Plaksha Mechatronics Project 2025

Draft Rules

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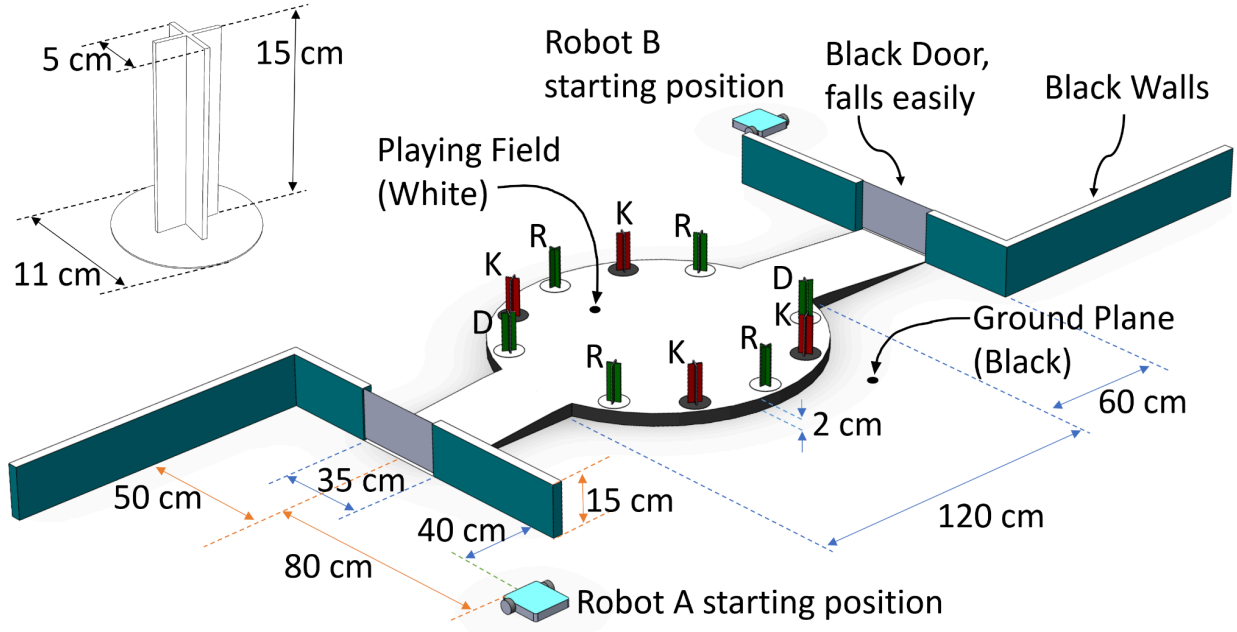
Rules are subject to clarification and, if needed, change. If anything is unclear, ask.

Summary

Your robot, with no wires and no remote control, tries to find the entrance ramp and knock down the entrance door. If it does that, it climbs the ramp to the circular playing field. If it gets that far, it then tries to:

* *push the bad 'Reject' cans off the field;*
* *push the opponent off the field,*
* *avoid pushing the good 'Keeper' cans off the field,*
* *staying on the field, and*
* *not being distracted by the Decoy anchored reject cans.*

K = Keeper can (black with black base)
R = Reject can (black with white base)
D = Decoy Anchored Reject can (black with white base)



Schedule

Starting Monday Oct 27, and for 2 weeks, labs and tutorials are focussed on the Mechatronics project/competition. The final public competition will be on Sunday 9 November starting at 11 AM in the robotic building in the big Drone Room.

IM lectures will continue through the competition period.

Teams

A team of 4 students (a few teams will have just 3 students) will build and compete with one robot.
All four students will be from one lab section.
Course staff will determine who is in what team (no self selection).
No switching between teams except with permission for special circumstances.

Scoring

In each match, each autonomous robot is attempting to get points.

Touch the entrance door	(+10 pts)
Get on to entrance ramp	(+15 pts);
Get on to raised circular playing field	(+25 points);
Opponent falls off the field or ramp	(+25 points);
Knock a 'reject white' can off the field	(+ 5 points each);
Don't knock a 'keeper black' can off	(- 10 points each);
Bonus for Winning the round	(+ 10 points);

Single-elimination Competition structure

Rounds and matches. The overall competition is a sequence of rounds. In each round there are several matches. Each match is between two robots. In each round each robot, that has not been previously eliminated, is in one match. In each match, you score points for task accomplishments or for errors by your opponent. You win a match by getting more points than your opponent in that match. Each match winner advances to the next round. If you lose a match you are eliminated from the later rounds. If you tie in a match you advance to the next round unless both robots in that round had zero points.

1. If an odd number of robots advance to the next round, the judges will advance, at their discretion, a previously losing wild-card robot.

2. Starting in round 2, robots will be paired based on their previous-round scores. The higher scoring half of the robots will be paired against the lower-scoring half (thus making it less likely for top robots to be excluded in early rounds).

3. In the first round there will be about 50 robots in 25 matches. The second round will involve about 13 matches. Then, about 7, 4, 2 & 1, respectively, for a total of about 52 matches in 6 rounds.

4. A robot's final competition score is their score in their best-round plus the match-winning bonuses.

5. The grand winner of the competition is the robot with the most points (which is not necessarily the winner of the final match).

Rules

6. **Start and stop.**

    a. A round starts exactly 60s after the warning bell.

    b. The round starts whether or not the robots are ready.

    c. Robots can start late.

    d. A round ends after 60s (This might be changed if this is found to be too short or too long).

    e. The competition continues for the full duration unless *both* robots are paralyzed.

    f. There is about a one minute break between matches and a 10 minute break between rounds.

    g. Match starts will not be delayed while waiting for teams to adjust or fix their robots.

    h. If a robot gets helplessly lost at the start and evidently has no hope of finding itself, the team may pick it up and put it back in the starting position.

7. **No self sacrifice**. Intentionally helping an opponent is not allowed.

8. **Fallen off.** A can or robot is considered off of the field if any part of it is touching the black ground surrounding the ramp and

field. For a given robot only its first fall credits the opponent.

9. **Who gets credit for can falls.** The last robot to touch a can before it falls off gets credit or penalty for its fall. If a can causes a can to fall, the last robot to touch the intermediate can gets the credit or penalty.

10. **Non-starter.** A robot that never gets fully on to the ramp does not give its opponent the falling-off reward.

11. **A robot falling is a robot falling.** You get credit for your opposing robot's falling off whether or not you helped cause the fall.

12. **Non-destructive.**

    a. **No sabotage.** Robots *cannot* intentionally damage opponents' robots (no cutting, burning, stabbing, throwing copper fibers, etc). No intentional disruption of opponents wiring.

    b. **No spiked wheels.** No anticipatable damage to the playing field or to the playing parts is allowed;

    c. **Keep it cool.** No fire, no explosions, no toxic or harmful chemicals.

    d. People safe. The robot cannot endanger people, including the team members. For example, it cannot have mouse-trap like things on board.

13. **Physical, but non-violent.** Poking, pushing, grabbing, etc, and temporarily disabling are allowed but not if they intentionally cause damage to the opponent.

Robot details

1) **Size.** In its starting configuration, a robot must fit in a 25 cm cubical box. On flat ground a box will be lowered over the robot to test this.

2) **Label.** The top of each robot will have a clear large unique identification number, visible from directly above, with letters at least 5 cm height. The robot design must include a horizontal surface on which to write that number.

3) **Weight.** Maximum weight is 2 kg.

4) **Springs**. robots can use stored energy besides electricity from batteries (e.g., springs or rubber bands), but not for causing damage.

5) **Expansion.** After the start, a robot can unfold and extend beyond its initial size.

6) **Intact.** Robots cannot release any fluids nor any detached objects.

7) **Allowed components:**

+ any parts distributed to the class
+ free items from the maker space;
+ items found in trash piles or construction refuse;
+ free items distributed by mechatronics staff;
  (resistors, wires, zip ties, string, glue, nuts and bolts, etc)
+ each team can spend up to Rs. 1,000 (per team)
  out of their own pockets, which must be accounted for;
+ teams can trade parts with other teams;
+ can buy replacement parts for parts the team
  accidentally destroys, outside the Rs 1,000 budget

(e.g., replace fried boards).

8) **Motor modifications.** The supplied motor gearboxes can be modified, but must be restored after the competition.

9) **No thing is required.** Within the constraints above, there is no particular part that you must use. You can use a different chassis, different wheels, etc.

Playing field and cans (See illustration above)

Black paint does not reflect IR light well.
White paint does reflect IR light well.
The field appears the same to both robots
(has 180 degree rotation symmetry about a vertical axis)

The primary playing field is a circular piece of plywood:

* diameter = 120 cm
* painted white that reflects IR light
* elevated 2 cm from the ground plane
* has entrance ramps from ground plane (painted white)
* ramp entrance has a thin low-mass black door
(easy to knock down and run over)
* ground plane has walls aiding
entrance onto playing field, painted black
* the ground pane outside the playing field is painted black

On the field are 6 kinds of objects:

+ your robot;
+ opponent's robot;
+ Reject white cans that you try to push off the edge;
+ Keeper black cans that you don't want to push off;
+ Decoys look like white reject cans. Screwed to field;
+ All "Cans" are acoustic corner reflectors 15 cm tall;

with circular bases.

- can diameter is 5 cm;
- base diameter is 11 cm;
- base thickness .5 cm or less;
- keeper cans have flat-black bases;
- reject white cans and decoys have white bases;
- two of the reject white cans are fake, they are;
  iimmobile anchored decoys;
- Outer edge of can base will be tangent to;
  playing field outer circle
- Cans placed evenly and symmetrically
  with 30 degree angular spacing;
- the initial locations of cans will be constant through
  all rounds.

The playing field will be available for practice at least two weeks before the competition.

Hint/advice

Most often, a simple design aimed at moderate success, that has been tested, debugged and refined will do better than a clever design aimed at total domination, that has not.