Penn State Club Places 2nd in International Drone Competition

A team of eight Penn State students from the Aerospace Engineering department placed 2nd at the 2019 International Micro Air Vehicle Outdoor Competition (IMAV).

There were a total of sixteen international teams from nine countries at the competition held in Madrid, Spain from Sept. 29th – Oct. 2nd. Penn State was the only team from the United States.

The competition featured autonomous navigation, mapping, object detection, and package delivery in a 30,000 m² outdoor venue. The Penn State team used three, 750 gram vehicles that each completed mapping and package delivery during the 25-minutes of allotted time. Each vehicle was built with the DJI F330 frame, Pixracer R15, Raspberry Pi, and Raspberry Pi camera with 10 minutes of maximum flight time in forward flight (without packages).

The three vehicles operated autonomously along pre-defined flight paths with onboard object detection to locate each of three mailboxes for package delivery. This information was then shared with all vehicles on the ground allowing each vehicle to deliver any of the seven available packages. The vehicles successfully delivered four of the seven packages to the correct mailboxes including a “fragile” package that was delivered successfully to a house porch.

Figure 1: Romeo attempting to deliver the largest package

Figure 2: Map of the outdoor venue created from image stitching, where the house for fragile package delivery is located in the top right
unbroken. The largest two were unable to be delivered because of strong headwinds during the run. A total of 250 images were taken during the mapping phase and then stitched together on the ground while the vehicles delivered packages.

Points were awarded based on the missions elements completed, level of vehicle autonomy, weight of the vehicles, and time leftover.

Team members included aerospace engineering graduate students Rachel Axten, Wen-Yu Chien, Jacob Crouse, Oliver Dunbabin, Venkatakrishnan Iyer, Masahiro Sato, Kalki Sharma, and Vidullan Surendran. All team members are a part of the Penn State Autonomous Robotics Competition Club (ARCC), a club created for participating in aerial robotics competitions such as IMAV. Dr. Eric Johnson, Professor of Aerospace Engineering, is the faculty advisor for ARCC.

Rachel, Wen-Yu, and Jake were the Remote-Pilots-in-Command (RPICs) for each of the three vehicles, named “Romeo,” “Yankee,” and “Bravo,” respectively.

This was the 11th Annual IMAV, and Penn State’s first time competing.