

COP-036

Building robots that smell: a summer research experience for undergraduates in engineering AND biology.

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Abstract

The departments of Mechanical Engineering and Biological Sciences at Lehigh University in conjunction with the National Science Foundation and the Department of Defense to offer a unique Research Experience for Undergraduates in both neuroscience and robotics. Traditional programs in science or engineering rarely include courses from the other discipline. Both disciplines have benefited from the cross fostering of knowledge that is generated by interdisciplinary study. The major objective of the project is to foster interdisciplinary research by simultaneously exposing the students from mechanical engineering and biological sciences to fundamental concepts in both disciplines. The program will bring the talent of two different faculty members - a neurobiologist and robotics expert- to bear on the project. The robotics person will bring his understanding of the principles of mechanics, electronics, software and robotics necessary to create a working mobile system. The neurobiologist will provide her knowledge of the sensory systems through which organisms detect and navigate their environment. Ten rising sophomores (i.e. students in the summer between their freshman and sophomore year) majoring in either biology (neuroscience) or engineering (robotics) will spend 12 weeks of the summer at Lehigh University building robots based on hypotheses generated from intensive study of both disciplines. The combination will develop alternative methods for olfactory, light intensity and touch sensor based vehicle motion.

Principal tenets of neuroscience and robotics will be conveyed through lectures and reinforced in a lab setting using a hands on approach to illustrate the scientific method. Students will work as teams to integrate these principles with cutting edge technology from NASA 2 to create a robot that navigates its environment using chemical cues and behaviors. This project will be hypothesis driven and the results will be submitted for publication to a peer-reviewed journal. On going results will be posted at the web site, www.lehigh.edu/~inmobile. Results from this project will also be sent to NASA to help in the design of a similar robot for their space projects. An additional goal of the project is to increase the numbers of underrepresented minorities and women in engineering and the sciences both at Lehigh and in professions at large. Students will be recruited from

ethnic and gender groups that are underrepresented in science and engineering; specifically African Americans, Latinos and women. Particular attention will be made to recruit these individuals from colleges that lack strong research components. The investigative nature of the proposed research experience, its strong hands on laboratory component, the one on one interaction with professors, graduate research assistants, and the professional development courses will generate interest in science and engineering that might not arise at the home institution. The lectures, labs and study guides will enhance course work provided at the home institution and better prepare students for upper level courses. Presentations and tours from faculty will familiarize students with graduate life, increasing the likelihood that students from their home institutions will continue their education beyond undergraduate studies. Both PIs are from underrepresented groups and will serve as role models in academic professions. Finally students will form an interactive network with professors and peers participating in the site. This will foster continued academic support throughout the year increasing retention in science and engineering.