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ECE students wow military leaders with brain-controlled robots

By Keith Pierce

Robots that walk for people who have lost limbs or talk for people who have lost the ability to speak, offer a myriad of possibilities for the military. This may be why the North Atlantic Treaty Organization (NATO), invited students from Old Dominion University's Vision Lab to attend the Chiefs of Transformation Conference (COTC) 2017 at Norfolk's downtown Marriott hotel.

"I am absolutely ecstatic to be here and be part of this project," said Caroline Kuzio, a junior majoring in computer engineering. "It has so many different applications that can be helpful to so many people. It's exciting to be working on something that's really making a difference."

COTC is a key annual event hosted by NATO's Allied Command Transformation (ACT) to discuss long-term capability development and transformational initiatives, as well as to explore innovations and examine future security challenges.

The high-ranking military leaders, representing more than 60 countries, did not seem to intimidate Kuzio or Ph.D. students, Lasitha Vidyaratne and Alex Glandon, as they presented their brain-computer-interface technology.

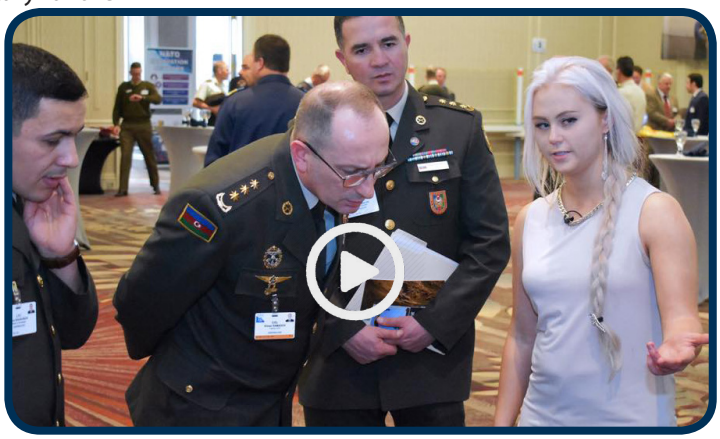
"I found most of the military leaders to be very sociable and nice," said Glandon. "Most of them wanted to know how the technology would apply to them. I basically told them to use their imagination a little, but to consider anything that would need to be communicated by a soldier, either to another person or to a device, in perhaps a situation where you cannot move, can be done by one of these robots."

Brain-computer interface (BCI), only one of several projects in the vision lab, relies on the brain to generate certain types of signals that can be interpreted by computers. Using an electroencephalogram or EEG cap to capture the brain's reaction to visual cues with luminous flash, the computer wirelessly transmits the brain signals to autonomous systems, such as a multi-function agile remote-controlled robot (MARCbot), which is commonly used by the military for the inspection of suspicious objects. The brain signals can also be transmitted to a humanoid robot, which might help an individual who is immobile, with day-to-day tasks.

"NATO has been engaging with us at ODU for quite some time, with other projects and through other faculty members. It offers our students a unique advantage to work on projects with immediate, real-world applications," said Khan Iftekharuddin, Ph.D., associate dean for research in the Batten College of Engineering and Technology. "Both of these projects, the autonomous vehicle project and the humanoid project, attracted NATO's attention because they could actually see their use in many different applications, relevant to their needs."

ECE Ph.D. student, Lasitha Vidyaratne, describes the capabilities of brain-computer interface technology to global defense leaders at NATO's Chiefs of Transformation Conference (COTC) 2017 in downtown Norfolk.

Hear more in this brief video:



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Ph.D. student puts Virginia Sea Grant Graduate Fellowship to work

By Keith Pierce

In a 2014 profile in the Hampton Roads Business Journal, Maura Boswell, currently a Civil and Environmental Engineering Ph.D. student at Old Dominion University, said, "If there is something you don't like or agree with, do something to impact a positive change."

As sea level rise continues to pose a threat to Norfolk, Boswell is making good on those words, thanks to a graduate research fellowship from Virginia Sea Grant (VASG), a division of the National Oceanic and Atmospheric Administration (NOAA).

Boswell, a native of Olney, MD, is the first Old Dominion University engineering student to win the highly competitive fellowship. Her proposal entitled, "Nature-based features for Coastal Resilience: Quantifying Wave Dissipation," examines the effect of hybrid measures (combination of hard coastal structures and soft components such as marsh), commonly referred to as "living shorelines," in damping waves and reducing shoreline erosion.

"As a practicing engineer, when I was tasked with designing a marsh sill living shoreline system a few years ago, I became frustrated with the lack of design guidance available for engineers to be able to assign a level of protection afforded by a living shoreline design," Boswell explained. "This grant makes it possible for me to conduct research to meet my goal of providing sound science upon which living shoreline designers can optimize their designs."

According to the NOAA, hardened structures, such as revetment, bulkheads or concrete seawalls, can increase the rate of coastal erosion. In contrast, living shorelines limit the use of concrete and instead use natural or green infrastructure – such as plants, sand and marsh – to provide shoreline protection and maintain valuable habitat. Boswell's research aims to provide guidance for designers and property owners on the level of erosion protection provided by a living shoreline design.

"Property owners have a choice with how to protect the upland from an eroding shoreline, yet the most common method is with a continuous hardened structure, such as a revetment or seawall," she says. "This type of design puts a physical barrier between the water and land to ideally stop further erosion of the upland. However, by putting a hardened structure on the shoreline, the interaction between water and land is completely cutoff and habitat is lost."

Utilizing field measurements and numerical modeling, Boswell seeks to better understand the way the structures and vegetation interact with waves and water to optimize the land-water interaction, and quantify the level of protection afforded by the entire living shoreline system.

"The idea behind a living shoreline is to couple a smaller structure with vegetation to help dissipate waves approaching the shoreline to provide erosion protection, but still allow for interaction between water and land to maintain existing habitat," she says. "Quantifying the level of protection of a living shoreline design will provide better guidance to designers and allow a property owner to directly compare a continuous hardened structure shoreline erosion protection system with a living shoreline erosion protection system."

Experts indicate that seas surrounding Norfolk are rising at twice the national average, making Hampton Roads a global hot spot for sea level rise, and the second most vulnerable region in the country, behind New Orleans. That rise recently prompted the U.S. Army Corps of Engineers to propose $1.8 billion in coastal upgrades for the City of Norfolk.

Maura Boswell

As the Virginia Sea Grant aims to find ways to help guard American coastlines from the threats that sea level rise presents, Old Dominion University remains actively engaged in aggressive research, education and outreach on critical issues for resilience at the community, regional, national and global levels. Supporting research such as Boswell's is just one small part.

"With the help of this grant, I hope to provide significant, science-based research for policy-makers or anyone considering shoreline stabilization projects for sustainable and resilient coastal communities," said Boswell. "I'm thrilled to be a part of such important work."

Boswell conducts field work along Norfolk's shore.

Dad, Navy veteran, and electrical engineering student, receives multiple job offers before his December graduation

By Keith Pierce

How do you balance being a husband, a dad, an association president, a full-time student and a full-time aviation technician, yet still manage to acquire multiple job offers before graduating? Just ask December electrical engineering graduate, Eric Gonzalez.

Gonzalez and is family celebrate on graduation day.

"I have a very supportive wife, who took care of my son and took care of me," said Gonzalez. "I had to sacrifice a lot, I had to give up having a social life, a lot of free time and a lot of sleep. But I was really dedicated to doing everything I could to succeed."

As the third child in his family to go to college within the same general timespan, the Las Vegas, Nevada native knew that paying for college would be tough for his parents. His decision to join the Navy was based solely on his desire to advance his education while sparing his parents the financial hardship.

"I knew it was a little tight for my parents to support three students in college," said Gonzalez. "And I knew it was on me to go out there and gain the ability to go to school. So, after high school, I joined the Navy to gain access to go to school and to serve my country."

Gonzalez spent six years in the Navy and, though not the job he originally wanted, he became an aviation electrician, the only job open when becoming a Navy Seal didn't work out. His first assignment brought him to Norfolk, where he met his wife. He was later stationed in San Diego, Ca. from where he was deployed twice to serve in the Persian Gulf. It didn't take long for Gonzalez to discover that he had a passion for aviation – specifically his work on the Navy's most versatile helicopter, the MH-60 Sierra.

"I feel like everything happens for a reason. Once I got into that job, I fell in love with it," he said. "I knew there were applications to it in the civilian world, so once I separated from the military, I knew I wanted to continue to work on aircraft and that engineering would offer the best possibility to fulfill that."

Gonzalez came to ODU with that same passion and determination to succeed. Becoming the president of the ODU Chapter of the Society of Hispanic Professional Engineers, he was able to attend national conferences that opened doors for internship opportunities with major companies, such as Dominion Energy and Boeing.

"The educational background that I gained here, prepared me to succeed in my internships because they were not just internship roles, but engineering internship roles," he said. "ODU taught me well and really trained me to fulfill the responsibilities that an engineering intern should know."

The internships, coupled with all the hard work, paid off for Gonzalez. Even before graduating he faced a problem most people can only dream of – having to decide which job offer to accept.

"Having multiple jobs offers, I thought, was a little unreal at first," he said. "But it was all that work I put in, not only in my studies, but in all the applicable experience I gained through the internships."

Though it was tough negotiating with the several companies seeking to employ him, with his wife's blessing, Gonzalez accepted a job as a systems engineer for Lockheed Martin, where he will work on F-35 fighter jets in Orlando, Florida.

"If it were up to her [his wife], we would probably be staying in the area," Gonzalez said with a smile. "But she's allowed me to follow my dream to continue working on aircraft."

See and hear more in this brief video:

International Space Station to Launch ODU CubeSat

By Jon Cawley

It's been two years of work, but later this year a project team from ODU will see the nano-sized cube satellites they developed launched from the International Space Station.

The Virginia CubeSat Constellation is a NASA and Virginia Space Grant Consortium-funded mission that will place three very small satellites in orbit as a constellation from the International Space Station as part of the NASA Undergraduate Student Instrument program. The student-led mission is a VSGC project and joint effort among four member universities: Old Dominion University, the University of Virginia, Virginia Tech and Hampton University. More than 100 students across the universities have been working on the project.

ODU students particpating in the constellation project include: James Flynn, student lead of the electrical engineering team; Kimberly Wright, mechanical team lead; Susannah Miller, University lead, oversees the entire project and coordinates with the other universities; and about 20 ODU students from mechanical, electrical and engineering technology.

"It's a tremendous opportunity for our students to build, develop and fly a satellite in a constellation," said Mary Sandy, director of the Virginia Space Grant Consortium. "Of all the missions NASA selected, we were the only project that is a constellation - the others are individual."

Hovakim Nazaryan (right), medical physicist at the Hampton Proton Therapy Institute explains the irradiation set up to James Flynn, ODU junior and student lead of the electrical engineering team participating in the The Virginia CubeSat Constellation project sponsored by the Virginia Space Grant Consortium and funded by NASA. Joining Flynn is Tony DeFilippis (Virginia Tech). Note: For this test, the jug of water was used to stop the proton beam.

The Constellation has been selected for launch to the International Space Station in the third quarter of 2018 or early 2019 with orbital insertion to follow from the Station. Students must deliver their satellites to NASA for integration in July 2018. The ODU satellite, which has a drag brake to intentionally cause orbital decay, is expected to remain in orbit for up to four months. The other two satellites should orbit for up to two years. The satellites will communicate data to ground stations at Virginia Tech, University of Virginia and Old Dominion University for subsequent analysis using an analytical tool being developed by Hampton University.

For Dimitre Popescu, associate professor, department of electrical and computer engineering, it is his first time working on a satellite.

"The students are very dedicated. This is an area they enjoy working on. It's great to see that whatever they design will end up in space," he said. "This is almost like a full time job. For students to work on a large scale project like this is not an every day opportunity.

Popescu said the project gives the students real working experience that will prepare them for jobs at NASA because they will know first hand what the agency expects.

"The final deadline to deliver the cubes to NASA Wallops is in May," Popescu continued. "We have to deliver on time if we want to catch this opportunity. It's the first time working on something like this for many of us"

The mission seeks to obtain measurements of the orbital decay of a constellation of satellites to develop a database of atmospheric drag and the variability of atmospheric properties. It will also evaluate and demonstrate a system to determine and communicate relative and absolute spacecraft position

The approximately four-inch CubeSat that was built by Old Dominion students will be launched from the International Space Station later this year.

across an orbiting constellation. Called CubeSats, these very small satellites, about 10 centimeters (4 inches) on each edge, take advantage of microminiaturization of sensors and other components to undertake relatively inexpensive studies and demonstrations in space.

The students have named their satellites after the Roman goddesses on the back of the Virginia State Seal who represent the blessings of freedom and peace. UVA has chosen Libertas, the goddess of individual liberties; Virginia Tech selected Ceres, the goddess of agriculture; and Old Dominion University chose Aeternitas, the goddess representing eternity.

Flynn also has never worked on a satellite.

"I love working with software and coding. I never thought I'd get to work on a satellite in college, he said. "This project definitely requires a good amount of practical and theoretical knowledge that go hand in hand. It's great to be part of it.

"A lot of atmospheric data was collected more than 50 years ago," Flynn continued. "Our goal is to improve satellites and their lifespans in space."

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