

SUMO ROBOT

SUMOROBOT Competition

This is a competition between 2 robot either autonomous or remote control. The main objective is to push the other opponent out of the ring within the given time period. The successful robot then moves on to the next round facing other winners from the round. The losers will be eliminated and in the end, the one robot that last is the main champion.

Definition of a Match

The match shall be contested by two teams, 2 robots (At the event, one team consists of one robot with two team members, one of which is a leader. Other team members must watch from the audience), according to these Rules for Sumo matches (hereafter called "these Rules"), with each team's robot made by each team (either a remote-controlled model or a standalone model) competing to get the effective points (hereafter called "**Yuko**"), within the perimeter of the defined Sumo Ring. The judges will decide which team wins. A single person can also compete with a Robot Sumo, with the same rules that apply to teams.

Ring Requirements

The Ring Area means the Sumo Ring and the space outside the Ring. Anywhere outside this Ring Area is called Outer Area.

Sumo Ring

1. The Ring shall be in circular shape with its height being 2.5 cm and its diameter 77 cm (including the outside of the line that divides the inside of the Ring from its outside). The Ring shall be of black hard rubber adhered on top of Ring.
2. Shikiri lines (where robots stand at the beginning of the match) are the two parallel lines with 10 cm distance between the lines, drawn in the center of the Ring. The Shikiri lines are painted in brown (or equivalent for reflection of IR light), 1 cm wide and 10 cm long.
3. The Ring shall be marked by a white circular line of 2.5 cm thickness. The Ring is within the outside of this circular line.

SPACE

There should be the space of more than 50 cm wide outside the outer side of the Ring. This space can be of any color except white, and can be of any materials or shape, as long as the basic concept of these rules are observed. This area, with the ring in the middle, is to be called the: "Ring Area". If there are markings or part of the ring platform outside these dimensions, this area will also be considered in the Ring Area.

ROBOT Requirements

Specifications

1. A robot must be in such a size that it can be put in a square tube of **20 cm wide** and **20 cm deep**. A robot can be of any height. A robot must not be in such a design that its body will be physically separated into pieces when a match starts. The robot with such a design shall lose the match. The design to stretch a robot's body or its parts shall be allowed, but must remain a single centralized robot. Screws or nuts or other robot parts, with a mass of less than 5 grams total, falling off from a robot's body shall not cause the loss of match.
2. The mass of a robot must be under **1000 grams** including the attachments and parts, but excluding the weight of a proportional system (the transmitter or control box held by the operator, hereafter called "Prop") for remote-controlled models.
3. The radio frequencies for remote-controlled robots must be either **315MHZ** or **433MHZ INEX RF Modules** which are provided by the organizers. Other 3rd party Remote control devices of any frequency cannot be used.
4. Only one Prop can be used for one robot, in which case, will be the **INEX RF Modules**
5. For fully autonomous robots, any control mechanisms can be employed.
6. Fully autonomous robots must be so designed that a robot starts operating a minimum of five seconds after a start switch is pressed (or any method that invokes the operation of a robot, eg. By sound, touch, light,etc...).
7. Microcomputers in a robot must be from INEX range of microcontrollers. Teams are free to choose any form of INEX robotics platform.

Restrictions on Robot Design

1. Jamming devices, such as an IR LED intended to saturate the opponents IR sensor, are not allowed. Do not disturb your opponent's radio-control by putting into a robot's body such devices as a jamming device.
2. Do not use parts that could break or damage the Ring. Do not use parts that are intended to damage the opponents robot or it's operator. Normal pushes and bangs are not considered intent to damage.
3. Do not put into a robot's body devices that can store liquid, powder, or air, in which are thrown at the opponent.
4. Do not use any inflaming devices.
5. Do not use devices that throw things at your opponent.
6. Do not stick a robot down onto the Ring, using sucking devices or glue, or use any type of sticky tires (such as double sticky foam tape) or any device to assist in adding more down force (such as a vacuum device).

Match Principles

1. One match shall consist of 3 rounds, within a total time of 3 minutes, unless extended by the Judges.
2. The team who wins two rounds or receives two "Yuko" points first, within the time limit, shall win the match. A team receives a Yuko point when they win a round. If the time limit is reached before one team can get two Yuko points, and one of the teams has received one Yuko point, the team with one Yuko point shall win.
3. When the match is not won by either team within the time limit, the extended match shall be fought during which the team who receives the first Yuko point shall win. However, the winner/loser of the match may be decided by judges or by means of lots, or there can be a rematch.
4. One Yuko point shall be given to the winner when the judges' decision was called for or lots were employed.

Match Procedures**Start**

With the chief judge's instructions, the two teams bow in the Outer Ring (For example, stand facing each other, outside the ring platform or "ring area", with ring between), go up to the Ring, and place a robot on or behind the Shikiri line or the imaginary extended Shikiri line. (A robot or a part of a robot may not be placed beyond the front edge of the Shikiri line toward the opponent.). A match starts with the following rules:

1. For remote-controlled robots, start operating a Prop when the chief judge announces the start of a round.
2. For fully autonomous robots, be ready to press a start switch. Press the switch when the chief judge announces the start of the round. After 5 seconds, the robot is allowed to start operating, before which players must clear out of the Ring Area.

Stop & Resume

The match stops and resumes when a judge announces so.

End of Match

The match ends when the judge calls the winner. Both contestants bow after removing their robots.

Time of Match

One Match will be contested for a total of 3 minutes, starting and ending by the chief judge's announcements. For stand-alone robots, the clock shall start ticking 5 seconds after the start is announced.

An extended match shall be for 3 minutes, if called by the Judge.

The following are not included in the time of the Match:

1. The time elapsed after the chief judge announces Yuko and before the match resumes. 30 seconds shall be the standard before the match resumes.
2. The time elapsed after a judge announces to stop the match and before the match resumes.

Yuko

One Yuko point shall be given when:

1. You have legally forced the body of your opponent's robot to touch the space outside the Ring, which includes the side of the ring its self.
2. A Yuko point is also given in the following cases:
 - a. Your opponent's robot has touched the space outside the Ring, on its own.
 - b. Either of the above takes place at the same time that the End of the Match is announced.
3. When a robot has fallen on the Ring or in similar conditions, Yuko will not be counted and the match continues.
4. 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
5. The match shall be stopped and a rematch shall start when:
 - a. Both robots are in clinch and stop movements for 5 seconds, or move in the same orbit for 5 seconds, with no progress being made. If it is not clear if progress is being made or not, the Judge can extend the time limit for a clinch or orbiting robots up to 30 seconds.
 - b. 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 it's movement first, after 5 seconds, he shall be considered not having the will to fight, and the opponent shall receive a Yuko, 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.
 - c. 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.

Violations

If the players perform the deeds as described in Robot Restrictions, insulting words or any part of the robot is out of the ring, the players shall be declared as violating the rules.

The player 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 any insulting action.

A Player

1. Enters into the Ring during the match, except when the player does so to bring the robot out of the Ring upon the chief judge's announcement of Yuko or stopping the match. To enter into the Ring means:
 - a. A part of the player's body is in the Ring, or
 - b. A player puts any mechanical kits into the Ring to support his/her body.
2. Performs the following deeds:
 - a. Demand to stop the match without appropriate reasons.
 - b. Take more than 30 seconds before resuming the match, unless the Judge announces a time extension..
 - c. Start operating the robot before the chief judge announces the start of the match (for remote-controlled robots).
 - d. Start operating the robot within 5 seconds after the chief judge announces the start of the match (for stand-alone robots).
 - e. Do or say that which should disgrace the fairness of the match.

Penalties

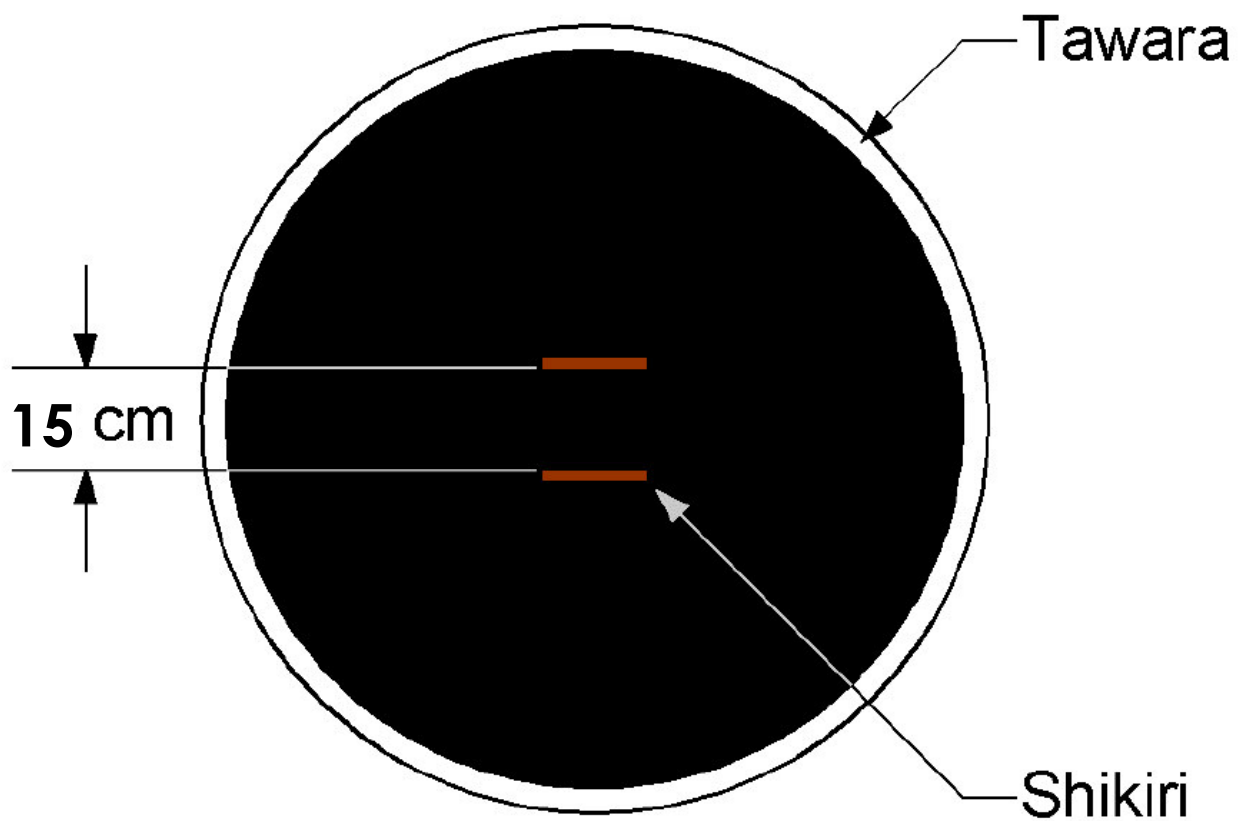
Those who violate the rules with the deeds shall lose the match. The judge shall give two Yuko points to the opponent and order the violator to clear out. The violator is not honored with any rights.

Each occasion of the violations shall be accumulated. Two of these violations shall give one Yuko to the opponent.

The violations shall be accumulated throughout one match.

SUMO RING Specifications

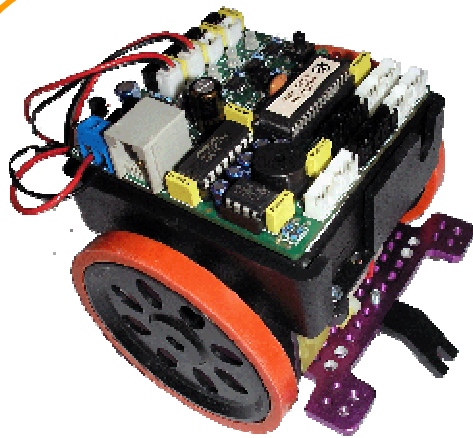
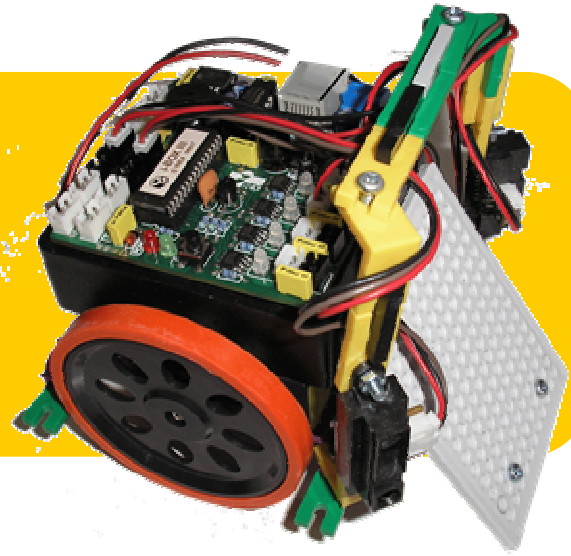
- 150 cm Diameter
- Height 2.5 cm
- Surface Hard Rubber
- Colors
 - o Ring Black
 - o Shikiri (start line) Brown5 (15 cm x 1 cm)
 - o Tawara (border) White (3 cm)



BUILDING an autonomous SUMOBOT

SUMOBOT AUTO

The SUMOBOT AUTO is a fully autonomous SUMO ROBOT that searches for its opponent and is programmed to push it out of the ring.



Nuts



3x10 Screws



GP2D120 Sensors



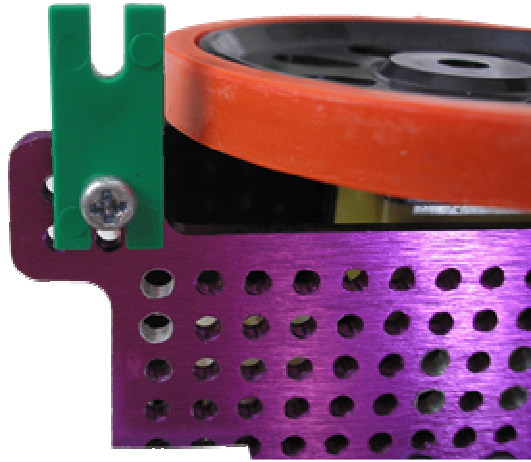
plate



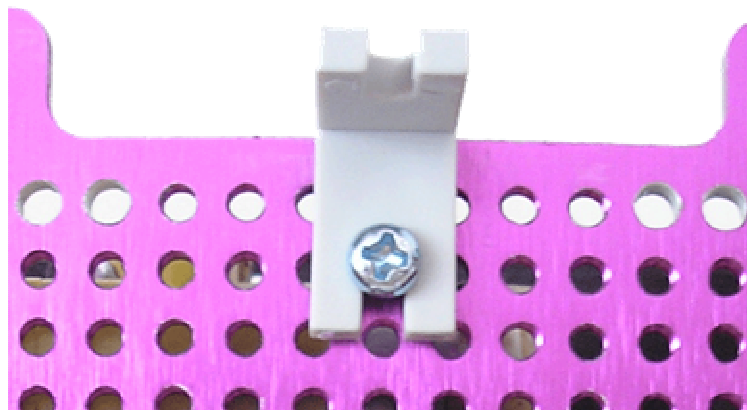
Plastic Spacers



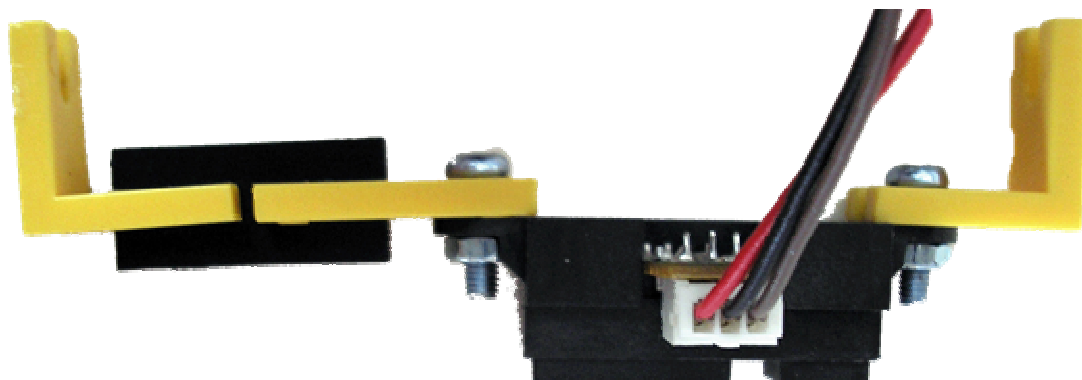
1. The first step is to add 2 straight joiners to the side of your basic robot.



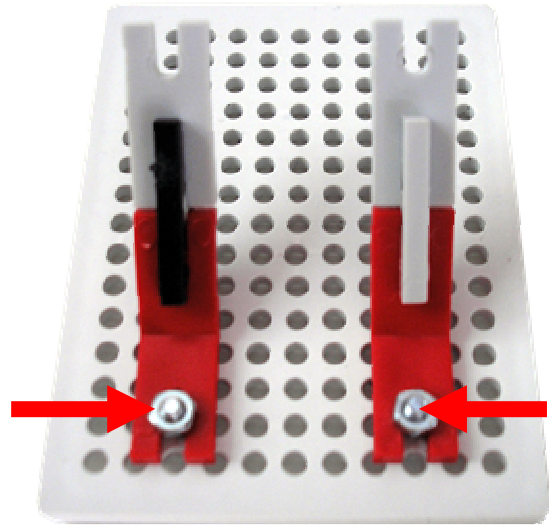
2. Add to angle joiners to the front and back of the robot to give it stability in movement.



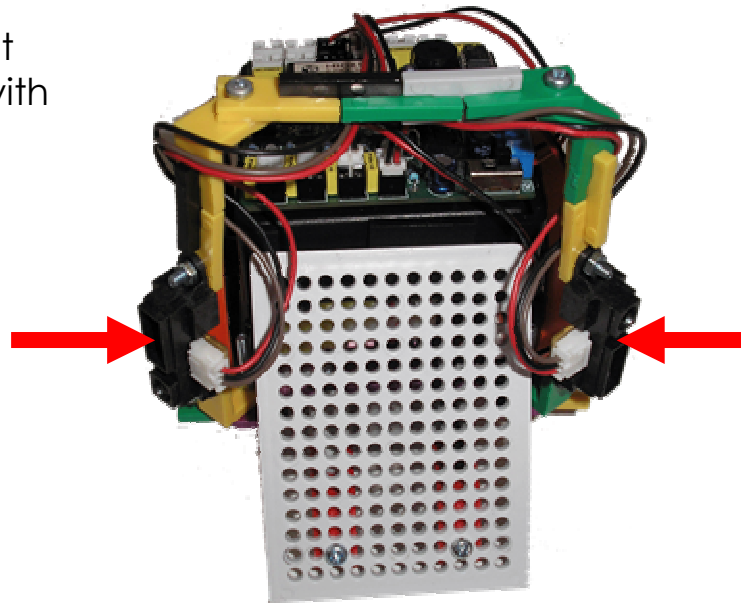
3. Next, place a few joiners together and screw them with a GP2D120 sensor. It should look something like this. Assemble 2 of these.



4. Assemble the front shovel. Use a 120 degree plate and join it with another 2 more plates. Connect them to the flat plate as shown in the picture.



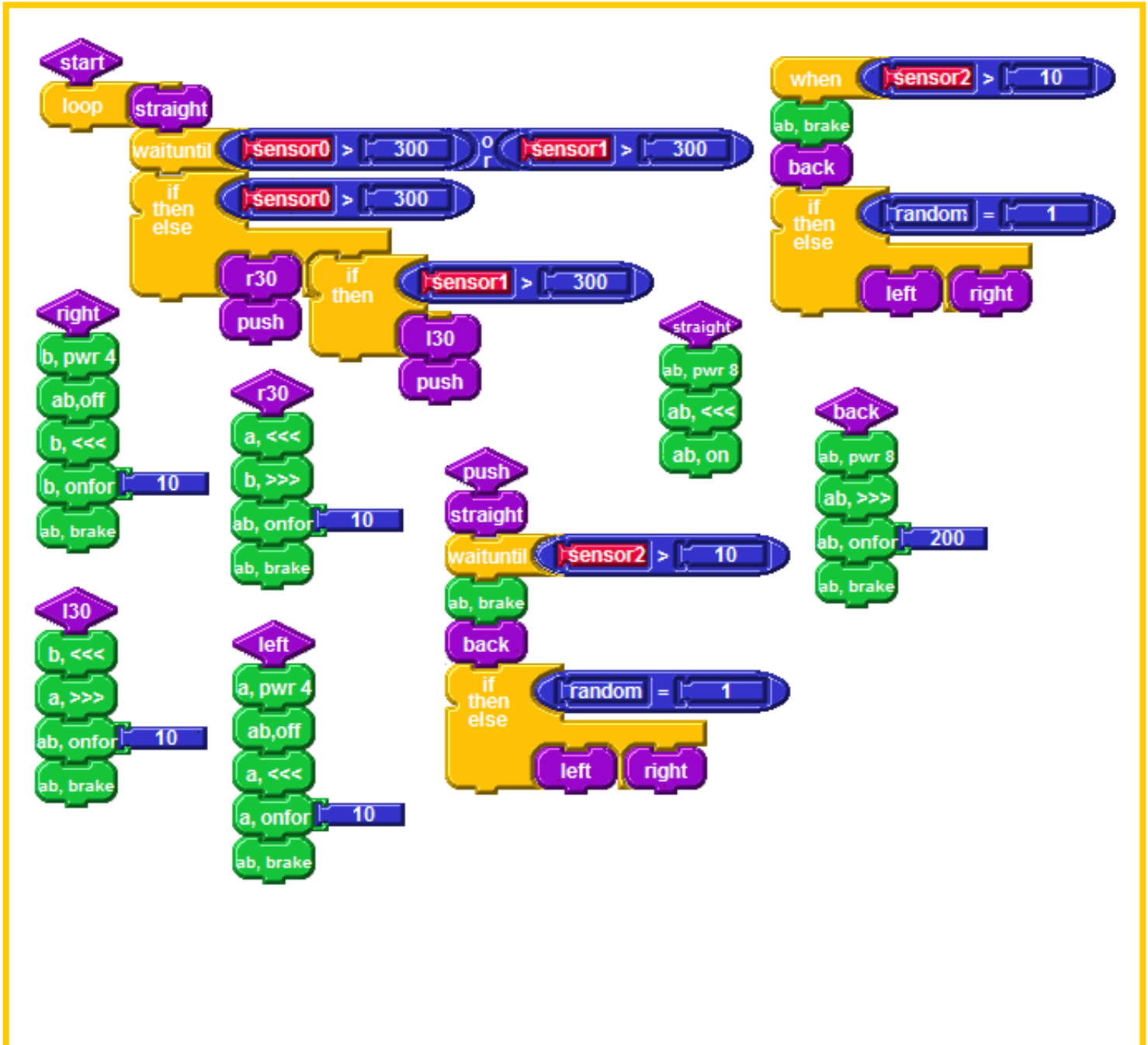
5. Attach the Front GP2D120 sensor with screws and nuts.



6. Your Overall Robot should look like this.

PROGRAMMING simple AUTONOMOUS SUMO

In Programming of Autonomous Sumo, there are many methods that you can use. We will be trying out a simple maze logic program that will allow your sumo robot to encounter your opponents robot, move forward to push it and move backwards when it reaches the white outer ring line.



In this simple program, the SUMOBOT first has pre-defined functions, "r30,r90,left,right,push,straight,...".

The program tells your sumobot to move forward and when it encounters its opponent, it will move towards the opponent and push until it reaches the white ring.

On reaching the white ring, the robot then will move backwards and then do a turn and then move forward.

```
to straight
ab, setpower 8
ab, thisway
ab, on
end

to push
straight
waituntil [ ((sensor 2) > 10) ]
ab, brake
back
ifelse (( randomrange 1 2 ) = 1)
[ left ]
[ right ]
end

to left
a, setpower 4
ab, off
a, thisway
a, onfor 10
ab, brake
end
```

Cricket Logo Code

```
to start
when [ ((sensor 2) > 10) ] [ ab,
brake
back
ifelse (( randomrange 1 2 ) = 1)
[ left ]
[ right ] ]
loop [ straight
waituntil [ ((sensor 0) > 300
or ((sensor 1) > 300)) ]
ifelse ((sensor 0) > 300)
[ r30
push ]
[ if ((sensor 1) > 300)
[ l30
push ] ] ]
end
```

```
to l30
b, thisway
a, thatway
ab, onfor 10
ab, brake
end
```

```
to right
b, setpower 4
ab, off
b, thisway
b, onfor 10
ab, brake
end
```

```
to r30
a, thisway
b, thatway
ab, onfor 10
ab, brake
end
```

```
to back
ab, setpower 8
ab, thatway
ab, onfor 200
ab, brake
end
```