**Project title:** Enhanced Animal Simulator: Evaluating chest compressions

**Overview:** Researchers at the Cornell Veterinary School, under the direction of Dr. Daniel Fletcher, have developed a physical simulator to model canine patients. The open-source simulator architecture includes manager software written in C++ running on a Linux PC, a user interface and simulator patient monitor written using Javascript and HTML 5, and a hardware interface based on a Beaglebone Black microcontroller and several custom PCBs. This animal simulator is used in clinical classes for training veterinary students as well as veterinary technicians and veterinarians. Although the current system has a wide range of functions, including palpable pulses, chest movements, and heart and lung sounds, additional functions would enhance the student experience. The simulators are used extensively for CPR training, an essential skill for veterinarians and veterinary technicians. The most important aspect of CPR is delivery of chest compressions to provide blood flow to the tissues, and the rate and depth must be correct in order for the compressions to generate adequate blood flow. The current system uses an accelerometer to detect chest compressions, but this project would involve developing algorithms and incorporating additional hardware to allow the system to estimate chest compression rate and depth in real time and to provide that feedback to the trainee.

**Specific MEng Contributions:**
The current system is in use at the Vet School and the project team must first study the system to learn how to integrate any new functions. Steps in the project process would include:

- Understanding the technology of the current simulation system
- Work with vet school researchers to understand the data needed from the compressions detection system
- Develop algorithms and select hardware for estimating chest compression rate and depth
- Implement algorithms and integrate the hardware with the current platform
- Design a prototype for testing with the current simulation system

The goal of the project will be to provide the enhanced function within the simulator by the end of the MEng project. This includes documentation for all design elements and an operation/maintenance guide for researchers at the Vet school.

- The team will work closely with researchers at the Vet school.
- The team must take direction from the Vet school researchers as requirements evolve.

Periodic meeting with Vet school colleagues will include updates and demos. Working prototype will be delivered according to the established schedule

**ECE Field Advisor Name:** Joseph Skovira
- Email – jfs9@cornell.edu
- Phone – 607 255 6633
- Office – 211 Phillips Hall

**Outside Field Advisor Name (if applicable):** Dan Fletcher
- Email – djf42@cornell.edu
- Phone – 607-253-4090
- Office – 318 Clinical Programs Center
Number of MEng students needed: 2

Related web sites: https://vetsim.org,
These videos contain information about our first generation simulator based on a human patient simulator:
  • https://www.youtube.com/watch?v=1vM71GW_8MA

Required Skills:
Microcontroller programming and system design, sensor development and interfacing, network communication, system integration skills, GUI and web site design

Estimated Project Time Frame: Fall 2017 + Spring 2018 semesters