ICUAS Association, Inc.

Issue 3
Summer 2020

www.icuas.com

ICUAS'20, September 1-4

The annual conference will take place, as planned, in the Divani Caravel Hotel.

ICUAS'20 will be a hybrid conference that will allow for virtual/remote and actual presentations.

Visit the conference web site for logistics and details. For any information email kvalavanis@gmail.com.

TRAVEL TO GREECE AUGUST–SEPTEMBER

Due to COVID-19, the list of countries from which travel to Greece is allowed, is updated every 15 days.

Visit the conference web site for details about the Divani Caravel Hotel safety protocol and procedures, as well as about measures to assure safety during ICUAS'20.

EDITORIAL

Dear Readers:
Welcome to the third issue of the ICUAS Association Newsletter.

This editorial is, again, written while the COVID-19 pandemic is present and still spreads all over the world. The list of 'hotspots' changes, complete lockdown has been mostly lifted, but this 'unknown enemy' is here. The bright side is the very fast and tremendous progress made by the medical scientific community to find a vaccine. We certainly hope for the best, and as soon as humanly possible.

The conference field has changed; conferences have been cancelled or postponed, or have gone completely virtual. Since ICUAS'20 is held in Athens, Greece, and Greece took very early measures to control the spread of COVID-19 with outstanding results, the committee's decision is a hybrid conference that allows for virtual video paper presentations, as well as physical paper presentations. One does not exclude the other, and as such, every author of accepted papers may upload the video presentation of their papers. Details may be found in the conference web site.

The technical program is composed of 238 papers (contributed, invited, poster) arranged in four parallel sessions, which will be presented over a three-day period. The program, paper abstracts, schedule, is uploaded on www.uasconferences.com.

On a different note, effective with the Summer issue of 2020, the issue at hand, the aim is to include a short paper or report that focuses on recent developments in unmanned aviation, on applications of UAVs (or RPAS or UAS), on prototype systems, and in general, on anything that reports on advances in the field.

The first report focuses on three specific precision agriculture applications using UAS. The authors are from the MESA Lab of the University of California, Merced. The team has already demonstrated leadership in the field of precision agriculture, among other areas, and has developed prototype systems with a plethora of onboard sensors suitable for a wide spectrum of applications.

This Issue also includes other important information items.

Informational Items

The following links include updated information about unmanned aviation.

FAA
https://www.faa.gov/uas/

ICAO
https://www.icao.int

and
https://www.icao.int/safety/UA

EASA)
https://www.easa.europa.eu

and

https://www.easa.europa.eu/easa-and-you/civil-drones-rpas

AUVSI
https://www.auvsi.org

UVS
https://uvs-international.org/

Additional information may be found at
https://dronenodes.com
and general news in https://www.commercialuavnews.com

The 2020 Commercial UAV Expo Americas, virtual only, will be in Paris Las Vegas, Las Vegas, NV, September 15-17. Visit for details

https://www.expouav.com/

Sample UAS Applications in Precision Agriculture

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In this short column, we briefly introduce several latest applications of unmanned aircraft systems (UAS) in precision agriculture based on recent and on-going projects. Considered as a remote sensing platform, researchers are more and more interested in the potential of UAVs in precision agriculture. Different types of UAVs, typically fixed-wing and quadrotors / multirotors, see Fig. 1, are used for research purposes, such as estimating water stress and tree canopy segmentation. Fixed-wings can usually fly longer carrying a larger payload. Flight time ranges between 1 to 2 hours, which is suitable for a large field mission. Quadcopters may fly for about 30 minutes, which is suitable for short flight missions.

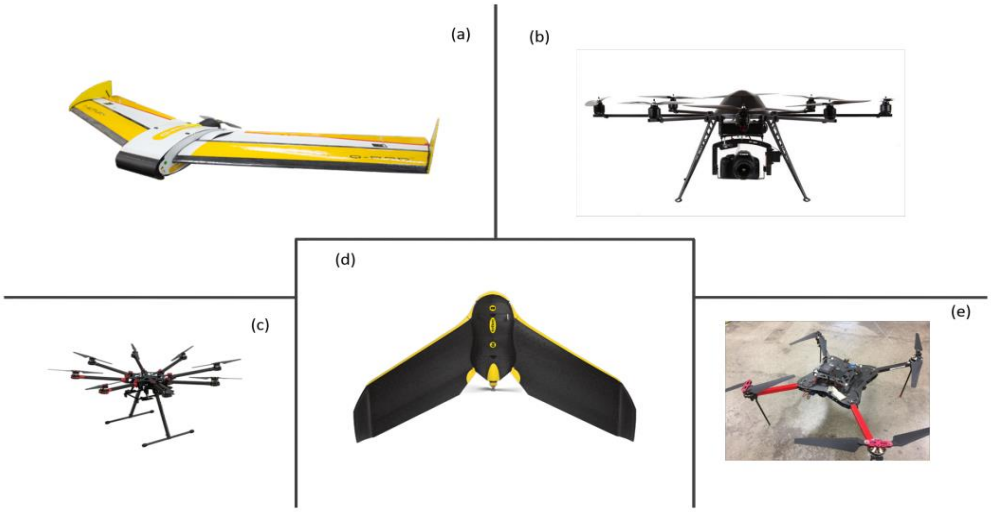

Figure 1. (a) The QuestUAV 200. (b) The MK Okto XL 6S12. (c) The DJI S1000. (d) The eBee Classic. (e). The Hover.

Compared with traditional remote sensing platforms, such as satellites and manned aircraft, UAVs can be more flexible in the field. For example, satellite remote sensing is prone to cloud cover; UAVs are below the clouds, and can be operated at any time if the weather is within operating limitations. A satellite has a fixed flight path; UAVs are mobile and flexible for site selection. Most UAVs are cost-effective, the cost is in thousands of dollars. As a low-cost scientific data collection platform, UAVs also make data acquisition relatively less expensive. Mounted on UAVs, lightweight sensors, such as RGB cameras, multispectral cameras, and thermal infrared cameras, can be used to collect high-resolution images. The following are three research topics that explain how UAVs may help with data analysis.

Evapotranspiration (ET) Estimation is important for precision agriculture, especially precision water management. Mapping the ET temporally and spatially can identify variations in the field so that it is useful for evaluating soil moisture and assessing crop water status. ET estimation can also benefit the water resources management and weather forecast. The higher temporal and spatial resolution images, relatively low operational costs, and the nearly real-time image acquisition, make the UAVs an ideal platform for mapping and monitoring ET.

In [1], the authors developed a regression model using Deep Stochastic Configuration Networks (DeepSCNs). Actual evapotranspiration was estimated and compared with the accurate lysimeter groundtruth data in an experimental pomegranate orchard. The UAV imagery provided a spatial and tree-by-tree view of ET distribution, see Fig. 2.

Irrigation management: In the semi-arid and arid areas of California, onion production is highly dependent on irrigation. Water stress could happen in any onion growing stage and cause onion yield loss. Therefore, to optimize irrigation management, it is important to have an optimal onion water stress monitoring method. Research results have been published on using UAVs to

detect water stress, which prove that UAVs can be a reliable and effective remote sensing platform.

In [2], a UAV resolution and waveband aware design was conducted to optimally collect remote sensing aerial images with UAVs. Then, the flight mission design was tested in an onion field at USDA ARS, see Fig. 3 during the growing season in 2017. Based on obtained results, UAVs successfully provide farmers and researchers the fundamental knowledge of irrigation management to identify irrigation non-uniformity. Using multispectral and thermal images collected by UAVs, one may apply supervised learning methods to find the relationship between the image features and onion irrigation treatments. It can also be figured out how the flight height of UAVs or resolution settings affect the accuracy of estimating onion irrigation treatment. Different spectral bands combination also has an effect on onion irrigation treatment prediction.

Tree canopy detection: Detailed information about tree canopy characteristics is important for effective management of trees and crops. Tree canopy geometric characteristics are also directly related to water stress, tree growth, and productivity. With the development of UAVs and sensors, canopy imagery with higher resolution are obtained easily and flexibly at a very low cost for precision agriculture, allowing better crop management via high-throughput phenotyping.

In [3], the authors proposed to classify and segment canopy pixels by using a deep convolutional neural network (CNN) based method called instance-aware semantic segmentation. By using this new method, even a single tree canopy can be detected from aerial images taken by the UAVs, see Fig. 4. Tests on validation set showed that its precision could be above 90% and it is robust to changes in camera settings, lighting condition, canopy development and changing background.

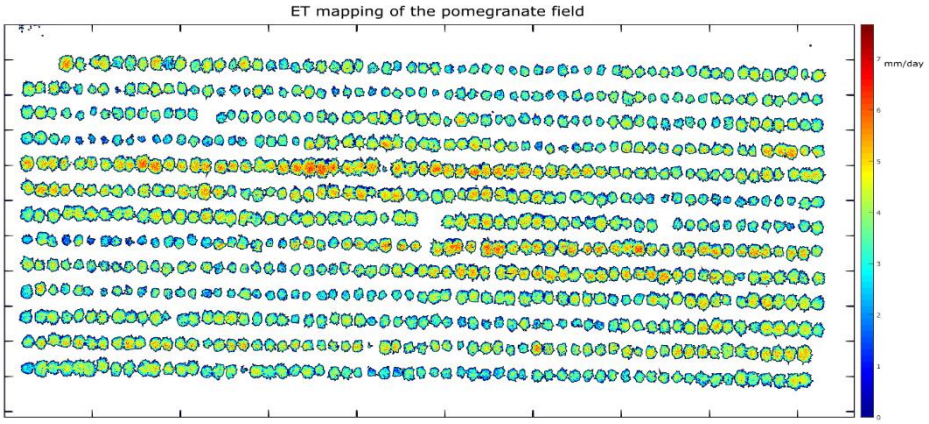

Figure 2. Spatial and tree-by-tree view of ET distribution.

Figure 3. Onion Field.

NEWS ITEMS

The American National Standards Institute (ANSI) has published the Standardization Roadmap for Unmanned Aircraft Systems, Version 2.0. A copy of the document may be found in www.icuas.com. .

P3 Tech Consulting is launched, with Dawn Zoldi serving as CEO. P3 stands for People, Platforms, Policy. Ms. Zoldi talked about "Drones in the Pandemic" in the ABA National Security Law episode, which is available on Soundcloud, Apple Podcasts, Google Play, Stitcher.

SEND YOUR REPORT

We solicit reports and briefs for the Fall 2020 issue. If you are interested, e-mail your contribution by September 30 to kvalavanis@gmail.com.

Cargo UAS

"Named after an Old English word for a type of dragon, the Rhaegal-A won't be making its mark by burninating the countryside. Instead the electric cargo drone capable of taking off and landing like a helicopter is in the spotlight today during a U.S. Air Force conference about "flying car" technologies."

Contact Us

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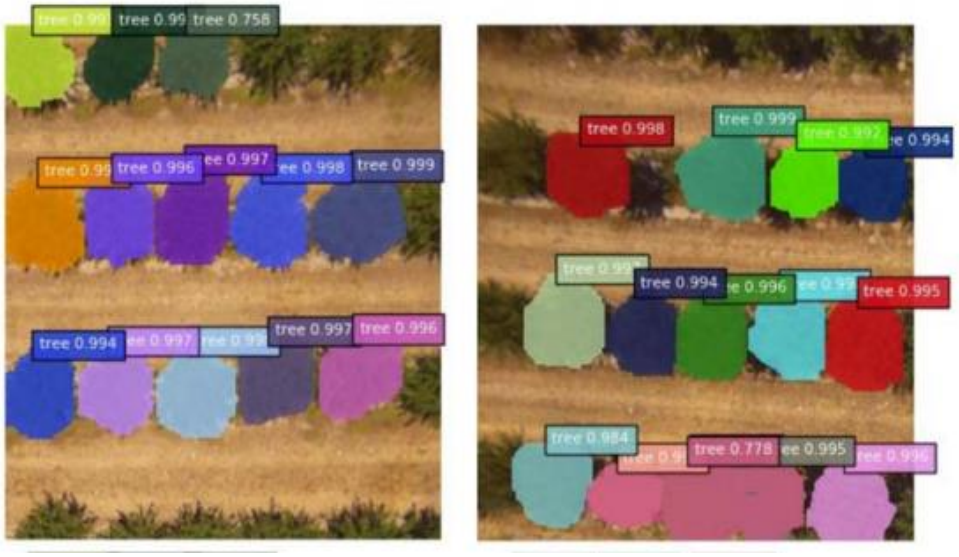

Figure 4. Tree canopy detection.

While there are many advantages with using UAVs for agricultural applications, many challenges still exist. Many researchers fly UAVs at different heights, using specialized equipment, relying on data analysis expertise. As researchers try to understand and realize the potential of UAVs, efficient workflow, image processing, and better software are still under development.

References:

1. Haoyu Niu, Dong Wang, YangQuan Chen. "*Estimating actual crop evapotranspiration using Deep Stochastic Configuration Networks model and UAV-based crop coefficients in a pomegranate orchard*." SPIE 2020, in review.
2. Haoyu Niu, Tiebiao Zhao, Dong Wang, YangQuan Chen. "*A UAV Resolution and Waveband Aware Path Planning for Onion Irrigation Treatments Inference*." 2019 International Conference on Unmanned Aircraft Systems (ICUAS). IEEE, 2019.
3. Tiebiao Zhao, Haoyu Niu, Erick de la Rosa, David Doll, Dong Wang, and YangQuan Chen. "*Tree canopy differentiation using instance-aware semantic segmentation*." 2018 ASABE Annual International Meeting. American Society of Agricultural and Biological Engineers, 2018.

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