IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	**Reconstruction of a dynamic object using sparse data and a mobile robot**	
Project Number	**IMURA0851**	
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Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? *(Please nominate JUST **one.** For more information, see www.iitbmonash.org)*		**Highlight which of the Academy's Theme(s) this project will address?** *(Feel free to nominate more than one. For more information, see www.iitbmonash.org)*	
1	*Material Science/Engineering (including Nano, Metallurgy)*	***1***	*Advanced computational engineering, simulation and manufacture*
2	*Energy, Green Chem, Chemistry, Catalysis, Reaction Eng*	2	*Infrastructure Engineering*
3	*Math, CFD, Modelling, Manufacturing*	3	*Clean Energy*
4	*CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control*	4	*Water*
5	*Earth Sciences and Civil Engineering (Geo, Water, Climate)*	5	*Nanotechnology*
6	*Bio, Stem Cells, Bio Chem, Pharma, Food*	6	*Biotechnology and Stem Cell Research*
7	*Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng*	7	*Humanities and social sciences*
8	*HSS, Design, Management*	8	Design

The research problem

For the 3-D reconstruction of a moving object, it is important to know the details for finer reconstruction. While collecting point cloud data from a 3D lidar mounted on a robot, planning trajectory of the robot plays an important role. New places in the trajectory from where the lidar scan is collected must register the new point cloud. It is worth investigating such a trajectory, which needs minimum time for finer reconstruction of a 3-D object. The challenge is to address simultaneous reconstruction and tracking of the moving object using a moving robot.

Project aims

The project aims to plan the trajectory of robot mounted with 3-D lidar for simultaneous reconstruction and tracking of an object. This robot trajectory aims to reconstruct finer details of the object in minimum time, while it is moving.

Expected outcomes

1. Given a desired level of fineness, produce the 3-D reconstruction of the object using lidar.
2. Plan trajectories that minimise the 3-D reconstruction time.
3. Devise a methodology for simultaneous reconstruction and tracking of an object.

How will the project address the Goals of the above Themes?

The project involves computations for fine reconstruction of objects from point cloud data. The method would be verified using simulations and experiments.

Capabilities and Degrees Required

Candidates with a B.E./B.Tech./M.E. /M.Tech. in any branch of Engineering - with consistent good academic performance (First Class with honors). Good mathematical and real time programming skills are essential. An experience in working with robotic platform and hand-on experience with ROS (Robot Operating System) is desirable.

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Select up to **(4)** keywords from the Academy's approved keyword list **(available at http://www.iitbmonash.org/becoming-a-research-supervisor/)** relating to this project to make it easier for the students to apply.

Robotics,Mechatronics,UAVs