caused by participating teams or their equipment.

APPENDIX 1

Team’s folder will have the following items:

1. The numbers for each robotThe participations diplomas for the team members
2. The badges for the team members
3. Informations regarding the rooms reserved for the teams and the competition area map
4. Promotional
5. Explanation regarding how the groups are formed
6. The map for the team’s room and the competition areas

APPENDIX 2

Remote start and stop

Explanation of use

You can find detailed information about the usage of the startmodules on:

http://www.startmodule.com

The start/stop module can be powered by a 5V or 3v3 power supply and has a total of 4 pins which 2 are used for supplying the module (pins labelled VCC and GND).

The other 2 pins (labelled as Start and Kill switch) are used to signal the robot when to start/stop and when to perform the kill switch. In our competition the kill switch is not mandatory to be used but this pin will be briefly explained. It's up to you for your robot's safety to use the kill switch.

For safety reasons we highly recommend the 4 pins configuration. Besides monitoring the start pin you can also monitor the kill switch pin and act accordingly.

Important: What if your code reaches a state that it doesn't monitor the start pin correctly or your robot experienced a short brown out/loss of power while competing against the opponent. The robot will not be able to monitor the start pin correctly. In a situation like this you can monitor the kill switch as well or follow the diagrams below.

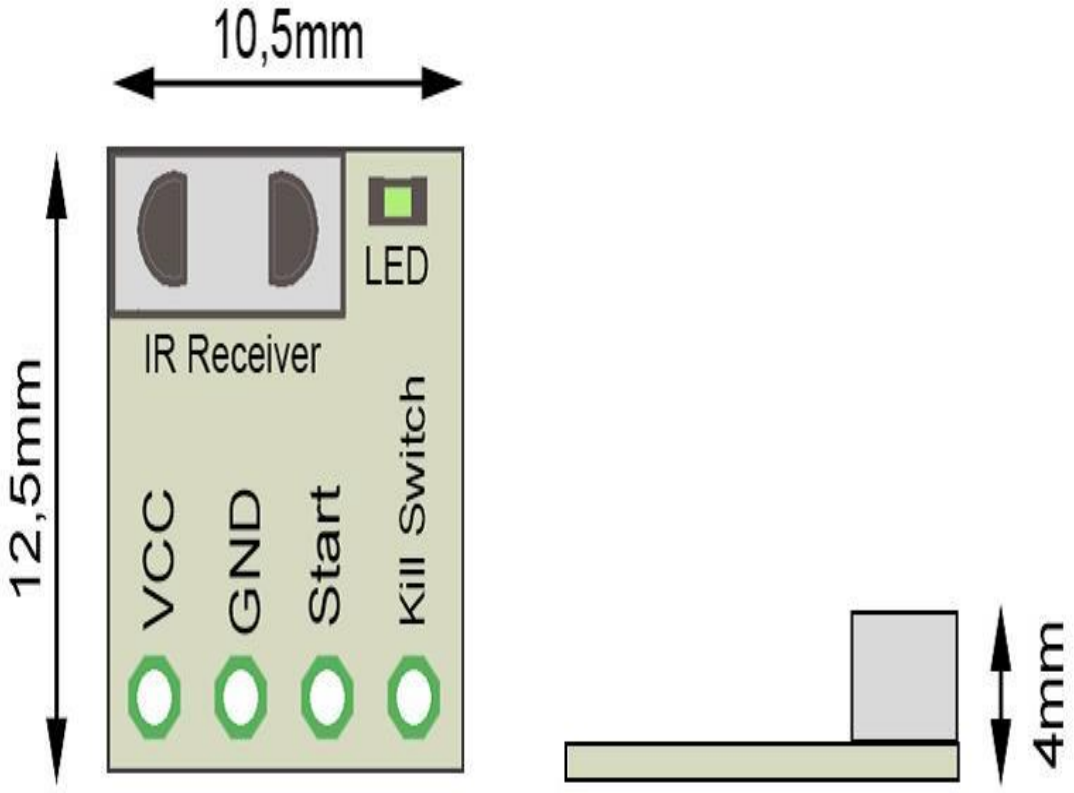
This module also features a green LED which will tell you if the module has received the start/stop command correctly or if something is wrong with your robot.

Important: When you first power on your robot you have to make sure that the green LED is OFF.

This means the robot is ready to accept the remote signal.

Important: If by any chance the green LED is ON then the robot will not receive any other start signal. In this situation you have to ask the referee to press the stop button on the remote and then you have to do a power cycle or just turn the robot off and on again.

Below you can see the layout of the start module. Check that the module fits in your robot and make sure you have 4 pins available.



How does the module work:

1. When you power on your robot make sure the green LED is OFF. This means the module is ready to accept any commands.

2. The referee will perform the initial program of the start module. Confirm that the LED flashes a couple of times. This means the robot will only listen to the referee's remote (by a unique identifier).

3. The module is ready for the start/stop command which will be triggered by the referee.

The start pin explained:

1. When you power on your robot the start pin is in a "0" logic state. Let's call it the "power on state".

2. When the match is about to start the referee will push the start button and the start pin will switch to a "1" logic state. Let's call it the "Started" state.

3. When the match is over the referee will push the stop button and the start pin will switch back to a "0" logic state. Let's call it the "Stopped" state.

The kill switch explained:

1. When you power on your robot the kill switch pin is in a "1" logic state. You can either monitor the kill switch pin in your code or power on the motor driver circuit. You can follow the diagram at this link to control a relay or optocoupler but remember that this is not mandatory.

Monitoring the kill switch accordingly is for your robot's safety!

https://p1r.se/startmodule/kill-switch-relay/

https://p1r.se/startmodule/kill-switch-oc/

1. When the match is about to start the referee will push the start button. The Kill switch will keep its state as "1".
3. When the match is over the referee will push the stop button and the Kill switch pin will switch back to a "0" logic state. If you follow the diagrams above the kill switch will turn off the power supply of the motor driver circuit.

For inexperienced users:

The code below is more or less a pseudocode. You have to adapt it to your microcontroller type and to your code structure. You can change it the way you like it but you have to verify that the code works flawlessly so that you don't get penalised if the robot doesn't behave as it should.

The pseudocode is not efficiently designed because each user has its own ideas of writing software. It should be viewed as a start for inexperienced users who just started to program robots. The code uses while loops which keeps the robot locked in different loops which is not flexible.

1. When you power on your robot you have to check that the start pin is in a "0" level state.

```
robot_ready_state = false;
// initial check
initial _start_pin_state = digitalRead(start_pin);
If (initial_start__pin_state == 1) {
        // error, the start pin should be 0 when you power your robot
        // if start pin state was "1" at the initial check you have to ask the referee to press
the
        // stop button and then power off and on your robot
        while(true) {
                // for safety reasons the robot is locked in this loop
                // you can flash a separate LED to let the user know
                // the only way to exit this loop is to do a power cycle
        }
} else if (initial_start_pin_state == 0) {
        // correct state
        // the robot is ready to accept the start command
        robot_ready_state = True;
}
```

2. If the initial check has passed you can proceed to the following part where you have to monitor the state of the start pin to catch the start command triggered by the referee:

```
current_start_pin_state = 0;
while (current_start_pin_state  ==  0) {
        // keep the robot locked in a loop until the start command
        // is received
        current_start_pin_state = digitalRead(start_pin);
}
// the program will continue only if the start command is received
```

3. When the start command is received the robot can start operating on the dohyo. When the stop command is received the robot should stop all activities (moving, turning).

```
If (current_start_pin_state  == 1 and robot_ready_state == True) {
        // the start command was received and the robot was in a ready state
        // this is where the robot will start to compete against the opponent
        // the if condition will not execute unless the robot is in a ready state.
        while (current_start_pin_state  ==  1) {
                // keep the robot locked in a loop until the stop command is received
                current_start_pin_state = digitalRead(start_pin);
        }
        // the program will continue only if the stop command is received
        If (current_start_pin_state  == 0) {
                // the stop command was received
                // this is where the robot should stop all operations
                while(true) {
                        // for safety reasons the robot is locked in this loop
                        // you can flash a separate LED to let the user know
                        // the only way to exit this loop is to do a power cycle
                 }
        }
}
```