Kshitij 2014

the techno-management fest

DeltaSurge

Problem Statement

INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

AIM: To design and build a remote controlled electric-powered bot that should be able to move on both land and water having a shooting mechanism on it. The participants need to make the bot to complete the given task in minimum possible time.

MODEL SPECIFICATIONS:

1. The basic principle of the bot is that it should be able to traverse on both land and water. The dimensions constraints of the bot are: a. Length of the bot must not exceed 0.50m. b. Breadth must not exceed by 0.30m.
2. The bot should have a shooting mechanism on it.
3. The bot should be motor powered, use of IC engine is not allowed.
4. The voltage of battery used should not increase more than 12.
5. The participants are free to use materials of their choice.
6. Usage of Readymade and Almost-Readymade kits are strictly prohibited. Although use of readymade actuators/motors, remote controls is allowed.
7. Any team violating the above rule will be disqualified immediately.
8. Use of multiple motors and actuators is allowed.
9. A run is said to be complete when the bot crosses the starting line and comes back after completing the task.
10. The bot must be a single object before it enters the arena.
11. All electronic components of the model should be properly insulated and water proofed to avoid any foreign object damaging the components. This point is to be paid utmost attention as there are many factors which would disturb the working of electronic components while completion of the task.
12. Number of bots per team is not fixed. A team can field more than one bot.

GENERAL RULES:

1. The participants are required to bring their complete kits to IIT Kharagpur
2. A pair of receiver and transmitter (Rx and Tx) will be provided by organizers, on prior request of the participants. The Tx-Rx pair has 4 channels. It can be used to control a maximum of 3 servo motors. Participants who wish to use Rx and Tx provided by us, will have to make provision for this receiver on their bot. The participants can bring their own set of receiver and transmitter if they want.
3. All teams must be present before the commencement of an event. Teams will be disqualified if they do not turn up during the slot allotted to them.

4. Maximum Team size of 5 per team.
5. The teams must adhere to the spirit of healthy competition. The teams must not damage the opponent's bot in any way. Judges reserve the exclusive rights to disqualify any team indulging in misbehavior.
6. The organizers reserve all rights to change any or all of the above rules. Change in rules, if any, will be highlighted on the website.
7. All rounds of the event will be held at IIT Kharagpur during Kshitij, 2014.
8. Judges' decisions on any matter will be considered final.
9. **The participants need to send the video and pictures of their model by 4th January 2014 to the undersigned head keeping the subject as "Delta Surge_Team Id".**

ELIGIBILITY CRITERIA:

1. The entries are restricted to the student currently pursuing education in a recognized institute.
2. The participants may be asked to furnish supporting documents at any later stage to prove the aforementioned condition.
3. Students from different colleges can form a single team.
4. Each team can contain a maximum of five participants.

RULES AND REGULATIONS:

1. **Team Size: 5**
2. The participant has to navigate the bot in a given arena with these conditions:

   a. Successfully completing the task assigned.
   b. Minimum time.
   c. Least number of contacts

3. A maximum of 6 minutes per run would be allotted to the team to complete the run.
4. In each attempt, one person is allowed to come near the arena and navigate the bot.
5. A run is said to be complete when the bot crosses the starting line and comes completes the task.
6. Time of navigation is defined as the total time taken to complete a run.

7. Participants will be given 2 runs to perform the task.

8. Best of 2 timings will be accounted for final scoring.

9. While one person is at the arena, other members of the team are not allowed to come inside the arena.

10. The team with maximum score+ least amount of time taken to complete the lap (after taking all penalties and bonuses into consideration) will be adjudged winners.

11. Each contact with any object in the arena (except for the specified targets) accounts to penalty in scores.

12. A contact is defined as the brush of the body of bot with the arena wall or the objects kept in the arena. In case a contact continues for more than 3 seconds, it will be accounted as another independent contact.

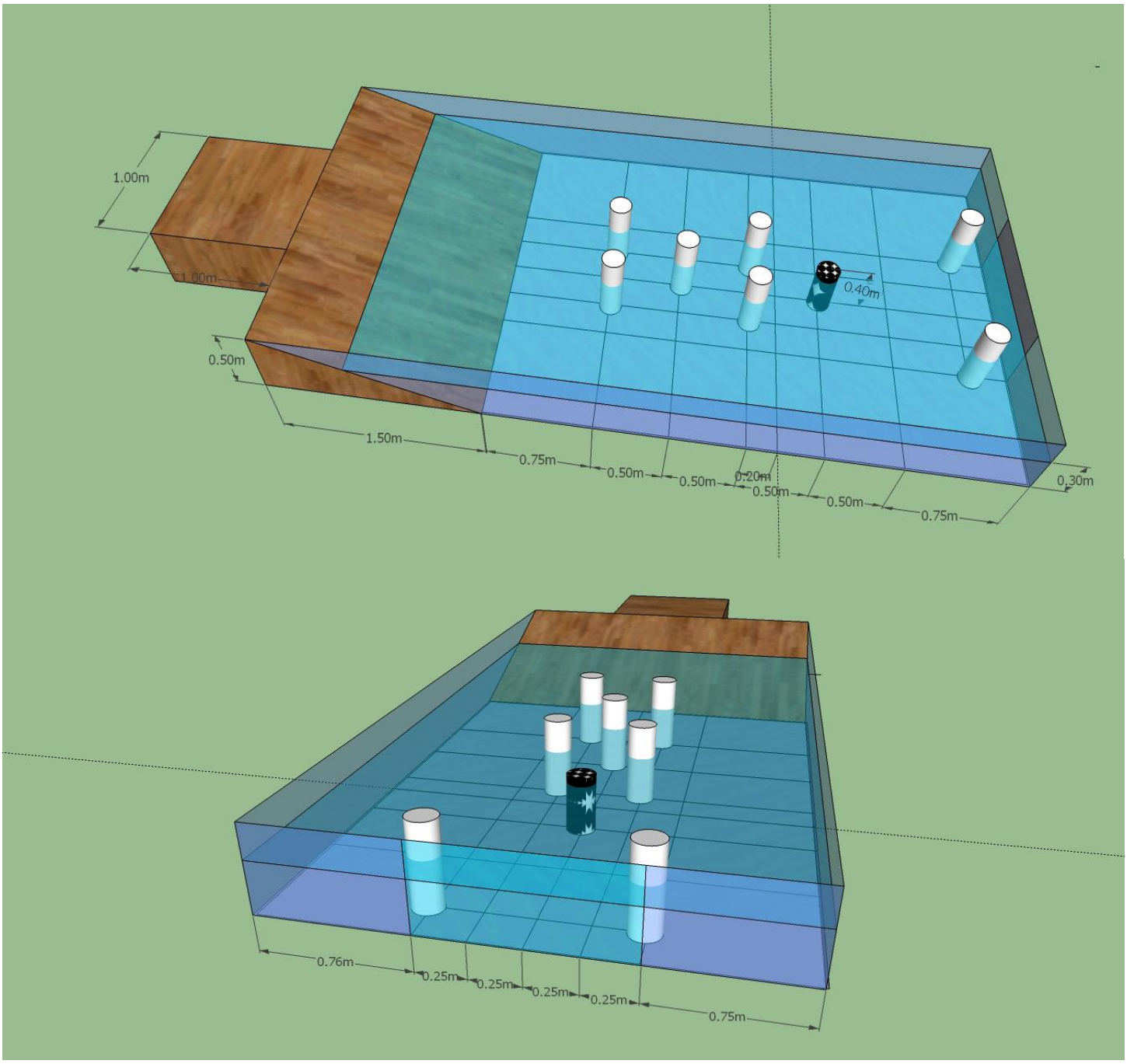
13. A contact is reported by organizers and their decision is final and abiding.

14. The teams are not allowed to come near the arena before or during the event until called.

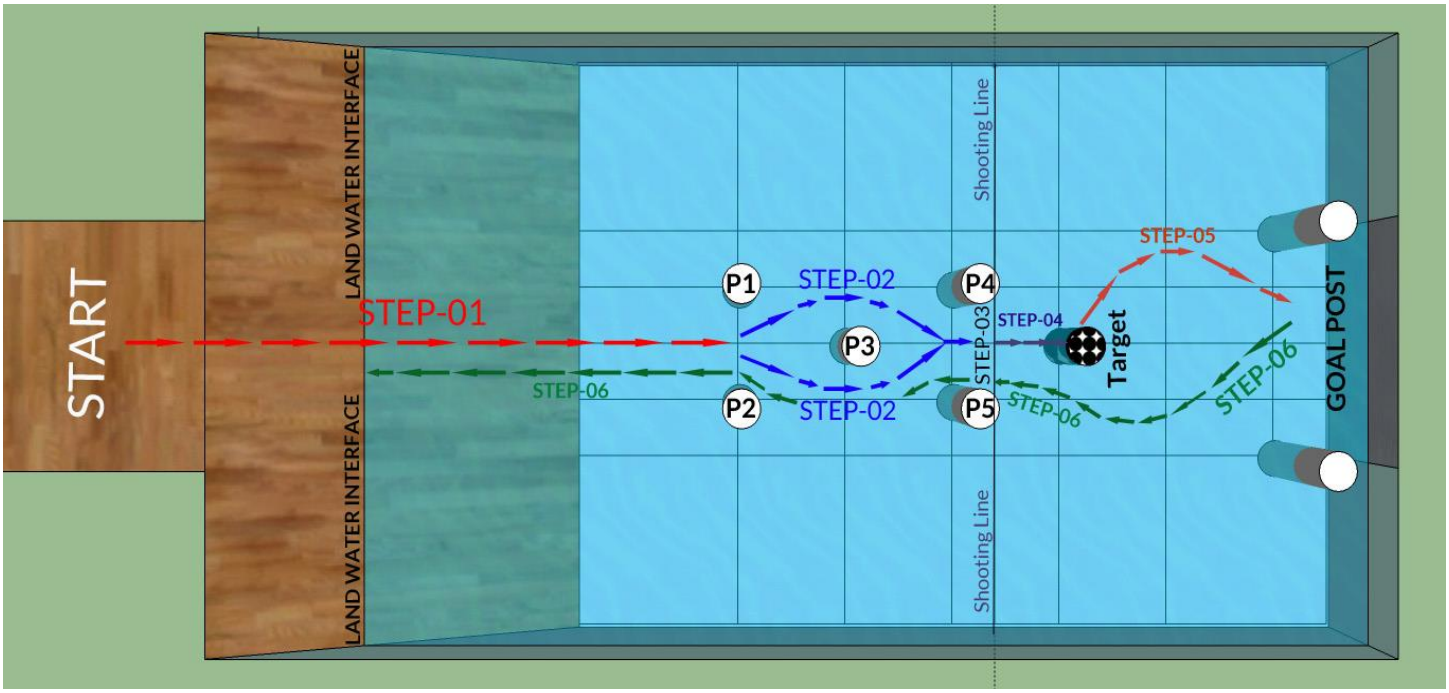
ARENA:

1. The bot enters the arena from a flat box of dimension 1m*1m, and then moves into the land region which is of total length 1.5m and is sloped.
2. The shooting target is a pyramid of four (3 in first horizontal layer, 1 in second) spherical balls (diameter 4cm, weight 3g), with its base at a height 10cm above the water surface.
3. The maximum level of water that can be found in the arena is 30cm.
4. The arena would have standing blocks where the driver can stand and navigate the bot.
5. The length of the arena would be 550cm and width would be 275cm.
6. The arena walls would be made of bricks.

SAMPLE ARENA LAYOUT:



SAMPLE TASK:



The following steps are to be performed:

1. **Step-1**: The bot has to start from the flat region, enter the water region while crossing the slopped platform.

2. **Step-2:** After the bot has entered the water region, it has to move between the poles P1 & P2 and then from either side of Pole P3.

3. **Step-3:** Bot has to move to the shooting line from between the poles P4 & P5 and shoot the Black target. (Target is a pyramid of four (3 in first horizontal layer, 1 in second) spherical balls of diameter 4cm, with its base at a height 10cm above the water level)

4. **Step-4:** If the shooter was not able to hit the target, the objects can be made to fall on water surface by means of a physical contact of the bot with the target. (Step-4 can be skipped in case of successful completion of Step-3)

5. **Step-5:** The bot has to drag/push the object from hit target fell onto water surface into the goal post shown in the figure.

6. **Step-6:** The bot has to return to the land water interface along the specified path.

JUDGING PARAMETERS:

The following parameters would be taken into account while judging:

1. **Task 1 (T1)**: The bot has to start from the flat region, complete its run through the land region and enter water.

2. **Pattern task (P1):** Traverse along the specified pattern.

3. **Shooting task (S1):** Bot has to move to the shooting line while moving along the specified pattern and shoot the Black target. (Target is a pyramid of four-3 in first horizontal layer, 1 in second spherical balls of diameter 4cm, with its base at a eight 10cm above the water level)

4. **Return task (R1):** After completing the pattern from between the other set of objects. The task is considered to be completed once the bot touches the land water interface.

5. Drag Task (D1): While in the process of completing the pattern task, the bot has to drag/push the object from hit target fell onto water surface into the goal post shown in the figure. (If the bot was not able to hit the target, the objects can be made to fall on water surface by means of a physical contact of the bot with the black target, for which no points will be added/deducted)

MARKING SCHEME:

- **Task 1 (T1): 40 points**
- **Pattern Task (P1): 80 points**
- **Shooting Task (S1): 50 points**
- **Return Task (R1): 20 points**
- **Drag Task (D1): 40XN points (N: number of balls dragged into the goal post)**
- **Time Left(T1): 360-t points if (t<360) t: time(seconds) taken to perform the task 0 points otherwise**
- **Penalty(P2): 20XN (N: number of contacts with the objects in arena, other than the specified)**
- **Total Score: T1+P1+S1+R1+D1+T1-P2**

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