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FEATURED

Eye in the sky

Student-led research on unmanned systems

Max Wasserman Contributing writer 8 hrs ago

In a dimly lit, cold, spacious hallway, students clustered around an electrical tape-covered drone, its wires swaying in the damp breeze from open doors. Everything was normal at the UW Aerospace Engineering Research Building, save for the fire.

The styrofoam chassis of FUNRA, one of the unmanned aircraft systems (UAS) at the Autonomous Flight Systems Laboratory (AFSL), had ignited. Concerned undergraduate researchers rushed the aircraft outside and passed by the office of Christopher Lum. Alerted by the smell of burning plastic, he followed them, his loose-fitting button-up shirt flapping between long strides.

“Oh, that’s no problem,” Lum said.

His upbeat tone likened the situation to getting a papercut. After a student nervously put out the flame, Lum returned to his office and picked up where he had left off as if nothing had happened.

Lum is the head researcher at the AFSL, which brings undergraduates, graduates, and professors together to research commercial and humanitarian applications of UAS, more commonly known as drones.

More than 670,000 drones were registered with the Federal Aviation Administration (FAA) in 2016, according to FAA chief administrator Michael Huerta. In the same year, consumer sales of drones skyrocketed to $150 million, more than four times the number from 2015.

Drones have also become a commodity in a rapidly growing commercial industry. Insitu, Aerovel, and Sagetech are some of the many UAS companies based in Washington state alone, with drones ranging in purpose from surveillance, to construction project oversight, to military defense. For researchers like Lum, the time is ripe to collaborate.

“What we really want to do is either work closely with aerospace companies in the region or to transition that out to an actual flight-test demonstration, as opposed to having this technology be written up into an article and sitting on a library shelf somewhere,” Lum said.

The AFSL partners with companies either directly or through the Joint Center for Aerospace Technology Innovation (JCATI), a state-funded initiative that helps pair university researchers seeking funding with industry leaders. In the case of their visual anchoring project, the AFSL has partnered directly with Insitu, a subsidiary of Boeing.

Drones currently track their position using GPS, but GPS is an easy signal to lose, and without it, a drone would crash. The AFSL’s proposed alternative? Cameras.

Mechanical Engineering graduate student Mike Brady suits up for the launch of Leia Skywalker, a bi-wing drone equipped with the latest modifications of the AFSL's visual anchoring software. When complete, drones using visual anchoring will be able to guide themselves without the use of GPS.

Courtesy Photo

Graduate researcher Ryan Grimes is the team lead for visual anchoring, a project which aims to use camera data to guide drone flight in place of GPS.

To draw a comparison, the human brain perceives depth by the slight differences of each eye image. We can determine size and position of an object relative to ourselves using these two data points. The concept remains the same for visual anchoring. A drone uses two pieces of data, height and imagery, to determine its trajectory.

“It’s almost like you’re throwing an anchor out the side of your boat,” Lum said. “But it’s not a physical anchor. It’s this vision information that’s my anchor point.”

A drone using visual anchoring software would be able to stabilize itself or determine a flight path from camera images without the use of GPS or an operator. According to visiting professor and AFSL researcher Tadej Kosel, this is the future of intelligent drones.

The AFSL conducts flight tests in Meadowbrook Farm over in North Bend, about a 45-minute drive east of Seattle. Last Saturday, a drone named Leia Skywalker took flight over grassy fields to test the most recent updates made to the visual anchoring software. It’s flight tests like these in which the AFSL’s unique lab environment shines.

Here, undergraduate researchers collaborate on the same level as their graduate and professor counterparts. Kosel worked alongside several undergraduates running calculations from their mobile unit. Graduate student Mike Brady made adjustments on Leia Skywalker with undergraduate Adam Mokhalalati, while flight director and recent UW graduate Hannah Rotta worked with everyone to make sure plans went smoothly. There was no hierarchy here.

Aeronautics and astronautics undergraduate Aaron Goldfogel pointed toward the collaborative nature of engineering as an explanation.

“This lab is a fantastic opportunity for undergraduates to do research,” Goldfogel said. “It all comes together into a team effort and that’s what engineering is about. Plus, it’s fun.”

It takes a team of all ages and expertise to make the AFSL’s research possible.

“Drones aren’t something you just click a button to make fly,” physics undergraduate Scott An said. “It takes people from multiple disciplinary backgrounds working together to make a drone.”

Lum believes strongly in the future of the drone industry. He cited an FAA prediction that drones are going to be the next big industry, similar to what the dot com boom was in the 1990s. Grimes maintained similar hope, likening it to a slower boom due to cautionary regulation.

“There’s a lot of potential, but the regulatory environment in place right now under the FAA is making it difficult for companies to feel safe in their investment,” Grimes said.

One concern of the FAA is that drones flying too close to restricted areas may crash and cause collateral damage. Between August and January of 2016 alone, there were almost 600 reports of drones violating airspace near airports.

Projects like the AFSL’s visual anchoring endeavor aim to bridge the gap, making drones safer and more reliable.

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