GREAT STEP 2018 GEOBOTICS

PROBLEM STATEMENT

Problem Statement

You have to design and prepare/make a robot which can take out mixture of different loose materials (mainly made up of wet sand, loose soil and broken rock pieces) from pond areas and travel the path in a remote control (Wireless/wired) manner, capable of traversing different terrains like gritting, undulated, rough (made of pebbles) etc, and negotiate inclinations along the haul road surface.

The robot will have to start from the fixed starting point as shown in picture (Marked as Point No. 1, indicated as green coloured zone). It has to move through the rough rocky terrain, slurry terrain etc. to reach the various dumping areas (Marked as Point No. 9, indicated as red coloured zones).

The robot will have to avoid itself from different mine obstacles in order to reach the various dumping areas, where it has to dump the material collected from the bottom of the three pond areas (the top portion of the ponds may be filled with water) as shown in the figure. The robot can dig out the different loose materials from the bottom of the ponds for any number of times and finally dump in the various dumping areas.

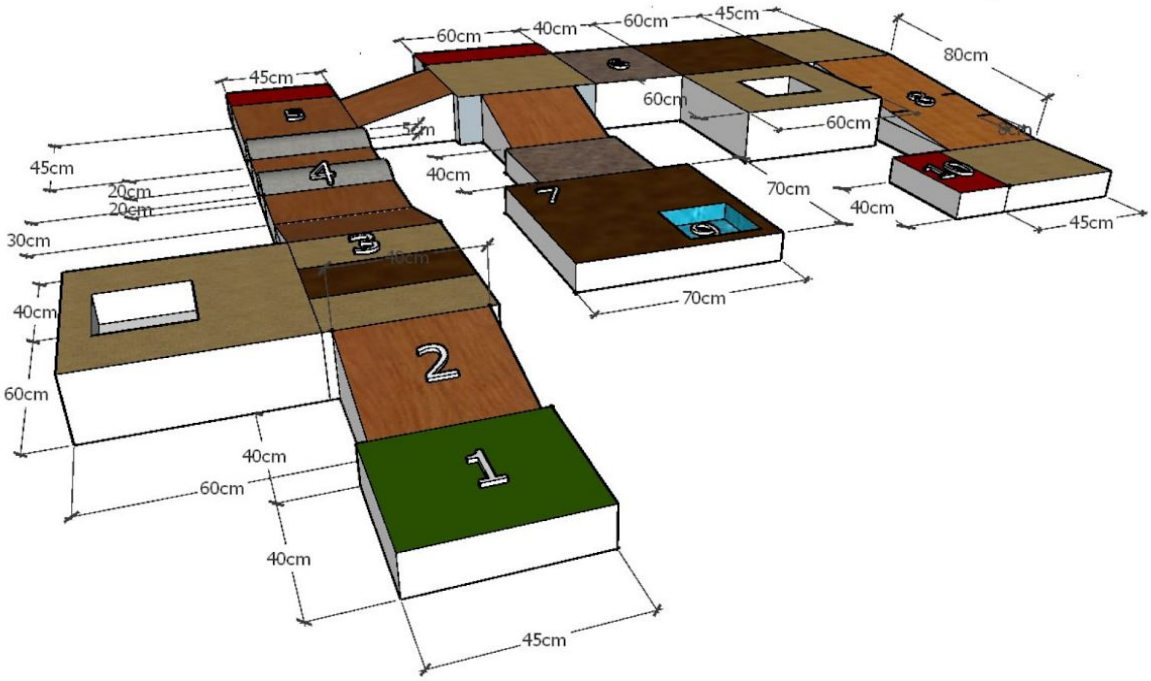
The arena consists of following zones-

1. Starting point
2. 15 degree (approximately) inclination each
3. Slurry terrain
4. Speed breaker
5. Smooth area
6. Rock terrain
7. Muddy area
8. Declination with 8 degree (approximately) with 4 obstacles on the ramp
9. Pond area
10. Soil dump point.

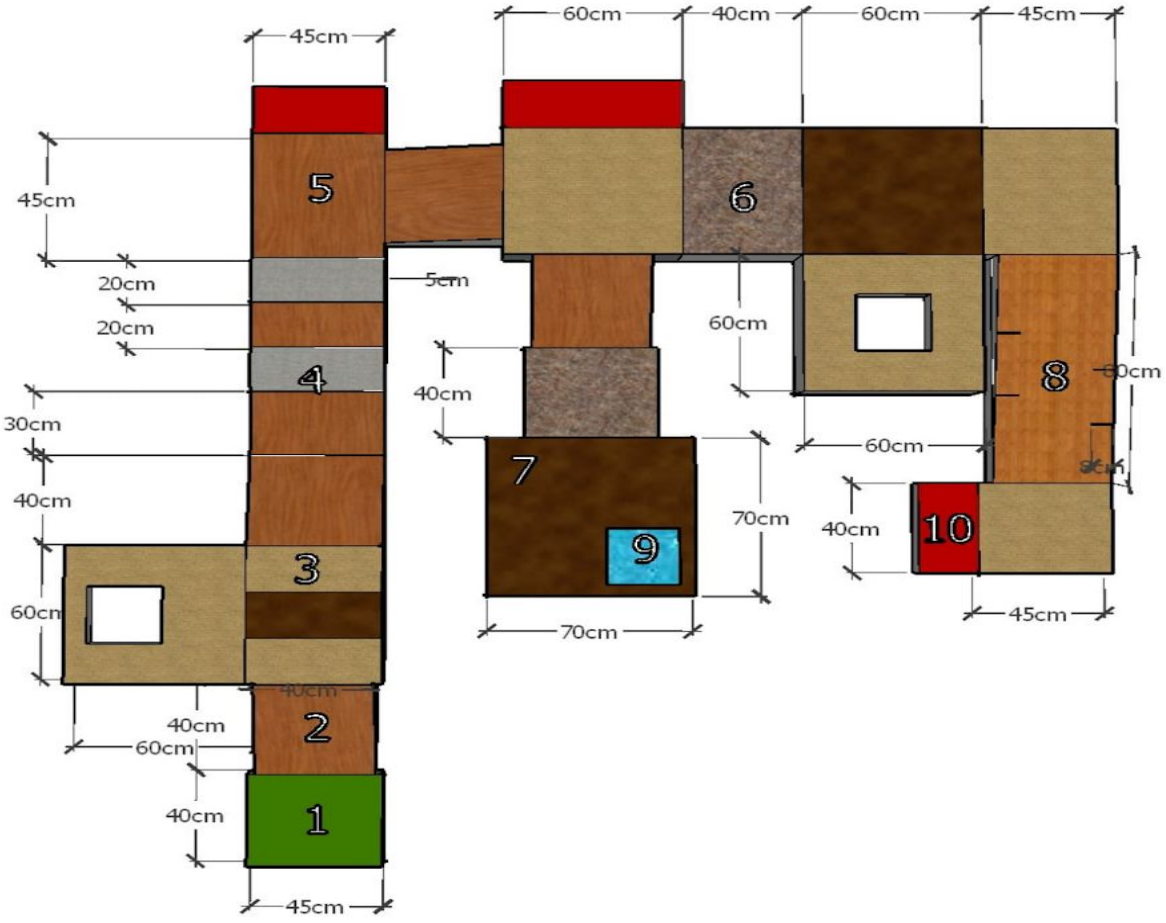
Note - 1. Same colours show same material.

2. The obstacles on the ramp are exactly same distance from each other consecutively. 4 obstacles are present there.

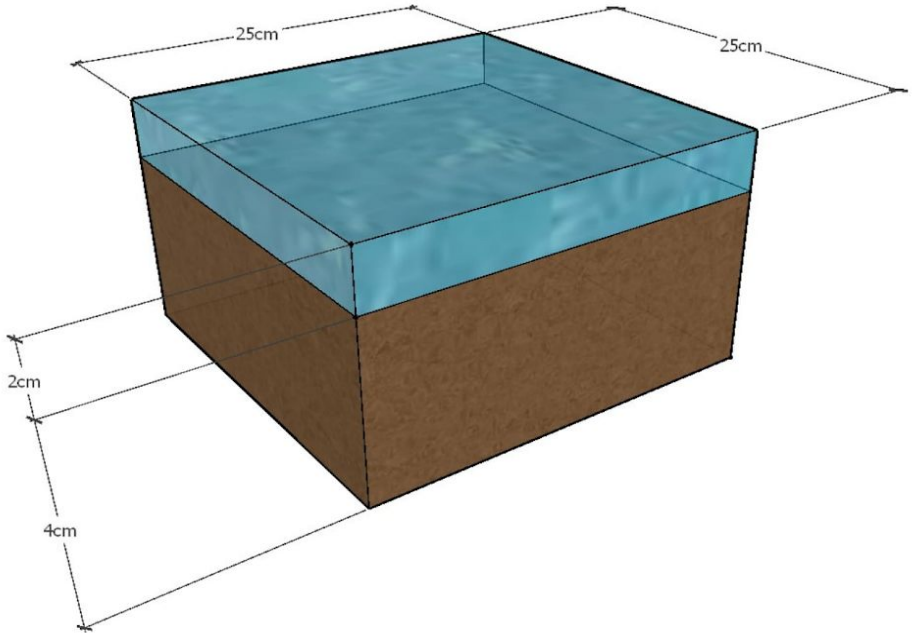
Isometric View



Top View


45cm
60cm
40cm
60cm
45cm
45cm
5
6
20cm
5cm
20cm
60cm
4
8
40cm
30cm
60cm
40cm
7
70cm
9
40cm
10
3
60cm
70cm
45cm
40cm
2
40cm
60cm
40cm
1
45cm

Details of the Pond



Ponds have a depth of 6 cm.

1. 2 cm water level at the top.

2. 4 cm of different mixtures of loose materials.

The first pond is close to the starting point, the second pond is midway between the starting and end points whereas the third pond is towards the end of the arena.

Each of the participating teams have to do the following:

1. Design documentation should be submitted having the key technical aspects of all the different components with sufficient logic. Hard copy need to submit offline during the event to GREAT STEP team at IIT Kharagpur.
2. Dimensions of the robotic vehicle should confirm to the provided dimension below.
3. The communication system is left to the participants to choose but with proper justifications.
4. Electrical power supply to a maximum of 12V will be made available to all participants.
5. All the components need to be brought by the participating teams.
6. The team with proper wireless control implemented will be given more marks.
7. Each team will be given a fixed time (It will be declared during the start of the event) to collect and dump the loose materials.

Marking will be done as per the following criteria:

1. After the given time, the weight of collected loose materials will be calculated using a fixed weighing machine.
2. If the dumping of material will be from the first pond 20% of material will be added to your final scores.
3. If the dumping of material will be from the second pond 50% of material will be added to your final scores.
4. If the dumping of material will be from the third pond 30% of material will be added to your final scores.
5. You have to dump the materials to the nearest dumping area.
6. Negative point will be awarded whenever the robot will strike with obstacles that is 0.5% of amount of materials will be deducted for each strike and 0.6% will be deducted for each manual handling of robot whenever it will be stuck in arena.
7. All the robots have to dump the loose materials at least once, if any robot fails to do so will be disqualified.
8. Finally, the team rank will be decided on the basis of amount of sand collected (considering the negative points).

Team Formation - Each team should not be of more than **4** members.

Robot Specification - The robot base should not be more than **30 cm** in width, **40 cm** in length and **25 cm** in height. The boom length and boom design has no limits (but the choice of the particular structure needs proper justification in the design document with modelling tools).

Note - 1. Any Robot Destroying the arena will be Disqualified from the event immediately.
2. In any case of confusion final decision will be taken by authority.
3. Similar type of robot may be disqualified.
4. Any control system consisting of either electronics or hydraulics based components

are allowed.

5. A maximum two operational units per team will be allowed during the competition. Multiple units should start from the same starting point. The inter collision will lead to a negative marking of 0.5% of the amount of loose materials collected. The final calculation of the weight of the collected loose materials will be averaged in case of multiple operational units.

Bonus Marks for all the participating teams If they participate in Module 2

Module 2(Optional)

You have to design and prepare/make **two single modules** or **one combined module** in the robot which can measure air velocity and deviations in path in a remote control (Wireless**/**wired) manner. You have to measure the air velocity at 3 different fixed locations and throughout the travel path and you have to detect the deviations in path with your robot. Each part has equal bonus scores (7 each) .

Note - **1.** You all have to measure air flow velocity without using Anemometer, you have to prepare It mechanically to measure air flow velocity.

2. For deviation in path, your robot must indicate the red light when it goes near to the side portion of the road (8 cm from both side).

3. The arena will remain same.