

# Autonomous Multi Robot Collaborative Exploration (Mapping)

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## Overview

- **Scanning process** – [3D scanning](#) is the process of capturing digital information about the shape of an object with equipment that uses a laser or light to measure the distance between the scanner and the object
- **Robotic Mapping** - The goal for an autonomous robot is to be able to construct (or use) a map or floor plan and to localize itself in it. [Robotic mapping](#) is a branch that deals with the study and application of ability to construct such a map by an autonomous robot and to localize itself in it.

## Project Definition

We would like to perform a robust and autonomous mapping of a room or a set of rooms (e.g. an apartment). We are looking to do this scan as complete and fast as possible, without falling on the quality. We propose a project to create an autonomous scan using multiple (ground and/or aerial) robots, in order to achieve that goal.



## Outputs

- Proof of concept (POC) a single robot autonomously mapping an indoor area in a minimal time.
- POC multi-robot scenario of mapping an indoor area and showing improvement in scan time
- Academic paper in a leading international conference (e.g. [ICRA](#))

## Logistics

- The project will be initially for 1 semester, with a potential extension to a 2nd semester due its large scope and great potential
- The project is offered both to undergraduate and graduate students with appropriate background

## Prerequisites

- Programing skills – C++, Python, ROS
- Path planning and Control theory – Advantage
- Computer vision knowledge - Advantage

## Related work

<http://www2.informatik.uni-freiburg.de/~stachnis/pdf/burgard05tro.pdf>

[http://www.cs.cmu.edu/~humanrobotteams/multimedia/presentations/Auto\\_Exploration\\_Coverage.pdf](http://www.cs.cmu.edu/~humanrobotteams/multimedia/presentations/Auto_Exploration_Coverage.pdf)

[https://www.ri.cmu.edu/pub\\_files/pub1/fox\\_dieter\\_1999\\_5/fox\\_dieter\\_1999\\_5.pdf](https://www.ri.cmu.edu/pub_files/pub1/fox_dieter_1999_5/fox_dieter_1999_5.pdf)

[http://vindelman.technion.ac.il/Publications/Indelman14icra\\_b.pdf](http://vindelman.technion.ac.il/Publications/Indelman14icra_b.pdf)

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