



Department Project Information

Department Name	MEES	Date Submitted	4/21/2023
Project Title	Compact low-cost snake-like mobile robot (UNCC_ME_SNAKE)	Planned Starting Semester	Fall 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	Electrical	1
Computer	1	Systems	
Other ()			

Project Overview:

Mobile robots with designs inspired by animal biomechanics can provide uniquely efficient and agile solutions to problems in autonomous environmental monitoring, in search and rescue, and elsewhere. Novel features of such robots can also make them important testbeds for fundamental research in areas like feedback control theory and machine learning. Unlike conventional wheeled mobile robots, however, bio-inspired mobile robots aren't available in many off-the-shelf varieties, and researchers in this area are typically compelled to develop their own robots from scratch, even when this entails replicating design and development work done in parallel elsewhere.

The goal of this project is to design, construct, test, and document a version of a particular bio-inspired mobile robot that appears regularly in scientific literature — a three-link planar kinematic snake — with a focus on miniaturization, on low cost, and on easy replicability. Replicates of the robot developed by the Senior Design team will be used in future research not only by the project's faculty advisors but also by members of the broader robotics community.

Project Requirements:

The final design should comprise only parts that are reliably available from commercial sources or can be manufactured with common 3D printing technology. The design should accommodate simple forms of customization — for instance, the addition of ballast to adjust overall mass, or the variation of link lengths at assembly time — and should incorporate a small onboard computer capable not only of actuator control but also of wireless communication.



Expected Deliverables/Results:

The team will be expected to manufacture at least one physical robot and to demonstrate its ability to respond to control commands from a stationary laptop, potentially in the context of a reinforcement-learning experiment in which the robot teaches itself to locomote efficiently. The team's documentation will be evaluated according to the ease with which someone unfamiliar with the project can replicate the robot following the team's instructions.

Disposition of Deliverables at the End of the Project:

Following completion of the project, 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 computers with general-purpose input/output capability (like the Raspberry Pi).