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VIRGINIA TECH

Project Number: **1**

Project Sponsor:

Altria

Altria, Richmond, VA

Project Title: **Altria - Vibration Monitoring and Analysis**

SME: Peter Han

Customer POC: Brian Cramer, Walter.B.Cramer@pmusa.com

Extend the existing Vibration Monitoring System to add analysis capabilities and a user-friendly interface. Version 1 provided the capability to collect vibration data and visualize it in a rudimentary way. The goal of this project will be to make it possible for a lightly trained user to collect baseline information over time or from different pieces of equipment to establish a vibration baseline with alarm limits to predict when a mechanical intervention is required. Thought must be given to the statistical analysis of vibration and failure data, as well as presentation and ease of use to make an effective industrial failure prediction tool.

The system should have a means of identifying and storing numerous sets of vibration data that may be optionally selected for establishing a historical baseline for comparing future data sets, a means of recording when real equipment failures occur and then identifying the warning signals in the historical vibration data sets. Many different types of failures should be supported, with potentially different warning signals. The system should provide useful predictions based on the failures that can be used for planning mechanical interventions weeks or hopefully months before actual failure occurs.

tbd

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Project Number: **2**

Project Sponsor:

ZETA ASSOCIATES

Zeta Associates, Fairfax, VA

Project Title: **Zeta - Personal Locator Beacons System**

SME: Louis Beex

Customer POC: Michael Drescher, Stephen Kralick, drescher-michael@zai.com, kralick-stephen@zai.com

Personal Locator Beacons (PLBs) are used around the world to summon emergency search and rescue assistance. Design, test, and prototype a complete system architecture to support multiple beacons, each transmitting a unique ID and GPS position. This project is important because it explores techniques for integrated RF and signal processing systems subject to size, weight, and power constraints.

tbd

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Project Number: **3**

Project Sponsor:

BAE SYSTEMS

BAE, Manassas, VA

Project Title: **BAE - Create the Power Schema**

SME: Peter Han

Customer POC: Bobby Bowen, robert.bowen@baesystems.com

Create the Power schema for a Space-based CCA that takes +12V input power and steps it down to common voltages (such as 3.3V, 2.5V, 1.8V, 1.5V and 1.0V) using the Kintex UltraScale plus as the target device (due to the price of the UltraScale plus, we recommend using a different load for testing purposes).

tbd

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Project Number: **4**

Project Sponsor:
ECE/ISE

Project Title: **VT ISE - CNC Lathe**

SME: tbd

Customer POC: Matt Earnest, VT ISE, mearnest@vt.edu

ECE student team will design, build, test, and deliver a more integrated CNC (computer numerical controlled) manufacturing lathe using the ISE Learning Factory ECOCA lathe. The lathe previously functioned as a stand alone tool system. It was disconnected to reorganize the Learning Factory workspaces. Student team will evaluate the current CNC control system, develop an action plan to reconnect the system and ensure safe operation and proper functionality of the equipment using CNC. The team will develop and integrate real-time monitoring as part of the Learning Factory digital dashboard and, optionally, will develop a 3D model of the system for virtual augmentation.

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Project Number: **5**

Project Sponsor:
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ECE/ISE

Project Title: **VT ISE - Factory Robot**

SME: tbd

Customer POC: Andrea L'Afflitto, VT ISE, a.lafflitto@vt.edu

- Receive from the user a list of locations to be visited. Some locations can be visited only after other locations have been already visited. Other sets of locations can be visited at any time. Then, plan the route accordingly.
- Plan the route according to the battery level, and decide when to charge the batteries.
- Keep an inventory of the material being transported, and plan its trip accordingly. If visiting some locations means overflowing the bins, then these locations cannot be visited or not all the payload can be loaded at this location.
- Report to the user what locations cannot be visited, what locations are to be visited, and what locations have been visited.
- Having created a map of the environment, the MIR will report to the user what paths, which would nominally be available, have become unavailable.
- Sense how many items are on the conveyor's belt and prepare some interface with a robotic arm to instruct the arm on when, where, and how much payload to load on the MIR.

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Project Number: **6**

Project Sponsor:

LOCKHEED MARTIN

Lockheed Martin, Bethesda, MD

Project Title: **LM - UAV Telemetry Courier System**

SME: Louis Beex

Customer POC: Geoffrey Kerr, geoffrey.b.kerr@lmco.com

The UAV Telemetry Courier System collects information from one or more mobile/roving sensors at a remote location (e.g. pitbots on the dark side of the moon, drone inspection of a grazing herd, etc.). To insure that information does not go stale before it can be processed and analyzed, the information is periodically couriered by UAV (or equivalent) to its base where it is offloaded using an RF channel. With the offload, the Telemetry Courier System's task ends and the offloaded packetized information is further processed and analyzed at the base. The remote sensor information is packetized and transmitted using a limeSDR Mini to the Courier UAV via RF channel. The UAV contains a limeSDR Mini that receives the remotely collected information, which is then flown to the base location where the collected information is offloaded.

tbd

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Project Number: **7**

Project Sponsor:

futureHAUS
Virginia Tech Center for Design Research

Virginia Tech, Blacksburg, VA

Project Title: **VT - FutureHAUS**

SME: Igor Cvetkovic

Customer POC: Igor Cvetkovic, igorc@vt.edu

Students will revive the existing electrical system comprising FutureHAUS PV panels, charge controllers, solar inverter, and batteries. All electric connections have to be checked, and the whole system tested in a few modes of operation. An advanced energy management algorithm already implemented before has to be checked and tested. Energy management algorithm currently runs on Raspberry Pi, and new graphical User Interface might need to be developed. This will be decided soon after the project kicks off. Additionally, students will need to test the home automation system.

tbd

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Project Number: **8**

Project Sponsor:

Aerospace Corporation

Project Title: **Aerospace - Satellite Nav Sensor**

SME: Greg Earle

Customer POC: John Janeski, john.a.janeski@aero.org

Satellites rely on Position, Navigation and Timing (PNT) systems to determine the vehicle's current position/attitude and time, the next desired position/attitude and the required position, velocity and acceleration corrections needed to get to the desired state. Typical large satellite systems require a significant amount of calibration time to calculate a navigation solution during initialization and/or lose their navigation solution during orbital maneuvers in environments where their PNT system does not have access to Global Navigation Satellite System (GNSS) signals. As a result of not having a navigation solution, the satellite system cannot execute its mission. One solution to this problem is to develop a small, commercial grade PNT sensor that can be used to propagate the primary navigation system's navigation solution through outage periods. As a first step towards a viable solution, the purpose of this design project is to design a low Size, Weight and Power (SWaP) sensor suite that will provide a navigation solution during spacecraft orbital maneuvers and can be initially flown on a 3-6U CubeSat for technology maturation.

tbd

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Project Number: **9**

Project Sponsor:

NAVAIR

NAVAIR, MCAS Patuxent River, MD

Project Title: **NAVAIR - Sonobuoy Communications**

SME: Louis Beex

Customer POC: Andrian Jordan, Israel Jordan, andrian.jordan@navy.mil, israel.jordan@navy.mil

The design task is focused on collecting sonobuoy sensor information and preparing it for burst RF transmissions. The main sonobuoy sub system for doing this is a compact RF transmitter with an FPGA, DSP, and port capabilities that needs to be interfaced and programmed for the indicated task.

tbd

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Project Number: **10**

Project Sponsor:
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ECE

Project Title: **ECE - Utility Scale Power Planning Design**

SME: tbd

Customer POC: tbd potentially VT PEC faculty

Student team will conduct a Utility Scale Storage and Power study based on our local VT and Blacksburg power systems to consider current and future needs. The students will analyze current system architecture and services. They will develop and propose, at least, two design concepts. Final deliverable will include functional model or simulation of, at least, the design team's primary recommendation. If batteries or solar are part of such a design, the recommendation will include sizing options, distribution, and potential siting of primary system components.

tbd

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