3D Reconstruction of IITI Central Dining Facility

3D Simulation & Autonomous Navigation Competition

Ingenium — IIT Indore

Competition Overview

Modern technology leaders use high-fidelity 3D reconstruction and virtual simulation to experiment, test, and innovate without the cost and constraints of physical prototypes. Virtual environments enable rapid iteration and robust validation of real-world systems.

This competition focuses on converting real-world scan data into accurate 3D models and enabling autonomous point-to-point navigation within the generated environment.

Participants are required to build a complete pipeline for 3D reconstruction and navigation under constrained computational resources.

Problem Statement

The challenge involves two core tasks:

- Converting Point Cloud data into an accurate 3D model

- Implementing a point-to-point navigation system within the generated 3D environment

On the competition day, participants who successfully complete Task A will be provided with specific start and end points. Teams must design a navigation pipeline for a drone operating within their generated 3D model.

The solution is expected to be iteratively refined to improve robustness and accuracy.

Task A: Point Cloud to 3D Model Reconstruction

Participants must:

- Use the provided scan data to construct an accurate 3D model

- Ensure geometric consistency and structural correctness of the reconstructed environment

  Completion of Task A is mandatory to qualify for Task B.

Task B: Point-to-Point Navigation

Participants must:

- Implement a point-to-point navigation system within the generated 3D model

- Design local planners capable of adapting to dynamic obstacles

A specific start and end point will be provided on the competition day. The objective is to successfully navigate a drone through the virtual environment.

System Setup and Constraints

- The entire solution must run on limited computational resources

- Participants must build a pipeline that converts Point Cloud data into a 3D model

- After reconstruction, a navigation system must be implemented for the 3D environment

Drone Sensor Availability:

- GPS

- IMU

- 3D LiDAR

Solution Deliverables

Participants must submit:

- Complete working pipeline

- Generated 3D model output

- Navigation algorithm implementation

- Comprehensive documentation (README or technical document)

- All references used during development

Partial marking will be awarded based on successful completion of each task.

Evaluation Parameters

Submissions will be evaluated on the following criteria:

- **Robustness of Results:** Accuracy of 3D reconstruction and effectiveness of navigation

- **Documentation:** Clarity and completeness of the explanation of the pipeline, navigation strategy, and references

- **Novelty:** Innovation in improving robustness, efficiency, or navigation performance

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Rules are subject to change at the discretion of the organisers.

Further instructions will be communicated to registered participants.