

TIEBIAO ZHAO

Ph.D Candidate, MESA Lab, UC Merced
GPA 3.566

PERSONAL DATA

Address: Room 22, 4225N, Hospital Road, Atwater, 95301
Email: tzhao3@ucmerced.edu
Telephone: +1-209-6008958

EDUCATION

Ph.D.	Mechanical Engineering	University of California, Merced	2013-Now
M.S.	Control Engineering	University of Science and Technology of China	2009-2012
B.S.	Automation	Yantai University	2005-2009

CURRENT PROJECTS

Almond Water Stress Detection Using Low Cost Scientific Data Drone

Jul. 2014-Now

Group Members: Andrew Ray

- A commercial almond orchard was setup to study the water production function. There are three blocks, consisted of five plots, treated with 70%, 80%, 90%, 100%, 110% of ETC. UAV-based remote sensing using Red-green-blue(RGB), near-infrared(NIR), thermal-infrared(TIR), shortwave-infrared(SWIR) cameras have been conducted weekly since 2014. Research is conducted to extract water status information from multispectral images by building the model between vegetation indices and stem water potential measurements.

Onion Growing Status Quantification Using Low Cost Scientific Data Drone

Apr. 2016-Now

Group Members: Allan Murillo

- An onion orchard was setup in USDA-ARS, Parlier center. Onions are treated with three different irrigation levels and four different biomass soil amendments. Onion samples are measured biweekly including bulb diameters, neck diameters, numbers of leaves, root length, shoot length, fresh weight and dry weight, synchronized with flight missions using RGB, NIR, TIR cameras over the onion growing season. Remote sensing study is targeted to quantify the growing status of onions under all these treatments by developing the model between vegetation indices and field measurements.

Pomegranate Water Stress Detection Using Low Cost Scientific Data Drone

Apr. 2016-Now

Group Members: Allan Murillo

- A pomegranate orchard was setup in USDA-ARS, Parlier center. There are 809 trees, divided into 16 blocks, treated with 35%, 50%, 75% and 100% ETC. Field measurements and flight missions with RGB, NIR, TIR cameras were conducted biweekly. Field measurements include stomata conductance, stem water potential and final yield. The study is aimed to quantify water status and yield of these trees through modeling the relationship between vegetation indices from multispectral images and field measurements.

Walnut Stress Detection Using Low Cost Scientific Data Drone

Sep. 2016-Now

Group Members: Allan Murillo

- A walnut orchard was setup in Kearny Research and Extension Center, Fresno. It is a block of trees 280*200 ft for the purpose of studying the impact of various types of stresses on walnut trees. Flight missions were conducted using RGB, NIR, TIR, SWIR cameras to identify the spectral signatures of these stresses.

Cherry Blooming Dynamics Evaluation Based on High Resolution Aerial Images

Feb. 2016-Now

Group Members: Qi Yang

- There are three different treatments in the cherry orchard. We are trying to use high-resolution aerial images to quantify the effects of these three types of treatment on blooming dynamics by comparing the numbers of blooms during the blooming windows.

Low Cost Scientific Data Drones for Enhanced Melon Productivity and Security

Jul. 2015-Now

Group Members: Zhongdao Wang

- Research is supported by BigIdeas@Berkeley, 2015, collaborated with Legned Produce to evaluate how UAV images can improve the melon production process, such as water treatment, fertilizer treatment and pesticide treatment. In particular, we are working on melon yield prediction based on fruit classification using high resolution images via both traditional image processing methods and deep learning methods.

PUBLICATIONS LIST

- **Tiebiao Zhao**, David Doll, Dong Wang, YangQuan Chen. A New Framework to Quantifying Almond Water Stress Characterized by Remote Sensing Using Unmanned Aerial Vehicles. The 2017 International Conference on Unmanned Aircraft Systems, Miami, Florida.
- **Tiebiao Zhao**, David Doll, Dong Wang, YangQuan Chen. Quantifying Almond Water Stress Using Unmanned Aerial Vehicles: Correlation of Stem Water Potential and Higher Order Moments of Non-normalized Canopy Distribution. 13th ASME/IEEE International Conference on Mechatronic & Embedded Systems & Applications (MESA), Cleveland, Ohio.
- **Tiebiao Zhao**, David Doll, Dong Wang, YangQuan Chen. Better Almond Water Stress Monitoring Using Fractional-order Normalized Difference Vegetation Index (NDVI). 2017 ASABE Annual International Meeting, Spokane, Washington.
- **Zhao, Tiebiao**, Brandon Stark, YangQuan Chen, Andrew Ray, David Doll. Challenges in water stress quantification using small unmanned aerial system (sUAS): Lessons from a growing season of almond. Journal of Intelligent & Robotic Systems.
- Qi Yang, Yanzhu Zhang, **Tiebiao Zhao**, YangQuan Chen. Single image super-resolution using self-optimizing mask via fractional-order gradient interpolation and reconstruction. ISA Transactions.
- **Tiebiao Zhao**, Zhongdao Wang, Y Chen. Melon yield prediction using small unmanned aerial vehicles. 2017 SPIE Commercial + Scientific Sensing and Imaging, Anaheim, USA.
- **Zhao, Tiebiao**, et al. More Reliable Crop Water Stress Quantification Using Small Unmanned Aerial Systems (sUAS). IFAC-PapersOnLine 49.16 (2016): 409-414.
- **Zhao, Tiebiao**, Brandon Stark, YangQuan Chen, Andrew Ray, David Doll. Challenges in water

stress quantification using small unmanned aerial system (sUAS): Lessons from a growing season of almond. Unmanned Aircraft Systems (ICUAS), 2016 International Conference on. IEEE, 2016.

- Liu, Jianxin, **Tiebiao Zhao**, and YangQuan Chen. Maximum Power Point Tracking With Fractional Order High Pass Filter for Proton Exchange Membrane Fuel Cell. IEEE/CAA Journal of Automatica Sinica 4.1 (2017): 70-79.
- Stark, Brandon, **Tiebiao Zhao**, and YangQuan Chen. An analysis of the effect of the bidirectional reflectance distribution function on remote sensing imagery accuracy from small unmanned aircraft systems. Unmanned Aircraft Systems (ICUAS), 2016 International Conference on. IEEE, 2016.
- **Tiebiao Zhao**, Jozef Franzen and YangQuan Chen. Melon classification and segmentation using low cost remote sensing data drones. ICPA2016, St. Louis, Missouri.
- **Tiebiao Zhao**, Merari Cisneros and YangQuan Chen. Almond classification and segmentation using low cost remote sensing data drones. ICPA2016, St. Louis, Missouri.
- Yang Qi, Dali Chen, **Tiebiao Zhao**, YangQuan Chen. Fractional calculus in image processing: a review. Fractional Calculus and Applied Analysis 19.5 (2016): 1222-1249.
- **Zhao, Tiebiao**, et al. A Detailed Field Study of Direct Correlations Between Ground Truth Crop Water Stress and Normalized Difference Vegetation Index (NDVI). Small Unmanned Aerial System (sUAS), 2015 International Conference on. IEEE, 2015.
- **Tiebiao Zhao**, Gregory Kriehn, Andrew Ray, YangQuan Chen, Larry Burrow, and David Doll. Evaluating and Extending the Use of Small Unmanned Aerial Vehicles (UAVs) as a Crop Monitoring Tool. 2015 Joint Strategic Initiatives Conference.
- **Tiebiao Zhao**, Andeas Anderson, Yoni Schemelinin, YangQuan Chen. Low Cost Scientific Data Drones for Enhanced Melon Productivity and Security. ASPRS UAS Technical Demonstration and Symposium, Reno, 2015.
- Brendan Smith, Brandon Stark, **Tiebiao Zhao**, YangQuan Chen. An Outdoor Scientific Data Drone Ground Truthing Test Site. Unmanned Aircraft Systems (ICUAS), 2015 International Conference on. IEEE, 2015.
- **Tiebiao Zhao**, Alejandro Sanchez, Andreas Anderson, Yoni Shchemelinin, David Doll YangQuan Chen. Small Plot Crop Water Stress Early Detection Using Low Cost Multi-Spectral Remote Sensing Data Drones with Simplified Radiometric Calibration. ASPRS UAS Technical Demonstration and Symposium, Reno, 2014.
- Jianxin Liu, **Tiebiao Zhao**, YangQuan Chen. Maximum Power Point Tracking of Proton Exchange Membrane Fuel Cell With Fractional Order Filter and Extremum Seeking Control. International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE), 2015.
- Li, Zhuo, **Tiebiao Zhao**, and YangQuan Chen. A low cost research platform for modeling and control of multi-input multi-output fractional order dynamic systems. Fractional Differentiation and Its Applications (ICFDA), 2014 International Conference on. IEEE, 2014.
- **Tiebiao Zhao**, Zhuo Li and Yangquan Chen, Fractional Nonlinear Model Predictive Control Using RIOTS_95, 2014 International Conference on Fractional Differentiation and its Applications, Catania, 23-25 June 2014.

HONORS&AWARDS

- 2017 Seed Grant Award @Blum Center, by proposing "[Irrigation Leak Detection Using Unmanned Ground Vehicles](#)"

- 2016-17 Yara North America Almond Fellowship equivalent to a total of \$15,000 (the only graduate student awarded in UC Merced, please see more detail [here](#))
- As the team leader, won the honorable award in Food System Innovations category, among a select awarded group from 260 submissions in Big Ideas Competition @UC Berkeley, 2016, by proposing "[Irrigation Leak Detection Using Unmanned Ground Vehicle](#)"
- As the team leader, won the 3rd place in Food System Innovations category, among a select awarded group from 200 submissions in Big Ideas Competition @UC Berkeley, 2015, by proposing "[Low Cost Scientific Data Drones for Enhanced Melon Productivity and Security](#)"
- ME Bobcat Fellowship for the Summer 2016
- ME Bobcat Fellowship for the Summer 2015
- ME Bobcat Fellowship for the Spring 2014

TEACHING EXPERIENCE

- Teaching assistant for the undergraduate course "Statics and Dynamics" in University of California, Merced, Spring 2014, Summer 2015
- Teaching assistant for the undergraduate course "Mechatronics" in University of California, Merced, Spring 2015, Spring 2016
- Teaching assistant for the undergraduate course "Strength of Material" in University of California, Merced, Spring 2015

PUBLIC SERVICES

- Helping Organize English classes for Mandarin/Cantonese individuals in Merced (Ongoing)
- Served as the mentor for Unmanned Aerial Vehicle Team, Engineering Service Learning of Fall 2014 (14 members), Spring 2015 (14 members), Fall 2015 (16 members).
- Served as the research adviser for 107 undergraduate students in MESA Lab (see the full student list in the excel)
- Volunteer speaker for Tea&Chat on Chinese Spring Festival, Feb.17, 2017
- Organized Spring Festival Party (2014, 2015, 2016, 2017) for over 50 Chinese visiting scholars and their dependents in MESA Lab
- Participated in the tabling event to introduce drone research in UC Merced in VLAB Agtech, Sep.15, 2015
- Led the tabling in River Fair Show to introduce drone research in MESA Lab, May 31, 2014, May 30, 2015

INVITED TALK

- Feb. 25, 2017. "Spraying Drones and Optimal Integrated Pest Management", Annual Young Farmer & Rancher Conference, Doubletree Hotel, Modesto.
- Feb. 1, 2017. "Spraying Drones and Optimal Integrated Pest Management", Spray Safe, Waite Hall, Yolo County Fairgrounds.
- Dec. 15, 2016, "Spraying Drones and Optimal Integrated Pest Management", Solano County CE Seminar, Solano Administrative Center.
- Nov. 17, 2016, "Spraying Drones & Optimal Integrated Pest Management", Cal Ag Safety CE Seminar at Linden Lion's Club.
- Sep. 28, 2016, "Spraying Drones and Optimal Integrated Pest Management", CAPCA CE Seminar at the Chico Masonic Family Center.
- Aug. 4, 2016, "Drone and Agriculture", Joint Informational Hearing Assembly Committee on

Agriculture, Assembly Committee on Wine at University of California, Davis.

- Jun. 22, 2016, “Spraying Drones and Optimal Integrated Pest Management”, CAPCA CE Seminar at the Stanislaus County Department of Agriculture Center, Harvest Hall in Modesto
- Feb. 4, 2016. “Spraying Drones and Optimal Integrated Pest Management”, Spray Safe, Waite Hall, Yolo County Fairgrounds.
- Jan. 8, 2015. “Applications of Data Drone in Precision Agriculture”, Workshop on Drones and Regulations, Merced Cooperative Extension.
- Oct.30, 2015. “Applications of Data Drone in Precision Agriculture”, Channel Islands AUVSI Symposium, California State University Channel Islands.
- Jul. 7, 2015. “Scientific Imagery Collection”, CITRIS Drone Safety Practices Technical Workshop July 7, Castle Facility, UC Merced.
- Jun. 10, 2015. “Crop Water Stress Quantification: Ground-truthed Efforts”, Agriculture Session Tutorial Session, 2015 ICUAS, Denver.
- Feb. 5, 2015. “Spraying Drones and Optimal Integrated Pest Management”, Spray Safe, Waite Hall, Yolo County Fairgrounds.

PROFESSIONAL ACTIVITIES

- Committee member of 2017, Specialty Crop Block Grant Program (SCBGP), California Department of Food and Agriculture
- Reviewer for the following journals: IEEE Transactions on Automatic Control, Journal of Intelligent & Robotic Systems, International Journal of Advanced Robotic Systems, ISA Transactions, IET Control Theory & Applications,
- Reviewer for the following conferences: IEEE International Conference on Unmanned Aircraft Systems (ICUAS 2015,2014), IEEE International Conference on Robotics and Automation(ICRA 2017,2016,2015), IEEE American Control Conference (ACC 2016,2015), IEEE Conference on Decision and Control (CDC 2014)
- Member of: American Society of Photogrammetry and Remote Sensing (2014,2015), SPIE - the international society for optics and photonics(2016), The International Society of Precision Agriculture(2016), American Society of Agricultural and Biological Engineers(2017)