Project list for Fall 2017/Spring 2018

February 5, 2018

M70: Redesign of a stethoscope for use in developing countries (Sponsored by MU).

Project description

In India and similar developing countries, one nurse is expected to meet the medical needs of around 7000 villagers who are located far away from any medical facility. There is an urgent need to provide diagnostic tools to help identify the lung and heart ailments of the poor. So, it is believed that the "black box" would be extremely beneficial to determine the sound of the lungs. What would be neat is for this device to amplify the auscultation (listening of) the heart and lungs so the assessment results would be universal and not subjective to the nurse listening to the lungs. All parties providing care for the patient could hear the lung sounds as well as determine the amount of fluid. In each level (low risk, moderate risk, high risk, severe risk for example), depending on and amount of fluid, could influence researchers to develop interventions for each level or stage to prevent illness and eliminate fluid in the lungs. You required to design and build and test a "black box" to meet these requirements. Since Dr. Cariapa has already researched this problem and two senior design teams have worked on this problem, you have a head start in meeting the needs of the poor. (This project is based on the continuation of a theme to serve poor people all over the world and despite past projects, this problem needs further attention).

Sponsor: MU
Suggested team composition: MEEN 4, COEN 2
Proposed Budget: < $500 for a working prototype.
Faculty advisor: Vikram Cariapa

M83: Developing (Designing & Testing) Scroll-Type Air Compressor and/or Expander (Mini Generator)

Project description

The main objective of this project is to develop a (small-scale) scroll air compressor or expander (mini generator). For a set of given specific operating conditions with appropriate geometric and application-related constraints, the team will explicit perform the basic/fundamental analysis to find optimal design parameters. Sample 3D CAD and the corresponding prototype models will be developed based on the design parameters selected. Performance testing work will be also followed to verify and even validate the theoretical analysis. The team will also develop a

guideline for designing and/or selecting the system components such as motor (for compressor) or generator (for expander). The team will be closely working with the team who will be working on test bed design.

Sponsor: MU
Suggested team composition: MEEN 5
Proposed Budget: < $1000 for a working prototype.
Faculty advisor: Hyunjae Park

M86: Africa/3rd World generator that produces power and clean water – Briggs and Stratton (Portable generator Group).

Project description

This is a project that has huge social benefits for Developing countries where there is a huge jump in cell phone use, but the resources for generating electrical power is very small. Based on a clever design One clever and dynamic company (http://www.bioliteenergy.com/products/biolite-campstove) has built a system that both facilitates the cooking of regular meals while providing a means to charge cell phones. Unfortunately, these products are too expensive for the target market where the annual income is around $500 for a family of 4 people, including 2 adults and two children.

You are required to design a very reliable device that can be used for cooking a meal for a family of 4 in a developing country such as India or China or Kenya. In addition, the device should charge a cell phone and/or providing light for the children of the family to study for 2-3 hours every night. Finally, the device should be manufacturable in the country that you have chosen for a maximum price of $100.

Proposed Budget: < $5,000 for a working prototype
Suggested Team Composition: MEEN 3, ELEN 1, COEN 2
Sponsor: Briggs and Stratton
Faculty Advisor: Tony Bowman

M93: Autonomous Snowplow Entry for Competition (Sponsored by Douglas Dynamics).

Project description

The Institute of Navigation (ION) is the proud organizer of the Annual Autonomous Snowplow Competition. This competition is operated by the ION North Star Section based in Minneapolis, MN, and includes ION members from Minnesota, North Dakota, South Dakota, and western Wisconsin. ION's Satellite Division directly sponsors the competition.

The contest objective is for teams to design a snowplow that will autonomously clear snow from a pre-defined field. The competition invites and challenges teams in high-performance autonomous vehicle guidance, navigation, and control. It is designed to encourage students that are interested of in the art of navigation and the general areas of science, technology, engineering, and mathematics.

Teams must build a vehicle to autonomously plow snow entirely from two snowfields in a set amount of time. The two snowfields have a straight single ”I” shape and a double “I” shape.

The teams can use augmentation systems, such as visual cues or GPS, to aid the vehicle’s navigation system, however there will be no direct human control of the snowplow during its competition run.

The 2018 competition will be held in St. Paul, MN on 25-28th of January. As such, the deliverables for the senior design project will be modified. The December deliverable will include a demonstrable prototype (instead of a conceptual prototype). The May deliverable will have an additional section in the final report with “Lessons Learned”, which will include appropriate engineering analysis and redesign.

http://www.autosnowplow.com/welcome.html

Sponsor: Douglas Dynamics (formerly Western Plow)
Suggested team composition: MEEN 4, ELEN 2, COEN 1
Proposed Budget: TBD, but >$5000
Faculty advisor: Anthony Bowman

M94: SAE Baja On-Board Data Logging System (Sponsored by MU).

Project Description:

Students will participate in the development of a data acquisition system that will be mounted on-board to the Marquette SAE Baja car. Data acquired will include shock displacement, frame member strain, engine RPM, acceleration, and others (see attached Excel sheet for full breakdown). Students will fit-up sensors and devices to output data to a Raspberry Pi-like device. The Eagle 2 car will be the vehicle integrated with this system, with an easy implementation to Eagle 3 and other Baja cars. Data will be gathered by having the car run several laps on an off-road track, and the on-board system will log the data during the testing. After the testing is complete, data will be downloaded and analyzed. A Graphical User Interface (GUI) will also be designed to present data in a neat and orderly fashion. Students will analyze the real-world data from the sensors and compare it to the results from the FEA simulations that were performed in the original design of the car. This DAQ system can be used to help better design components in the future, and to see how changing an individual component can affect car performance (air shocks vs. coil-overs, aluminum vs. steel arms, different CVT weights, toe-in vs. toe out, etc).

Sponsor: MU
Suggested team composition: Alex Zucca (MEEN), Gerald Zucca (MEEN), Bryan Kendall (MEEN), Zach Bernaden (MEEN), Thomas Arlotta (MEEN), John Dolan (MEEN), Jacob Krakauer (MEEN), Brandon Kupczyk (COSC)

Proposed Budget: TBD
Faculty advisor: Dr. Casey Allen