



DIC's Terrace Farming Robot

High-Prep Event (400 Points)

What is Terrace Farming?

Terrace farming refers to the act of creating steps or terraces on mountain slopes to carry out farming activities. Each level consists of various crops being grown. The advantage is that rains do not wash away the nutrients altogether, but they are pushed down to the lower levels. These steps also prevent a free-flowing avalanche of water that might destroy all crops. In this system, aqueducts are created to carry water to each level.

In India, terrace cultivation takes place in the states of Punjab, Meghalaya, Haryana, Plains of Uttar Pradesh, Himachal Pradesh and Uttaranchal.

Crops predominantly grown in the hills and mountains are cereals, wheat, maize, rice, pulses, oilseeds, millets, vegetables and fruit crops. In the higher hills, farmers also grow crops such as buckwheat, saffron, black cumin, and grain amaranth.

Challenges faced in Terrace Farming?

A narrow terrace (<2 m wide) prevents the use of machinery or animal power. Therefore, the vast majority of farmers in the hills and mountains use locally made hand-held agricultural tools appropriate to narrow terraces. Thus, many terraces are not as productive as farms that have appropriate mechanization and irrigation.

In wider terraces (i.e., 2–6 m wide), animate power (humans and draft animals) is a major source of farm power but not machinery (e.g., diesel engines, tractors) which is restricted due to physical constraints (e.g., having little area to turn around the machines; trees or shrubs in the middle of the terraces). A steeper slope makes the movement of people and tools more challenging—analogue to a staircase having deep steps. The time required to move a machine up and down a terrace (i.e., against gravity) increases labor demands.

Also, access to improved tools and power machinery is restricted by poor/no electricity in remote regions.

Problem Statement

The teams are required to develop a lightweight robot that can do the work of plowing, seeding, watering, or harvesting considering the above-mentioned challenges for terrace farming. Robot should be able to perform at least one of the above-mentioned processes and able to climb up and down through the steps of terrace farming. Teams are required to produce a reliable navigation plan of the robot for autonomous navigation in the field. Teams need to develop a technology-driven solution for them and demonstrate the prototype / Proof Of Concept in action during the 8th Inter IIT Tech Meet at IIT Roorkee.

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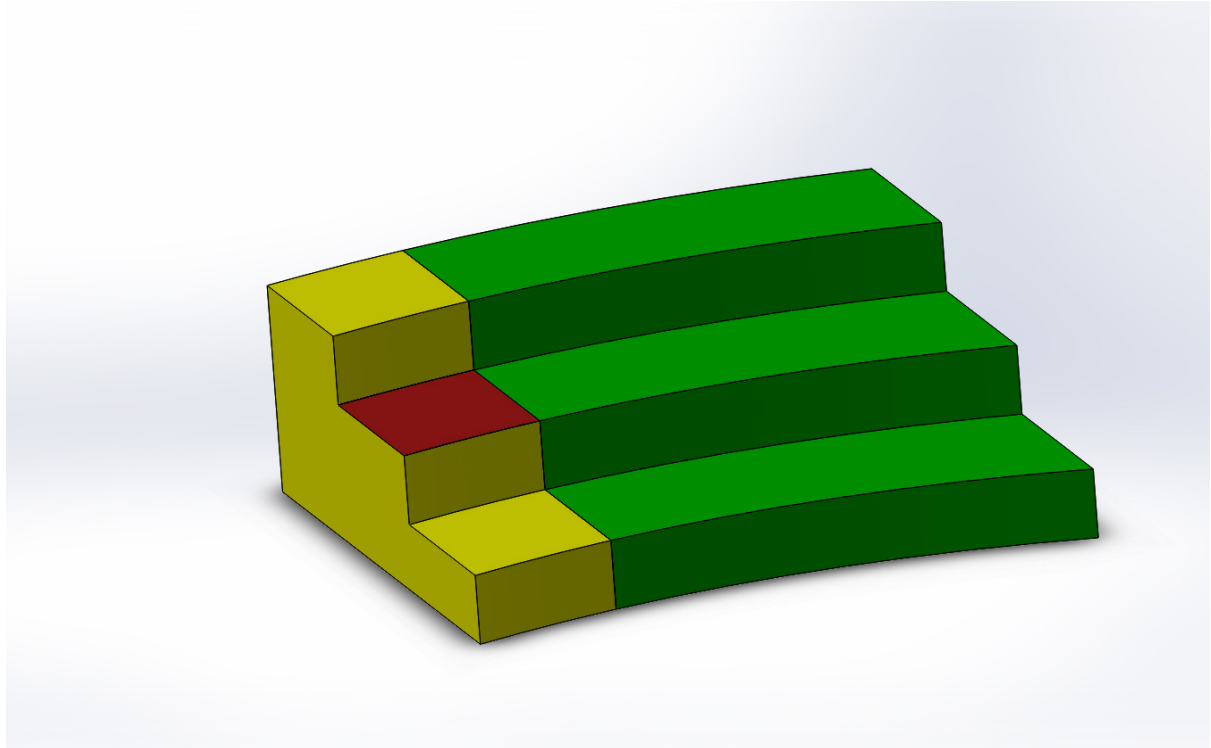
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Arena



Arena comprises of 3 zones:

1. Yellow zone - Pathway
2. Green zone - Field
3. Red zone - Start zone. Height and width of each step are 40cm and 100cm respectively.

The robot has to start from the start zone (red zone), automatically transversing through the field, it has to perform any of the tasks of plowing, seeding, watering, or harvesting and returns to the start zone. Now the robot has to climb down to the lower step and has to repeat the same or other tasks. After completing the task in the lower step, the robot has to climb up to the red zone. Each team will be given 15 minutes to complete the above-mentioned tasks.



Judging Criteria

Evaluation will be based on:

- Presentation
- Technical Design Report
- On-field evaluation of the working of Robot.

Each team will be given a total of 25 minutes in which 15 minutes will be given to on-field evaluation and 10 minutes for presentation. If team is presenting proof of concept then they have to present a video showcasing the working of the robot.

Presentation should cover aspects related to design, the impact of the solution developed and business analysis.

Robot will be judged on the basis of the following criteria:

- Quality of task performed by the robot.
- Versatility of robot - No. of tasks performed.
- Economic Feasibility of solution developed.
- Novelty/innovation of the solution proposed.
- Analysis of existing solution, discussion with relevant stakeholders, field visits/surveys

The event is categorised as High Prep and shall yield a maximum of 400 points towards overall tally

Minimum Qualifying score : 150 points out of 400

Mid-Evaluation Report

A mid-evaluation report containing the abstract of the idea in not more than 4 pages, has to be emailed at interiittech@iitr.ac.in by November 14, 2019.

The mid-evaluation report shall comprise of 100 points.

Rules and Regulations

A maximum of 10 participants shall be awarded participation/merit certificate. A maximum of 4 student from team will be allowed to present during tech meet. An Interdisciplinary team of people from different backgrounds is preferred.

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