

UNC Charlotte – Lee College of Engineering Senior Design Program Company Information

Company Name	<i>MEES</i>	Date Submitted	<i>04/15/2019</i>
Project Title	<i>Efficient robotic locomotion via deep reinforcement learning</i> UNCC_LOCO	Planned Starting Semester	<i>Fall 2019</i>

Funding:

What is the source of funds that will be used to cover all of the direct costs of this project?

The project will require only resources available in the supervising faculty member's lab as a result of prior NSF-funded research, including hardware components and basic infrastructure.

Is this source of funds already secured? Yes x No _____

Technical Contact(s)*

	Technical Contact 1	Technical Contact 2	Technical Contact 3
Name	Scott Kelly		
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*We would like to have more than one technical contact, so there is a back-up in case of travel, sickness, job re-assignment, etc.

Personnel

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



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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	4	Electrical	1
Computer	1	Systems	
Other ()			

Project Overview and Requirements:

Participating students will design and construct a simple robot capable of multimodal independent locomotion, equipped with sensors sufficient to measure the efficiency of this locomotion by tracking the movement of the robot through its environment. The students will develop software to enable the robot to maximize this efficiency autonomously using deep reinforcement learning. The learning algorithm will be fundamentally agnostic to the mechanics of the robot, and the students will demonstrate that the robot can re-optimize its behavior autonomously to compensate for partial actuator failure.

Expected Deliverables/Results:

- an autonomous mobile robot capable of multimodal locomotion
- software implementing sensor-based deep reinforcement learning to optimize locomotion in a manner portable to other hardware platforms
- a technical manuscript describing the project, suitable for publication in an academic journal or conference proceedings in the area of robotics

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

- familiarity with mechatronics in general, and with the Arduino and Raspberry Pi platforms in particular, is preferable
- familiarity with the Python programming language is preferable
- familiarity with basic principles of reinforcement learning, or at least some aspect of machine learning, is preferable

(Note that the supervising faculty member taught an MEGR 3890 course in Spring 2019 concerning the application of reinforcement learning to problems in robotics, so the third requirement above isn't unreasonable.)