

An Indian-Australian research partnership

<b>Project Title:</b>	Distributed coordination algorithms for target identification, localization and tracking with mobile visual sensor networks	
<b>Project Number</b>	IMURA0446	
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## Research Academy Themes:

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](http://www.iitbmonash.org))

1. **Advanced computational engineering, simulation and manufacture**
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

## The research problem

Target tracking has been an active research area. It is now possible to have a large number of low-cost, autonomous mobile robots, acting as a visual sensor network which can be used for target identification, localization and tracking purposes as a single entity. But, achieving optimal outcomes in a fully-distributed manner, without centralized control, is a difficult and still an open problem. In this project, we propose to create fully-distributed algorithms that will guide a mobile visual sensor network to identify, localize and track targets in a given region. The locations of the targets are not known a priori. The mobile sensors scan a region to detect a target, once detected, some of the sensors get into a formation around the target for continuous monitoring, while the others search for more targets. To ensure scalable and robust operation, only local information is used. The goal is to achieve optimal distribution of the sensors among the targets. We will both focus on theoretical development, mathematical analysis as well as empirical studies by implementing the algorithms on Monash University's Wireless Sensor and Robot Network Laboratory's experimental testbed.

## Project aims

The aim of the project is to create robust and scalable distributed algorithms to guide a network of mobile visual sensors to detect, localize and track targets. It involves (a) developing guidance strategies for individual mobile sensor and (b) decision making for optimal allocation of sensors to the targets.

## Expected outcomes

At the end of the project, we expect that

- Distributed target identification, localization and tracking algorithms will be created
- Mathematical foundations on the optimality, scalability and stability of the algorithms will be established
- Experimental performance of the algorithms over a test network will be obtained
- 3 journal papers will be published

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

- A thorough review of the existing research literature will be conducted and most promising approaches, including their weaknesses will be identified.
- A theoretical analysis of the selected approaches, over simplified models will be conducted.
- Based on the findings in the above steps, new algorithms will be created and their theoretical bounds will be studied
- Algorithms will be implemented on Wireless Sensor and Robot Networks Laboratory's testbed and a rigorous empirical study will be completed.

## Capabilities and Degrees Required

BE or MTech with knowledge in basic control systems, and C/C++ programming. Real-time systems programming is desirable.

## Potential Collaborators

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

Please provide a few key words relating to this project to make it easier for the students to apply.

Target tracking, mobile sensor network.