

Creative Inquiry in Bioengineering

Robotics and Bioengineering

BIOE 451-005

Overview

The CI will investigate several projects in robotics and bioengineering. The first project will continue the MindBot project, which was started by undergraduates in the bioengineering department. MindBot was originally started as an undergraduate led deep-drive into neurology, robotics, and engineering using relatively cost-effective technology. The aim of the project was split between demonstrating the capabilities of consumer-grade neural technology and establishing a creative outlet for electrically and mechanically inclined Bioengineering students. The first system used cranial EMGs to control a simple two wheel robot in forwards, backwards, and rotational motion. Shortly thereafter a research grant was awarded to build a more functional and better designed robot. The goal of the project became to develop a device which can be wirelessly navigated through a maze while also be capable of dealing with physical obstacles (and of course controlled exclusively by a neural headset). There are numerous electromechanical challenges involved with designing such a device, starting from optimal mechanical design of the robot and extending to integrating its control system with a neural headset. Real world applications of the technology can range anywhere from entertainment to enabling devices for quadriplegics.

The project already offers hands-on engineering experience in electrical and mechanical design, computer programming, and system architecture. With the formation of a creative inquiry group, additional dimensions such as signal/image processing and psychological feedback can be explored and perhaps included in the final design - the limiting factors are of course time, money, and the creativity of the team. The project seeks devoted students who are striving to expand upon their current technical skill sets and contribute to a fast paced, team-centric environment. It's assumed that team members will not begin knowing the difference between a PIC and an ARM or how to handle segmentation faults. However, it is expected that students will ask questions, independently seek out answers when necessary, and devise group-driven strategies to solve technical problems. Above all, the group is looking for people who will have fun with the technology and grow from the experience.

Skills Developed:

- Circuit design and analysis
- Mechanical Design
- Hardware Interfacing
- Computer Programming (C/C++)
- System Design and Architecture
- Bioelectrical interfacing
- IRB protocol
- Patent/Intellectual Property processes

Questionnaire

- 1) Name:
- 2) Major:
- 3) Year at Clemson University (as of Aug. 2010): 1st
- 4) Current Overall GPA:
- 5) Why are you interested in joining this Creative Inquiry experience?

6) What do you want to do when you graduate and why?

7) How do you rate yourself in time management?

I think I am 3 (On time mostly)

Explanation of the choice

1. Well organized (Have a weekly calendars of things to do, always on time for class and meetings, prepare for class/exams in advance)
2. Moderately organized (Have a to do list, always on time for class and meetings, try to give myself some time to get things done)
3. On Time Mostly (Try to show up at class/meetings and get things done on time)
4. Procrastinator (I wait until last minute to do things)
5. Total mess (Always late and/or miss deadlines often)

Free response

You have a four-wheel robot with a VEX microcontroller and need to receive user commands (such as move forward or backwards) from a PC through some form of wireless communication, such as Bluetooth or Wi-Fi. You have \$100 and two weeks to order parts, build, test, and write a brief report (no more ½ a page) on the system. How would you solve the technical challenges in time while also managing your regular course load and personal commitments?

Note: No panic! We just want to see that you are able to deal with a realistic situation. Try your best and let us know where you get your sources.