



MANUAL ROBOTICS PROBLEM STATEMENT-2015

Introduction

Welcome to the Inter-Hostel Quidditch Tournament for the year 2015-2016. The final match is played between Gryffindor (Red) and Ravenclaw (Blue). Both the teams shall have two players (robots), a Chaser and a Beater. The Chaser's task is to collect the quaffles placed in the jars on the shelves and pass them on to the Beater. The Beater's task is to pass them through the hoops for goals or bludgeon them at the opponent Chaser entering the home zone. The one with the maximum number of points earns the bragging rights and wins the Quidditch Cup.

Problem Statement

Each team has to build 2 manually controlled robots: Bot A and Bot B

The general tasks are as follows:

- There are bottles containing Quidditch Quaffles arranged on shelves. Bot A should pick the bottles up and take them to the interaction zone.

- These bottles are closed. They need to be opened by the bots. This can be done by either Bot A alone or by a cooperative work between the two bots.
- The 2 Quaffles inside the bottle need to be loaded onto Bot B.
- Bot B should shoot these Quaffles into hoops.
- If all the bottles are emptied, then Bot A can move into the opponent's house to pick up bottles and come back to its own house. This crossing over and coming back happens via a ramp.
- When a Bot A is in the opponent's house, the opponent's bot B can become a beater and can shoot the Quaffles at it.

The team which has the highest no. of points at the end of 10 minutes, wins.

Game Procedure and Rules

- At the whistle, bot A should go from its check point to the shelf containing bottles.
- The shelf has 2 rows containing 4 bottles in each. Level A is at a height of 8 cm from ground and Level B is at a height of 25 cm from the ground.
- The bottles are made of plastic, and is closed with a screw cap.
- Bot A should carry at least 1 bottle from the shelf and go to the interaction zone.
- Bot B can start only when bot A enters the interaction zone. Its starting point is at the top of a ramp. It has to come down the ramp and move to the interaction zone.
- The bottles should be opened only inside the interaction zone.
- Opening of the bottle can be done by bot A alone or can take the help of bot B. Any case, the points given remain the same.

- There will be two tennis balls inside each bottle.
- The balls inside the bottle need to be transferred to Bot B. In this course, the balls are not allowed to touch the ground. If the balls touch the ground, there will be a penalty of -10 points per ball.
- The transferring of balls onto bot B can be done by Bot A or by Bot B.
- Once the balls are received, Bot B should throw these balls into the hoops.
- There are 3 hoops on the centre line of the arena. These are separated by a distance of 60 cm from each other. The hoops are as follows:

Hoop	Diameter	Height
A	15 cm	20 cm
B	20 cm	30 cm
C	25 cm	40 cm

The heights of the hoops are measured from the ground to the bottom most point of the hoop.

- It is compulsory to shoot into hoop B at least once before shooting in hoop C. Similarly, it is necessary to shoot inside hoop A before the bot can shoot in hoop B.
- Bot B can shoot from a minimum distance of 30 cm. This will be marked by a line. No part of the bot is allowed to cross this line while shooting.
- If and only if, all balls in the home shelf have been exhausted, bot A can cross the ramp to enter the opponent's house. Now, bot A is allowed to pick up bottles from the opponent's shelf and return to its house.

- Bot B can act as a beater and shoot the opponent's bot A when the opponent is in its house. To shoot at the opponent's bot A, your bot B has to necessarily remain inside the interaction zone. No part of the bot B is allowed to cross the interaction zone while shooting at the opponent.
- If bottles of both the teams get exhausted before 10 minutes, they will be refilled by the coordinators.
- Closing of the bottles is optional. The team may choose to not to do this task. The cap should not hang loose after closing. The cap has to be screwed back into place tightly.

Scoring and Penalties

1. If Bot B is unable to climb down the ramp, it can start from a zone right beside the ramp, with a penalty of -10 points.
2. Bot A is allowed to bring any number of bottles to the interaction zone.
3. The balls should not touch the ground while they are being transferred from the bottles to bot B. This holds true till the balls are shot into the hoops. If a ball touches or falls on the ground, there will be a penalty of -10 points.
4. For a successful throw into the hoop, the ball must go inside it. Rebounds from the edge of the hoops will not be accepted as successful throw.
5. It is necessary to shoot in hoop A at least once before shooting into hoop B and it is necessary to shoot into hoop B at least once before shooting in hoop C.
6. If balls are successfully thrown into the hoops in consecutive shots without missing, bonus of +10 will be added in arithmetic

progression. For eg: Throwing in hoop A will fetch 40 points. If a ball is thrown into hoop B in the next attempt successfully, it will fetch 60 + 10 points. If in the next attempt the bot shoots into hoop C, it will fetch 80 + 20 points.

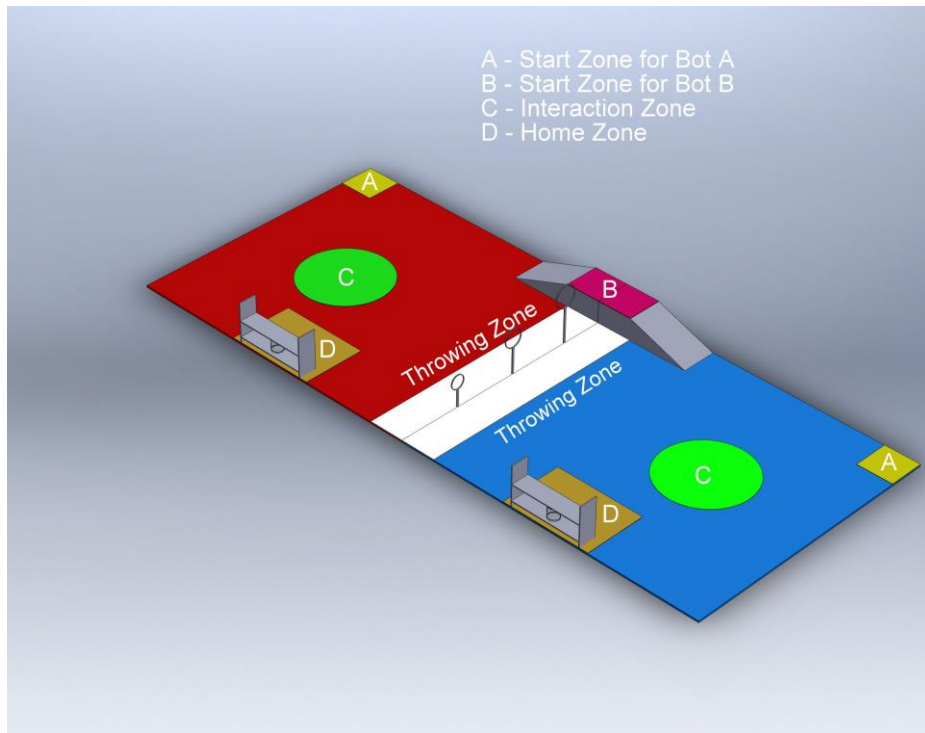
7. This bonus will start from zero if there is a miss.
8. Bot B is allowed to hit opponent's bot A with the balls if the latter is in its house. It can shoot only from within its interaction zone.
9. It is enough for the ball to just touch the opponent's bot to be considered as a successful hit. Hits from rebounds and accidental touches from previous attempts will not be considered.
10. If bot A of both the teams go for the same bottle, whoever touches it first will be entitled to get it.
11. The bottles will be refilled only if all the bottles have been emptied in both the shelves.

The general scoring is as follows:

Task Completed	Points awarded
Robot B getting down the ramp	20
Robot A taking the jar to the interaction Zone from Level A	20(+20 for opponents jar)
Robot A taking the jar to the interaction Zone from Level B	35(+20 for opponents jar)
Opening of the jar	80
Transfer of the ball from the jar to Robot B	20 for each ball
Closing the jar (optional)	150
Shooting of the ball into hoop A	40

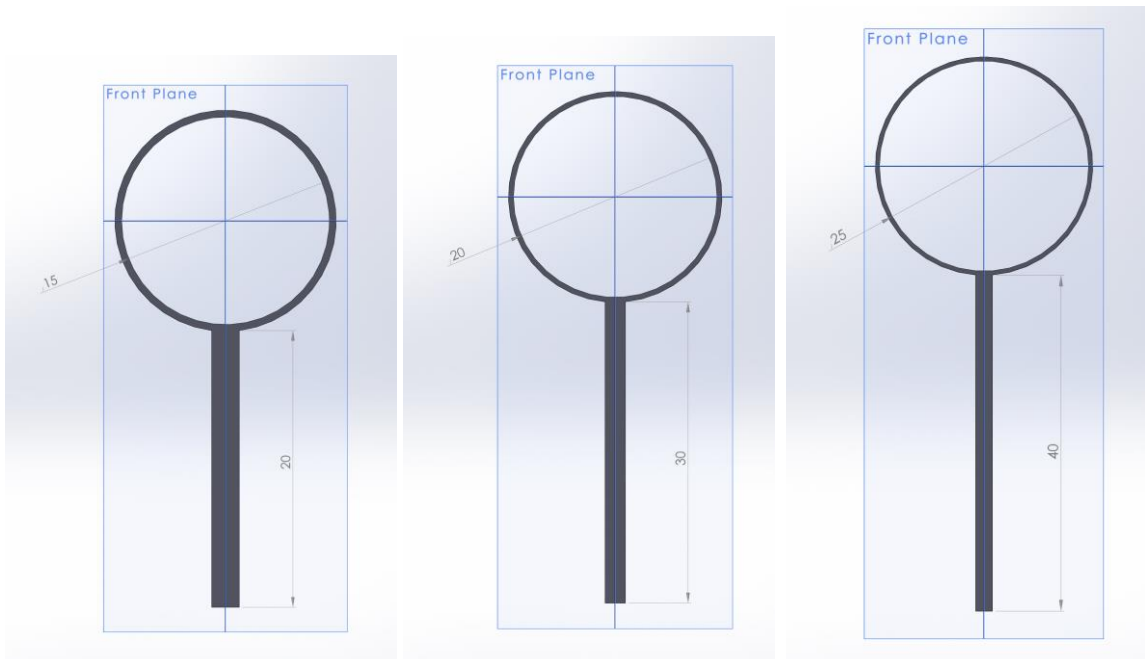
Shooting of the ball into hoop B	60
Shooting of the ball into hoop C	80
Shooting on the opponent's bot (for each hit)	40

Arena Description



The Arena

Hoops:

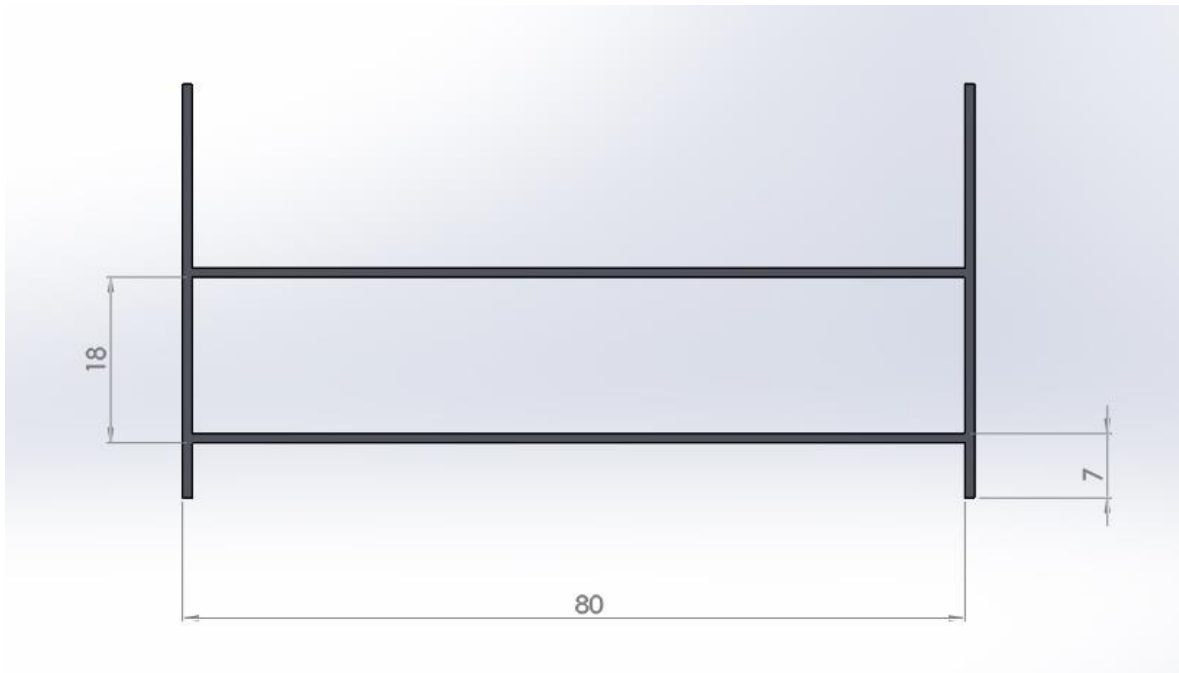


Hoop 1

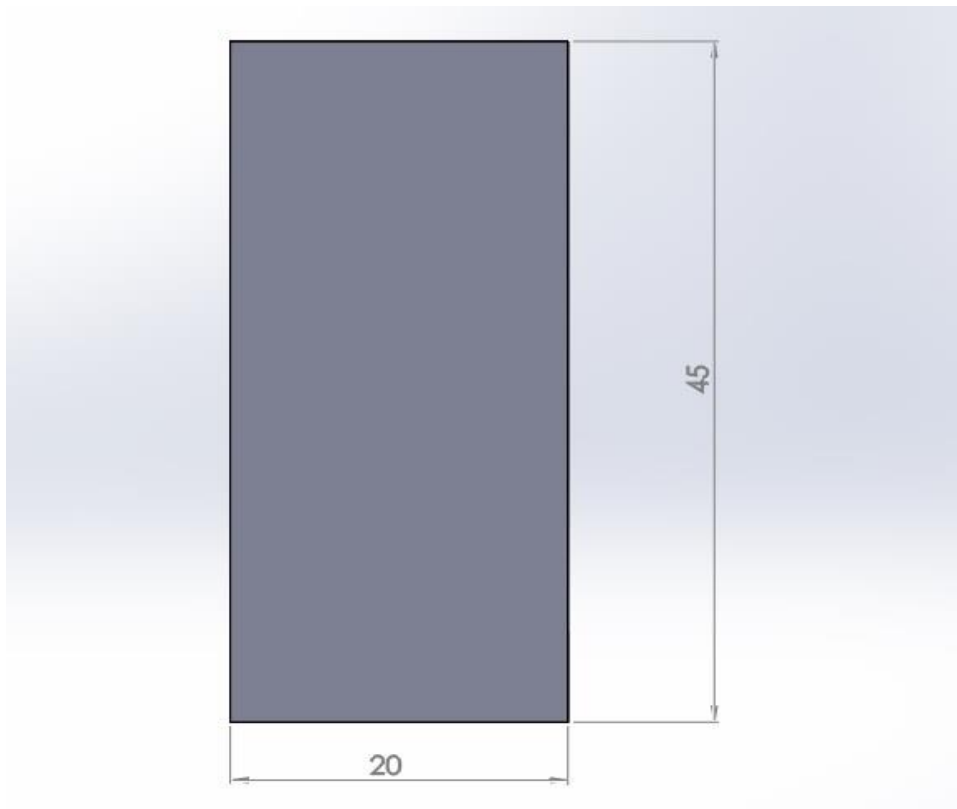
Hoop 2

Hoop 3

The Shelf:

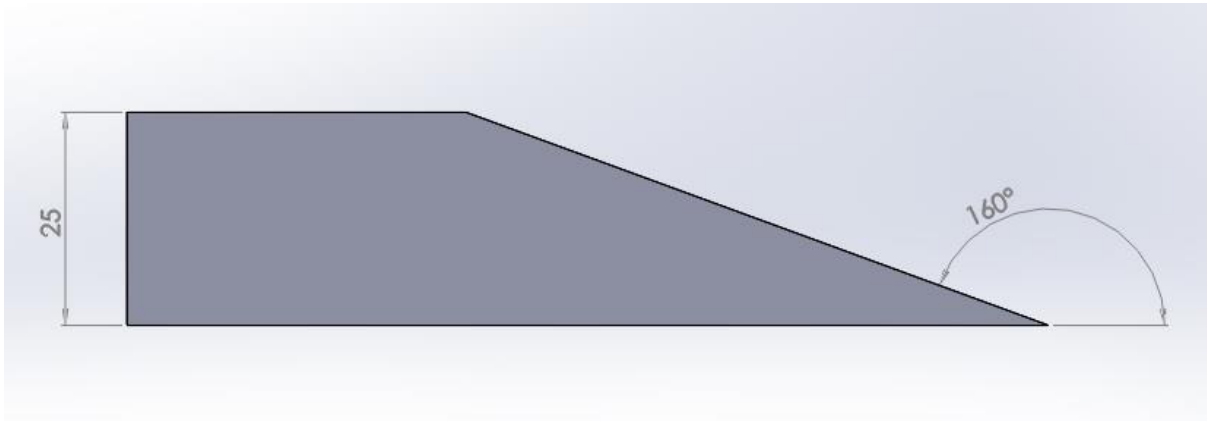


Front View

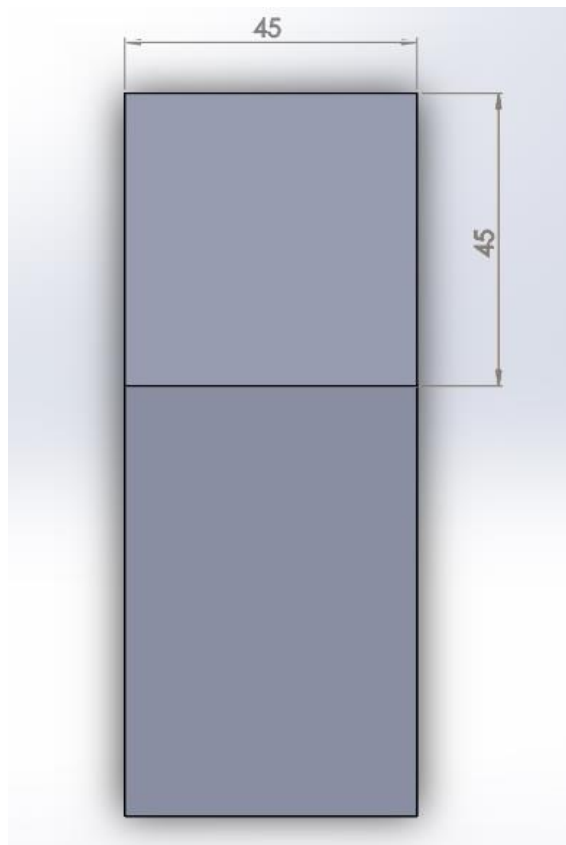


Side View

The Ramp:

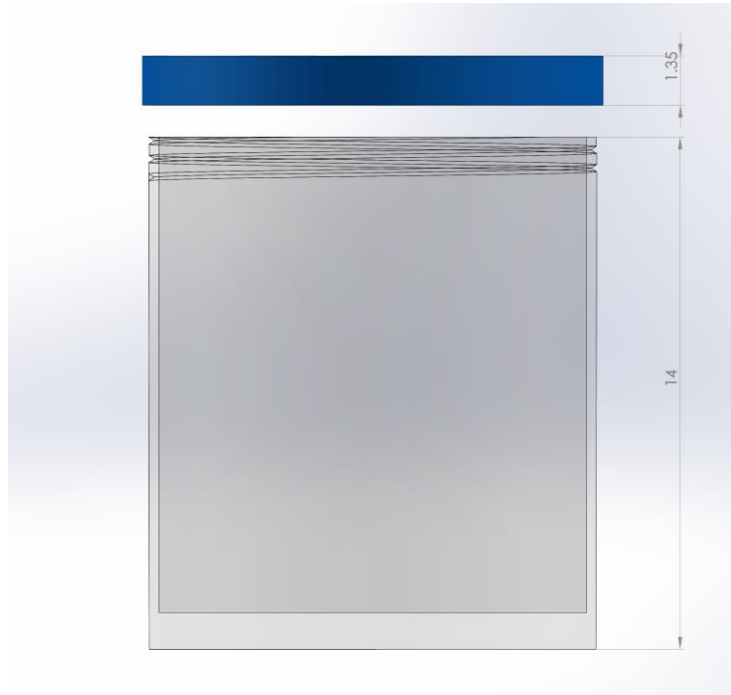


Side View

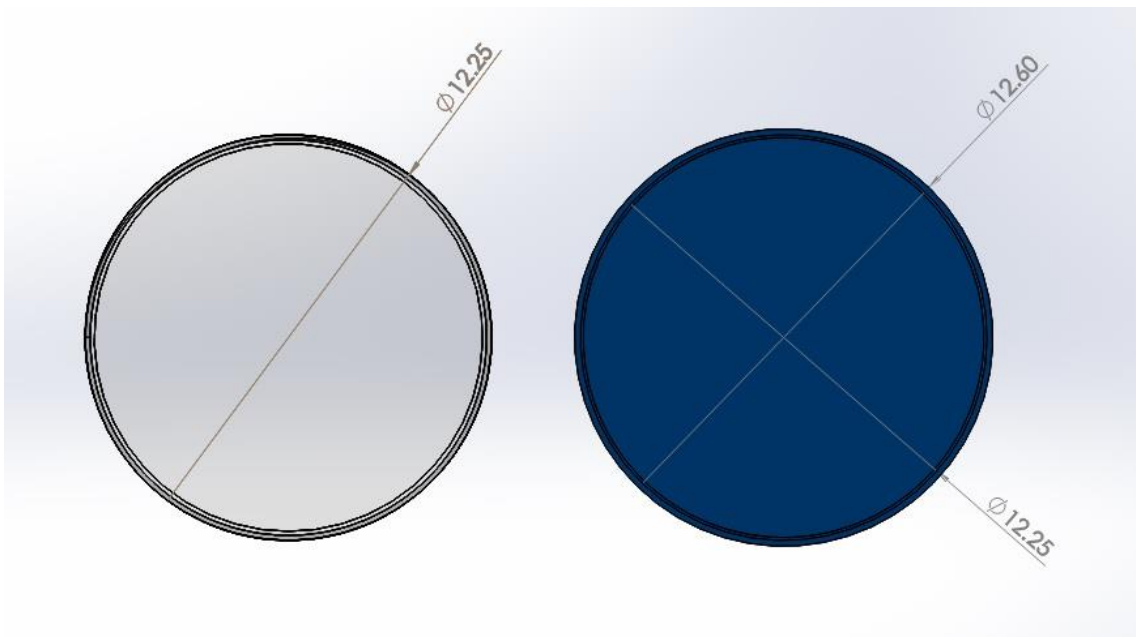


Top View

The Jar:



Front View



Top View



Threading in the Jar

Violations

- Maximum Dimensions of both the bots can be a maximum of 40cm*40cm*40cm before the start of the match. It can extend to how much ever it wants to after the match begins.
- The potential difference between any two points of both the robots should not exceed 12 V.
- Use of pneumatics and hydraulics is allowed. The maximum allowed pressure is 7 bar.
- 4 people from each team will be allowed to enter the arena during a match.
- The bottles have to opened and closed only by screw mechanism. The threading of the cap or the bottle should not be damaged.

- The bots should not hit and damage the opponent's bot. This is manual robotics, not robowars.
- Li-Po batteries may be used, but the safety has to be guaranteed by the teams themselves.
- Damage to the arena or any part of the arena will not be tolerated.

Violation of any of the rules will lead to disqualification.

Coordinator's decision is final and binding in case of any discrepancy.

Note :

- Game field dimensions are subject to a tolerance of $\pm 5\%$. No tolerances will be given in case of maximum bot dimensions.
- The authenticity of any action not provided in this problem statement shall be subject to discretion of Coordinators.

For any further queries feel free to contact the coordinators:

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