Annual Forward-Thinking Poster Session and Colloquy Presentation

November 28th, 2017

. . . The high quality of the proposed research and the outstanding participation of the students truly made this a successful event. In addition, there were many exciting dialogues between and among faculty and students which will certainly result in more robust research projects and increased applications to extramural funding sources.

– Dr. Jeanne Hossenlopp, Vice President for Research and Innovation

Congratulations EECE winners!

Dr. Henry Medeiros, Miguel Hernandez Virto, Brian Stumph and Weihua Liu (Electrical and Computer Engineering) for their project, "Quantification of Dispersal Patterns of Invasive Insects with Unmanned Aerial Systems."

Introduction: Invasive species are often inadvertently transported from their native range to novel habitats where they often have strongly negative impacts on food security, public health, economic interests, and native species biodiversity. As an example, in the United States, annual economic losses from invasive species are estimated at $120 billion (Pimentel et al., 2005), and these severe impacts are predicted to continue (Paini et al., 2016). A key element to the mitigation of invasive pest damage to both natural environments as well as agricultural production is understanding their migration patterns.

In this project, we propose to study the dispersal patterns of invasive insect species employing a small unmanned aerial system (sUAS). This system, equipped with recently developed novel laser imaging technology, can collect on-field high-resolution data to be latter processed in a computer vision algorithm pipeline, generating accurate geotagged detections that can be easily studied over a scaled map.

Significance: Although there are studies about insect dispersal, they are limited to mark-release-recapture techniques with a human in the loop, which have significant drawbacks. Recapture is a very laborious, time-consuming, and error-prone task. In addition, due to the labor-intensive nature of the process, very few samples of the insect motion can be captured, typically < 5% (Merckx et al., 2009), which negatively impacts the accuracy of the resulting dispersal models.

Preliminary results show that, with our present method, we are able to detect 60% of the insects used in outdoor tests (Virto et al., 2017), drastically improving the counting accuracy of the current manual methods, and being much more time efficient.

Innovation/Forward Thinking: To the best of our knowledge, this is the first automated insect detection system in the literature. The future work on the sUAS design and sensing equipment, as well as in the video processing algorithm, will allow us to create a fully automated system which is easy to implement and can be used for a wide range of mark-and-release applications.