DRAPER

Summer 2019 Projects

Project A (Hand-held MRI): Magnetic resonance imaging is a form of medical imaging that utilizes strong magnetic fields, magnetic field gradients, and radio waves to produce images of the anatomy and physiological processes in the body. For this project, a team of students will have the opportunity to design, test, and optimize constraints of materials to be utilized in the development of a handheld MRI device. A general understanding of high school physics (magnetic fields) is preferred, and algebra and trigonometry are required. Some experience with modeling software (ANSYS, COMSOL, or SolidWorks) is desired but not necessary.

Project B (Sunflyer): Unmanned aerial systems (UAS) can be used for a number of applications, from dispatching medical supplies in areas where travel is difficult due to lack of roads and infrastructure to delivering internet connections to remote locations. For this project, a team of students would be working together to modify a UAS to fly for long durations without need for repair or refueling. A general understanding of algebra and trigonometry are required, while an interest in building objects (prototyping) and aviation technologies are desired but not necessary.

Project C (Raspberry Pi Water Test Kit): Drinking contaminated water can lead to waterborne diseases and in turn cause serious health issues for the consumer. Developing a field test for public water sources could be beneficial in informing users of water quality for consumption. For this project, a team of students will use a Raspberry Pi to develop a sensor to determine the safety of drinking water in public places. A general understanding of basic algebra is required. Some experience with programming (MATLAB, Python, or C/C++) and measuring/recording data is desired but not necessary.

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Project A (Visualize UAV Data): A Graphic User Interface (GUI) is a platform that users can interact with in order to engage with electronic devices through graphical icons and visual indicators, instead of text-based user interfaces, typed command lines or text navigation. In order to develop and demonstrate navigation software for Unmanned Aerial Vehicles (UAV), a GUI is necessary. For this project, a team of students will have the opportunity to work with a Snapdragon Flight UAV and develop a GUI for visualizing the UAV's navigation software, for both development and demonstrations. Familiarity with and interest in visual design, using Linux systems, MATLAB or Robot Operating Systems (ROS) are a plus.

Project B (Simulation of Novel Space Systems): Miniaturized satellites have reduced the costs associated with satellite construction and launch and created new opportunities in space. In order to survey a space-based target vehicle for condition and its location, extremely small femto-satellites can be employed. For this project, a team of students will investigate novel approaches to space systems that will service satellites, including uncooperative disabled target satellites, using femto-satellites. This will be in collaboration with work conducted by US Naval Academy interns, who will mentor the students in system simulation design. Geometry and Algebra II are required, and Trigonometry/Pre-calculus and Physics coursework are preferred. Some programming experience (MATLAB, Python, or C/C++) is desired but not necessary.

Project C (Sea Condition Buoy): Ocean buoys are instruments used to collect various metrics about ocean conditions, such as water temperature and aspects of the waves they encounter. For this project, a team of students will aim to create a small and affordable buoy that can detect environmental conditions including water temperature, current direction, and wave and swell height. Students should have a familiarity with Physics coursework, and readily be able to employ critical thinking skills. Some programming experience (MATLAB, Python, or C/C++) is desired but not necessary.

Project D (Turtlebot Test Platform): Turtlebot is a commercial off-the-shelf (COTS) ground robotics platform which consists of a mobile base, a 3D depth camera, and an onboard computer running open-source software known as the Robot Operating Systems (ROS). ROS is an open-source set of software libraries and tools that have been used to build robotics applications and offers a variety of packages for communication, control, and autonomous operation of the Turtlebot platform. For this project, a team of students will build a mature and reliable Turtlebot platform to gather data and test augmented reality tools, such as the Microsoft HonoLens, for more intuitive and capable human-robot interaction. Students will have the opportunity to demonstrate the performance of the platform by designing scenarios where the Turtlebot must navigate through an environment with unexpected obstacles to a user commanded position. Some programming experience (Python or C/C++) is helpful but not necessary. Familiarity with and interest in ROS are a plus.