MEng Design Project Announcement – 2017-18

Project Title: Radio Tag Design for Laboratory and Wildlife Mouse Tracking

Brief Description of Design Project Goals:

Overview: An existing, Cornell-developed wildlife tracking system will be adapted for use in both a simulated and natural mouse habitat. The mouse habitat research is a long-term project in Cornell’s department of Neurobiology and Behavior. As part of the new system, the wildlife tag current in use must be redesigned to be more species-specific. In addition, the tag will be modified for biometric sensing.

E&EB’s TABER team has developed a field-proven radio tag for proximity detection and weighs between 0.4 and 0.7 grams, along with a base station receiver and data logger. The TABER system includes a recently updated base station (based on the Raspberry Pi 3) that records tag data in the field. In order to use radio tag tracking for mouse habitats, an existing radio tag from the TABER group must be redesigned.

Specific MEng Contribution:
The TABER system will be adapted to the requirements for (1) a Laboratory based mouse habitat and (2) a wildlife mouse habitat. The existing tag, designed for avian research, will be redesigned to fit the constraints of the mouse habitat. The design requires:

- Working with the initial tag design from the TABER group, tag footprint size will be relaxed to optimize production costs.
- Considering possible tag implantation, multiple interconnected components will be investigated; for example, developing separate RF/computing and battery power components.
- Rechargeable battery technologies will be developed along with inductive charging stations designed to be included within the habitat.
- The tag will also be modified to include biometric sensing of test subjects including:
  - Temperature
  - Heart rate
  - Mouse activity (Accelerometer)
  - Urine production
- Performance characteristics for the tag will be defined including: range, power consumption, charging time, transmission speed.
- Comprehensive testing strategies will be developed in order to test improvements and modifications of the tag design.

At the completion of the project, working field-deployed tags will be demonstrated in the mouse habitat enclosures. The end-goal will be to have field-deployed tags available for the NB&B researchers to use in the system. The design, testing, and deployment of these tags are the completion goals of the project.

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**Number of MEng Students needed:** 2

**Required Skills:**
Microcontroller programming, algorithm development, Microcontroller interface experience, VLSI design, printed circuit board (PCB) design, familiarity with Eagle files, Linux Operating System, Python and/or C programming.

**Estimated Project Time Frame:** Fall 2017 + Spring 2018 semesters