MEng Design Project Announcement – 2018-19 AY

**Project title:** Design of a Mobile Robot to Support Collaborative Human-Robot Swarms

**Brief Description of Design Project Goals:**

**Overview:** In a collaboration between the Verifiable Robotics Lab, the Human-Robot Collaboration and Companionship Lab, and the Collective Embodied Intelligence Lab at Cornell, we are interested in how robots can support swarms of people under duress, e.g. during a disaster situation. This challenge necessitates both novel reactive controllers and electro-mechanical designs that enable safe, intuitive natural interactions with untrained people, while remaining low cost, durable, and low maintenance to permit mass deployment and hour-long operations. To this end, we are inspired by work in urban search and rescue robotics, soft robotics, and swarm robotics.

**Specific MEng Contribution:** The students involved in this project will contribute by designing and fabrication a remote controlled rover for human-robot interaction. The rover will include an Intel Aero Compute Board and the Intel Aero Vision accessory kit capable of color image and depth (RGB-D) sensing. The rover will also carry a Tenker Pico miniature projector, and an inflatable human-scale bladder. When deflated, the robots may move quickly and easily in confined spaces. When inflated, the robots can make their presence noted, and project visual cues onto the bladder. If time permits, we will look into detection and recognition of interactive gestures by humans onto the bladder using the RGB-D sensor. In summary, this project is highly integrative and will involve 1) holistic design and operation of a remote-controlled, durable, fast and light-weight rover, 2) control with embedded operating systems, 3) design of a bladder and driver circuitry for stable inflation/deflation, and 4) vision-based interpretation of user feedback. Students will work in pairs to complete these tasks, but every student will spearhead and be responsible for a separate platform component.

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**Project Web Site:** [http://www.cei.ece.cornell.edu/](http://www.cei.ece.cornell.edu/)

**Number of MEng Students Needed:** 4 - 6

**Required Skills:** We need smart, self-motivated, and creative students with a mix of backgrounds for this project. Each student must have a subset of the following skills: Embedded Linux, Python, OpenCV, and robotics including mechanical (3D printing, laser cutters, molding and casting) and EE prototyping (e.g. circuits, PCB design, and motor drivers).

**Estimated Project Time Frame:** 2018-19 Academic Year, Two (2) Semesters