AEROSPACE ENGINEERING
ENGINEERING

RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

APPLICATION DEADLINE: September 22, 2025

PROJECT TITLE: Remote (manual) control of a microrobot moving in an EM-shielded space

Physical Requirement :
Hardware design is required. Materials costs will be covered by IRAS Lab

Project's Technical Skills Requirement :
Electronic engineering and computing engineering

Project's Available Positions : 1

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Project Description

Objective:
Mobile robots are increasingly employed for inspection and fault-detection tasks across various industries. However, when a microrobot operates inside an electromagnetic-shielded (EM-shielded) space, remote navigation becomes extremely challenging, as wireless communication between the robot and an external controller is severely limited or completely blocked. This project aims to explore innovative solutions to overcome this technical challenge. One initial approach is to deploy a wired RF base station inside the shielded space to establish a localized RF network, enabling reliable communication with the microrobot. With this setup, the robot can potentially be remotely controlled to navigate within the EM-shielded environment. This work represents an exploratory investigation into a novel robotics research problem.
Requirements
(a) A remotely controlled microrobot shall be selected and purchased.
(b) An EM-shield environment shall be designed and constructed for prototype testing.
(c) A wired communication station (base) shall be designed, prototyped, and tested.
(d) RF communication within the EM-shielded space shall be modeled, simulated, and analyzed before making a hardware prototype to support the system design.
(e) An alternated RF comm device shall be designed and installed on the acquired microrobot.
(f) An alternated remote controller of the microrobot shall be designed to control the robot through the communication base.
Deliverables

(1) An integrated prototype of an RF base and robot unit, remote controller, and microrobot and their corresponding software.
(2) Hardware demonstrations of remotely controlling the microrobot to navigate within the physical EM-shield space.
(3) A project report including the detailed design and user’s manual of the prototype system.