



Department Project Information

Department Name	MEES	Date Submitted	10/30/2022
Project Title	Passive robotic locomotion via ambient energy harvesting (UNCC_LOCOMOTION)	Planned Starting Semester	Spring 2023

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical	3-5	Electrical	
Computer		Systems	
Other ()			

Project Overview:

As mechanical devices designed for locomotion, animals often surpass man-made autonomous robots in speed, agility, and efficiency. Their superiority can be traced in diverse cases to the exploitation of passive elastic dynamics alongside deliberate actuation. It's the gradual storage and rapid release of elastic energy that allows certain insects, for instance, to jump large distances. Even in a completely relaxed state, certain animals' bodies will naturally convert energy from an external source into propulsion. It's been shown, for instance, that the body of a recently deceased fish can be induced to swim upstream against a current by exposing it to the oscillatory vortex wake of a stationary object. This project will investigate design aspects of passive elastic devices that — like the dead fish — locomote naturally when placed in energized environments.

Project Requirements:

The project team will design, construct, and test simple mobile robots — likely resembling particular animals — that locomote on surfaces and in water when these media are driven by external forces. Testing will include the explicit characterization of each robot's response to a variety of stimuli, and will involve sensors and actuators under computer control.

Expected Deliverables/Results:



- *Functional laboratory hardware of the kind described above*
- *Data and text documenting experimental results of the kind described above, suitable for inclusion in a manuscript submitted for publication in a scientific journal or conference proceedings*

Disposition of Deliverables at the End of the Project:

Following completion of the project and display at Expo, the hardware to be developed will be the property of the project mentors and their department.

List here any specific skills, requirements, specific courses, club affiliation, knowledge needed or suggested (If none please state none):

Members of the project team should have experience with the design, manufacture, and assembly of basic mechanical parts and with the programming of microcontrollers (like the Arduino) and computers with general-purpose input/output capability (like the Raspberry Pi).