School of Energy

2019/20 Electrical Engineering Capstone Projects

Students	Project	Faculty Advisor	Sponsor(s)
Engleman, Jonathon Howard, Grant Tallentire, Austin	**BC Hydro Underground Vault Inspection Drone:** An Integral part of BC Hydro's electrical infrastructure is the underground vaults containing high voltage cable joints which link customers to substations. The current inspection process for these transmission junction vaults is costly, time consuming, and requires a system shutdown. The goal of our project is to design an automated inspection drone that will eliminate the need for workers to enter the high voltage junction vaults and reduce service interruptions to customers. Moreover, confined space regulations require three technicians on-site, which will be reduced to one after our automated system is implemented.	Glenn Pellegrin	BC Hydro
Aldis, Liam Jones, Garrett Ma, Teng	**Non-invasive Prosthetic Arm:** This arm will consist of two myoelectrical controlled sections, one band will be placed on the user's bicep and one on the forearm. This prosthetic arm will be attached to a table and have a gripping hand and moving elbow joint controlled by the two bands on the user's arm. This is just to demonstrate the muscle impulse control and movement functionality of the prosthetic; later research will enable it to be fitted to an individual. To complete our vision, we will be incorporating a fair bit of new technology into our project. To interpret the muscles impulses of the arm we will be using electromyography (EMG) sensors centered on the forearm and on the bicep. A feedback system is going to be implemented that will allow the user to accurately control the grip strength of the arm by matching the pressure sensed on each digit of the arm to the pressure set by the EMG, fed back to indicate the current pressure level.	Diane Kennedy	

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Heyer, Kevin Kerluke, Christopher Olesevitch, Aleksander	**Robot Arm Actuator Enhancements:** The key to robotics is the actuator (the part that makes the robot move). With its small footprint and low cost, the position control actuator being developed as part of this project will take advantage of brushless DC motors to make precision robotics more accessible to the consumer market.	Craig Hennessey	
Liu, Yang Soberano, Brendon	**Electric Vehicle Charging Station Maintenance Tool:** Development of a costeffective testing tool for public charging stations built for electricians or technicians. The device will track charging parameters such as voltage, current, duty cycle, and efficiency and send data via the cloud, for preventative maintenance data collection, or Bluetooth for the convenience of the technician when working on site. This device will be compatible with North American charging stations following CEC and SAE standards.	Ed Casas	

Dobrzanski, Joseph Huttemann, Nicholas Maisuria, Bhavik	**Electromagnetic Field Detector for BC Hydro:** BC Hydro is installing permanent sorting work area facilities underneath high voltage power lines at their Material Classification Facility. Employees working beneath these transmission lines are exposed to low power electromagnetic fields (EMF). Although the levels of EMF exposure were shown to be within acceptable levels with paperand-pencil calculations, theory and reality are two different things. To ease any worries about EMF overexposure, our team is developing a personal EMF monitor that will store electric/magnetic field data, and display it on its screen. The device will be small, lightweight, and durable enough to be brought with employees for the duration of their work shift. The information that's collected is then stored in a database where various analytical/trending techniques can be applied to an individual employee's (or the entire workforce's) EMF exposure data. To send data from the device to the database, two methods are being investigated: To transfer it by USB cable when the monitor is being recharged, or to transfer it continuously over LTE-M cloud services (e.g. Microsoft Azure).	Reza Vahidnia	BC Hydro

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Mission, Karen Santos, John Lemuel Wong, Ryan C	**The Hound – Disaster Response Drone:** Earthquakes are inevitable, and scientist everywhere are expecting an earthquake of unimaginable size to hit North America sometime this century. As a result of long-time delays between each disaster, the number of first responders is almost never enough. In response to this, the team will build a user controlled or autonomous ground-based drone that will be modular enough to fit between cracks in rubble as well as survive in dilapidated buildings, all the while providing a real-time room mapping ability using state of the art LIDAR algorithms. The drone aims to help speed up the disaster response process by not only helping the search team with locating dangers and survivors but also providing records to the search team about what they found.	Chris Goetz	BCIT Emergency Response Teams
Askarzadeh, Sajjad Lu, Hsiao-Yi McConnell, William	**Brushless-DC Motor for Submarine Applications:** There are existing servos that have the capability to operate underwater; however, these servos are expensive. In response to this, a BLDC digital servo motor and controller that is reliable and affordable is under development for this project. Brushed motors wear out overtime as they have brushes that make a sliding contact. In addition, these brushes also reduce the efficiency of the motor. Brushless DC motors are better because they are more efficient and have a longer lifetime.	Ali Palizban	Nuytco
Bessey, Cody Dhillon, Aarondeep Yusuf, Andrew	**Autonomous Multi-Purpose Maintenance Vehicle:** This vehicle will be capable of snow plowing, salting, lawn mowing, and act as construction vehicle capable of carrying medium duty payloads around a construction site. The main components of this vehicle will be the sensors, Lidar, and cameras that will be used to do object detection and mapping of the area to be plowed. The sensors being employed are ultrawide band sensors, capable of tracking the vehicle at all times in a predetermined area. The Lidar will be used to measure distances to objects and detect objects in the area of interest which will be necessary to provide safety. The cameras will also be used for object detection to provide another safe alternative when detecting potential hazards in an area.	Chris Siu	

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Cabales, Ian Doulfikar, Amine Hossan, Akash	**Power Generation & Distribution System for Canadian Space Agency Stratospheric Balloon (STRATOS) Project:** In 2021, the Canadian and French Space Agencies are planning to start transatlantic balloon flights between Northern Sweden and Canada's far north. These massive weather balloons will be loaded with equipment conducting science experiments and gathering data with hopes to give new perspectives on our own planet, further our understanding of our fragile atmospheric layer, and provide different aspects to view into outer space. The goal of this project is to provide the Canadian Space Agency with a modular and adaptive power generation subsystem to enable these flights to reach lengths of up to 6 days by investigating high efficiency solar modules and integrating them with an intelligent battery management system. This design will have to withstand the harsh temperature extremes and irregular weather patterns seen at heights of 30-40 km above the surface of the earth. The outcomes from this project will not only benefit the scientific community but will also provide precedence and inspiration for future capstone experiences in this area.	Jeff Bloemink	Canadian Space Agency (CSA)

Baryshnikov, Vasyl Liivamagi, Tristan P Mir, Fazlay R	**Robotics and Automation Device Operations Counter:** Industry has requested an efficient, fast, cheap, and secure method to collect usage data for their products and display graphically in a centralized location. This device will predict the industrial machine's life by reliably counting piston cycles. The system will consist of three parts: the wireless cycle counter, mobile applications, and the online database system. The software will run on an Android phone. The application will request information from the device and display graphical and analytical usage data of the device. Product life and failure rates will be calculated using information received.	Steven McClain	
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Flood, Andrew Friel, David Jennings, Tyler-James	**Automated Mapping for Parking Structures:** The system being developed for this project aims to answer the question "where is the most efficient and profitable place to put an EV car charger in Vancouver?" through an automated information gathering system. The device developed will be mounted onto a vehicle and driven around various parkades to build a map and identify objects of interest in real time using a simultaneous localization and mapping algorithm. This will then be processed by the AI component and give the user metrics including where all the current chargers are, what make/model they are, how often they are being used, if locations have the space for a charger, and if so how much would it cost to bring an electric vehicle charging service to the targeted spot.	Robert Trost	Cypress Power

Lewthwaite, Charles	**Remote Community Microgrid (RCMG) Project:** BCIT's Smart Microgrid Applied Research Team is working on a front end engineering and design (FEED) study for a hybrid renewable energy platform for the Lutsel K'e Dene First Nation. Lutsel K'e is a remote indigenous community, located on the eastern arm of Great Slave Lake in Northwest Territories. It is not connected to the North American electricity grid, is off the piped natural gas network, and not accessible by road. This capstone project has been defined to assist the progress of this RCMG.	Ali Palizban	Lutsel K'e Dene First Nation