

An Indian-Australian research partnership

Project Title:	AgriBots: Agriculture Inspection Robots	
Project Number	IMURA0841	
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Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <u>one</u>. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
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

Define the problem

Agriculture industry makes one of the dominant parts of the economy of any country and this is equally applicable to both Australia and India. This industry is facing a whirlwind due to global warming and abnormal weather patterns that has posed a threat to food security in various parts of the world.

Modern farming practices make use of advanced techniques and automated machinery for effectively increasing productivity and reducing waste throughout the food supply chain. Robotics and autonomous systems are set to transform many global industries and agricultural robots have found their way in the market. **The agricultural robots are** characterized by the application (such as harvesting and navigation) and by the types of functions that they perform (such as data collection, inspection and management). There are numerous commercial systems in global market for the former, including heavy automated machinery (non-robotic), however the inspection and livestock management application is estimated to grow at the highest rates in the coming years. This rapid growth rate creates challenges for manual and regular inspection of the crops through the growth process before becoming ready for harvest or collection from the agriculture fields.

Project aims

Define the aims of the project

In this project, we propose small, light-weight, agri-bots, equipped with novel sensors (being developed at IIT Bombay) for inspection and monitoring of various conditions of the soil and plant with respect to the use of water and fertilizers. These integrated hardware and software systems would be used for replacing stationary sensors with fixed position, maintaining the sensor signal acquisition, preliminary processing and the automated evaluation, which will be sent online to 1) the farmer for her/his tracking and 2) the monitoring agencies for their quantitative records data-base, low-cost Internet of Things (IoT) technologies and advanced statistical analyses and further necessary action. The developed technology would, therefore, also provide an efficient means to help in collecting the data on weather, temperature, moisture, humidity and other relevant parameters for optimising yield, improving the farming practices, make better decisions on the required resources and their distribution to minimise waste.

Expected outcomes

Highlight the expected outcomes of the project

1. Smart Inspection AgriBot prototype (sensor intensive HW and SW integrated system) for the field parameter sampling, sensor signal recording, monitoring and data base generation;
2. Processing and data analysis approaches;
3. IoT techniques for data communication.

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

Describe how the project will address the goals of one or more of the 6 Themes listed above.

- It will involve novel mechanism design, manufacturing and prototyping;
- Computing, numerical simulation and signal/data-processing and analysis techniques;
- IoT and data communication with automated feedback mechanism to the farmer

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

- Ideally a Mechatronics engineering background candidate or,
- ECE background candidate (both HW and SW skills) with aptitude to learn design/CAD for customized application;

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.

Dr. Rajul Patkar

We will also interact with one or two agriculture scientists from ICAR or other agriculture institutes.

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.

1. Robotics, Mechatronics, UAVs (30)
2. Sensor and Sensor Networks (13)
3. Signal Processing (14)
4. Networks and Telecommunications (26)
5. Systems Analysis and Control (29)