

第十六屆農畜產品品質非破壞性檢測技術國際學術研討會

日期：2023年11月7日(星期二) 08:30 - 17:00

地點：國立臺灣大學總圖書館 B1 國際會議廳

主辦單位：國立臺灣大學生物機電工程學系
財團法人農業機械化研究發展中心

協辦單位：中華農業機械學會
臺灣生物機電學會
國立臺灣大學智慧農業教學與研究發展中心

國立臺灣大學生物能源研究中心

補助單位：國立臺灣大學生物資源暨農學院

議程表

時間	內容	主持人 / 演講者
08:30 - 09:00	報到	吳筱梅 教授 國立臺灣大學
09:00 - 09:10	開幕式	生物資源暨農學院 李達源 副院長 生物機電工程學系 盧福明 名譽教授 生物機電工程學系 郭彥甫 教授 農業機械化研究發展中心 邱奕志 主任
	第一節	陳世銘 教授 國立臺灣大學
09:10 - 09:50	近期精準畜牧科技之進展 Recent scientific advances in precision livestock farming	Tomas Norton 教授 比利時魯汶大學
09:50 - 10:20	使用非侵入式感測技術於畜牧產業生產 Using non-intrusive sensor technologies in livestock production	Thomas Banhazi 教授 國立臺灣大學
10:20 - 10:50	茶歇	
	第二節	林浩庭 教授 國立中興大學
10:50 - 11:30	光譜成像技術在農業產品品質與安全性評估之應用 Spectral imaging application for quality and safety measurement for agricultural materials	Byoung-Kwan Cho 教授 韓國忠南大學
11:30 - 12:00	人工智慧與自動化技術於家禽農場的發展與應用 Development and application of artificial intelligence and automation technology in poultry farms	蔡耀全 教授 國立中興大學
12:00 - 13:30	午宴	
	第三節	李柏旻 教授 國立屏東科技大學
13:30 - 14:10	利用合成數據和數位孿生訓練農業機器人之新方法 A new approach to training agricultural robotics through synthetic data and digital twin	Dana Choi 教授 美國佛羅里達大學
14:10 - 14:40	精準室內農場草莓監測與採收機器人之研究 Mobile robotic strawberry monitoring and harvesting in precision indoor farms	丁冠中教授 美國伊利諾大學香檳分校
14:40 - 15:10	茶歇	
	第四節	陳世芳 教授 國立臺灣大學
15:10 - 15:50	以非破壞性方式評估蔬菜與家禽產品之品質：利用熱成像技術與深度學習演算法之潛力 Non-destructive measurements of vegetable and poultry products for quality assessments: opportunities of thermal imageries using deep learning algorithms	Tofael Ahamed 教授 日本筑波大學
15:50 - 16:20	機器視覺於畜牧產業之應用 The applications of machine vision in animal husbandry	郭彥甫 教授 國立臺灣大學
16:20 - 17:00	綜合討論 與談人	盧福明 名譽教授 國立臺灣大學
	Tomas Norton 教授 比利時魯汶大學	
	Byoung-Kwan Cho 教授 韓國忠南大學	
	Dana Choi 教授 美國佛羅里達大學	
	Tofael Ahamed 教授 日本筑波大學	
	Thomas Banhazi 教授 國立臺灣大學	
	蔡耀全 教授 國立中興大學	
	丁冠中 教授 美國伊利諾大學香檳分校	
	郭彥甫 教授 國立臺灣大學	
	陳世芳 教授 國立臺灣大學	
	陳世銘 教授 國立臺灣大學	
	林浩庭 教授 國立中興大學	
	李柏旻 教授 國立屏東科技大學	

THE 16TH INTERNATIONAL WORKSHOP ON NONDESTRUCTIVE QUALITY EVALUATION OF AGRICULTURAL, LIVESTOCK AND FISHERY PRODUCTS

Date: November 7, 2023 (Tuesday) 08:30 - 17:00

Venue: International Conference Hall, B1, Main Library, National Taiwan University, Taipei, Taiwan

Organizers: Department of Biomechatronics Engineering, National Taiwan University
Taiwan Agricultural Mechanization Research & Development Center (TAMRDC)

Co-organizers: Chinese Institute of Agricultural Machinery, Taiwan
Taiwan Institute of Biological Mechatronics
Center for Intelligent Agriculture Education and Research, National Taiwan University
Bioenergy Research Center, National Taiwan University

Sponsoring Organization: College of Bioresources and Agriculture (CBA), National Taiwan University

PROGRAM																										
Time	Agenda	Chair / Speaker																								
08:30 - 09:00	Registration	Prof. Hsiao-Mei Wu National Taiwan University																								
09:00 - 09:10	Opening Ceremony	Prof. Dar-Yuan Lee (Vice Dean of CBA) Prof. Emeritus Fu-Ming Lu Prof. Yan-Fu Kuo Prof. Yi-Chieh Chiu (Director of TAMRDC)																								
	Session I	Prof. Suming Chen National Taiwan University																								
09:10 - 09:50	Recent scientific advances in precision livestock farming	Prof. Tomas Norton Catholic University of Leuven, Belgium																								
09:50 - 10:20	Using non-intrusive sensor technologies in livestock production	Prof. Thomas Banhazi National Taiwan University																								
10:20 - 10:50	Coffee Break																									
	Session II	Prof. Hao-Ting Lin National Chung-Hsing University																								
10:50 - 11:30	Spectral imaging application for quality and safety measurement for agricultural materials	Prof. Byoung-Kwan Cho Chungnam National University, Korea																								
11:30 - 12:00	Development and application of artificial intelligence and automation technology in poultry farms	Prof. Yao-Chuan Tsai National Chung-Hsing University																								
12:00 - 13:30	Lunch Break																									
	Session III	Prof. Pomin Li National Pingtung University of Science and Technology																								
13:30 - 14:10	A new approach to training agricultural robotics through synthetic data and digital twin	Prof. Dana Choi University of Florida, U.S.A.																								
14:10 - 14:40	Mobile robotic strawberry monitoring and harvesting in precision indoor farms	Prof. Kuan-Chong Ting University of Illinois Urbana-Champaign, U.S.A.																								
14:40 - 15:10	Coffee Break																									
	Session IV	Prof. Shih-Fang Chen National Taiwan University																								
15:10 - 15:50	Non-destructive measurements of vegetable and poultry products for quality assessments: opportunities of thermal imageries using deep learning algorithms	Prof. Tofael Ahamed University of Tsukuba, Japan																								
15:50 - 16:20	The applications of machine vision in animal husbandry	Prof. Yan-Fu Kuo National Taiwan University																								
16:20 - 17:00	<p style="text-align: center;">General Discussion</p> <p style="text-align: center;"><u>Panelists</u></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">Prof. Tomas Norton</td> <td style="width: 40%;">Catholic University of Leuven, Belgium</td> <td rowspan="12" style="width: 30%; vertical-align: top;">Prof. Emeritus Fu-Ming Lu National Taiwan University</td> </tr> <tr> <td>Prof. Byoung-Kwan Cho</td> <td>Chungnam National University, Korea</td> </tr> <tr> <td>Prof. Dana Choi</td> <td>University of Florida, U.S.A</td> </tr> <tr> <td>Prof. Tofael Ahamed</td> <td>University of Tsukuba, Japan</td> </tr> <tr> <td>Prof. Thomas Banhazi</td> <td>National Taiwan University</td> </tr> <tr> <td>Prof. Yao-Chuan Tsai</td> <td>National Chung-Hsing University</td> </tr> <tr> <td>Prof. Kuan-Chong Ting</td> <td>University of Illinois Urbana-Champaign, U.S.A.</td> </tr> <tr> <td>Prof. Yan-Fu Kuo</td> <td>National Taiwan University</td> </tr> <tr> <td>Prof. Shih-Fang Chen</td> <td>National Taiwan University</td> </tr> <tr> <td>Prof. Suming Chen</td> <td>National Taiwan University</td> </tr> <tr> <td>Prof. Hao-Ting Lin</td> <td>National Chung-Hsing University</td> </tr> <tr> <td>Prof. Pomin Li</td> <td>National Pingtung Univ. of Science and Technology</td> </tr> </table>	Prof. Tomas Norton	Catholic University of Leuven, Belgium	Prof. Emeritus Fu-Ming Lu National Taiwan University	Prof. Byoung-Kwan Cho	Chungnam National University, Korea	Prof. Dana Choi	University of Florida, U.S.A	Prof. Tofael Ahamed	University of Tsukuba, Japan	Prof. Thomas Banhazi	National Taiwan University	Prof. Yao-Chuan Tsai	National Chung-Hsing University	Prof. Kuan-Chong Ting	University of Illinois Urbana-Champaign, U.S.A.	Prof. Yan-Fu Kuo	National Taiwan University	Prof. Shih-Fang Chen	National Taiwan University	Prof. Suming Chen	National Taiwan University	Prof. Hao-Ting Lin	National Chung-Hsing University	Prof. Pomin Li	National Pingtung Univ. of Science and Technology
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Non-intrusive sensor technologies used in agriculture

Abstract

Agriculture production has to become more advanced and efficient as in excess of 9 billion people will need to be fed by 2050. Thus, so-called SMART agricultural technologies have been promoted heavily in recent years and they do have the potential to revolutionize agricultural production as we know it. It is generally believed that agricultural production can become more sophisticated, labor efficient, environmentally sustainable and socially responsible if relevant information is automatically collected, analyzed and resulting knowledge applied on farm. This presentation will use several examples of research work undertaken in Australia aimed at developing various smart AgTech tools to make agriculture production more advanced.



Professor Thomas Banhazi,
International College, National Taiwan University
RESEARCH AREAS AND EXPERTISE

- General area: Animal/agriculture production
- Specific area: PLF & environmental issues

AWARDS AND RECOGNITION

- Ex-President and current Vice-President of the "Australian Society for Engineering in Agriculture" (SEAg)
- Hon. Chair of the CIGR (International Commission of Agricultural Engineering) - Section II and Honorary Vice President of CIGR (2014)
- Vice-Chair of the "CIGR, - Image Analysis for Agricultural Processes WG and external Director of IRCAEW (International Research Centre for Animal Environment and Welfare)
- Member of Editorial Board of the "International Journal of Agricultural and Biological Engineering" the "Journal of IPA" and the "Journal of Agricultural Informatics"
- Best Agricultural Engineering Innovation Award, (2009) SEAg and SA Primary Industry, Breakthrough Innovation (2010)

Thomas Banhazi completed his PhD studies at the University of Adelaide and worked as Research Scientist at SARDI for 17 years before joining the University of Southern Queensland in 2010 as an Associate Professor and the Taiwan National University in 2022 as Full Professor. As part of his academic activities, Thomas has supervised 35+ PhD, Masters and Honors students and involved in the delivery of 8 under and 4 post-graduate courses. Thomas also published 3 edited books, 4 Special Journal Issues (SJI), 57 peer reviewed journal articles, 26 book chapters, 152 conference proceedings and in excess of 120 industry reports/seminar/extension articles. He has successfully obtained 7 patents on a number of innovative technologies in the US and Australia. Thomas has been involved in approximately 40 research projects both in Europe and Australia funded by various government agencies and farming organizations. His expertise is mainly related to PLF applications (sensors, automation and data manipulation) and housing & environmental assessment methods. In his spare time, Thomas is actively involved in hiking/bush walking and various arthouse film clubs. In addition, Thomas is a keen aikido practitioner and an experienced horse rider.

Development and Application of Artificial Intelligence and Automation Technology in Poultry Farms

Abstract

Taiwanese poultry houses are gradually changed from outdoor farming to indoor rearing. To provide poultry with suitable growth conditions, many environmental control systems have been installed within poultry houses. In recent years, environmental sensing and automatic control systems have been applied for achieving automated control of the poultry house environment. For today's automated poultry houses, some challenges need to be overcome, such as the risk of disease transmission from wild birds and the need for frequent human access to the poultry houses to monitor the condition of the poultry. This report will provide an introduction and discussion of the technologies developed by our team in recent years. These technologies include: AI laser bird repeller, AI smart weight scale, chicken laser response assessment system, poultry health warning technologies.



Associate Professor Yao-Chuan Tsai
Department of Bio-Industrial Mechatronics Engineering
National Chung Hsing University, Taichung city, Taiwan

RESEARCH AREAS AND EXPERTISE

- General area: Micromanufacturing and Automation
- Specific area: Sensing, Actuator and AI applications

AWARDS AND RECOGNITION

- Outstanding Teacher in Industry-Academic Collaboration Award, National Chung Hsing University, 2022 and 2023
- Honorable Mention, 2021 CTCI Foundation AI Innovation Competition, 2021
- Guest Editor, *Micromachines*, Special Issue "NEMS/MEMS Devices and Applications" and "MEMS/NEMS Devices and Applications, 2nd Edition"

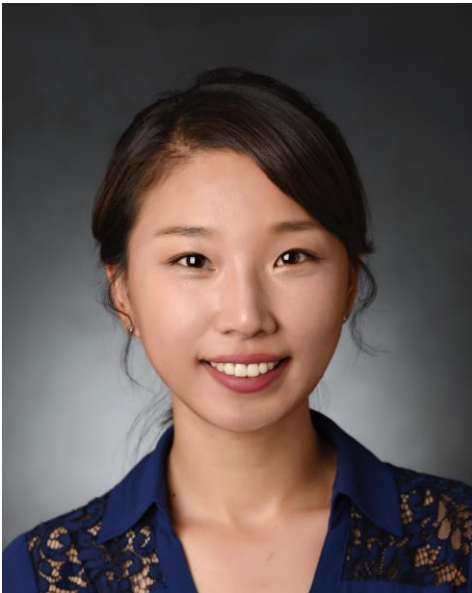
Yao-Chuan Tsai is an Associate Professor in the Department of Bio-Industrial Mechatronics Engineering at National Chung Hsing University (NCHU), Taichung city, Taiwan. He received the B.S. degree in mechanical engineering from National Chiao-Tung University, Hsinchu, Taiwan, in 2004, and the M.S. and Ph.D. degrees in mechanical engineering from National Taiwan University, Taipei, Taiwan, in 2006 and 2011, respectively. He was with a postdoctoral researcher at Tohoku University, Sendai, Japan from 2011 to 2014. From 2014 to 2016, he was with a researcher at MEMS-CORE Co., Ltd., Sendai, Japan.

He was with the faculty as an Assistant Professor at the Department of Bio-Industrial Mechatronics Engineering, National Chung Hsing University, Taichung, Taiwan, in 2016, where he was promoted to an Associate Professor, in 2021. He was with the faculty as a Director at the Agricultural Automation Center, National Chung Hsing University, in 2021. His current research interests include the area of micromachined sensors and actuators and smart agriculture applications.

Enhancing Sustainable Crop Production with Machine Learning, Synthetic Data, and Digital Twin for Strawberry

Abstract

The advancement of farming technologies, including the transition from conventional farming practices to mechanization, automation, and robotics, has been critical for precise and scientific farming techniques. However, the development of new precision farming technologies requires substantial resources due to the limited timeframe of the crop growing season for data collection, method validation, and hardware testing. During this talk, we will discuss how digital twin and synthetic data can be powerful tools for shortening the development time of machine vision and robotics applications. The presentation will cover the following topics: •The challenges of implementing precision agriculture technologies, such as the need for reliable data collection and the high cost of equipment. •The use of synthetic data to train machine learning models when real-world data is scarce or expensive to collect. •The benefits of digital twins for simulating crop growth and development, and for testing new agricultural practices. The presentation will conclude with a discussion of the future of precision agriculture and the potential of these technologies to improve the sustainability of crop production.



Assistant Professor Daeun "Dana" Choi
Department of Agricultural and Biological Engineering
University of Florida, United States

RESEARCH AREAS AND EXPERTISE

- General area: Agricultural Automation
- Specific area: Robotics Applications for Specialty Crop

AWARDS AND RECOGNITION

- Rain Bird Engineering Concept of the Year award, ASABE, 2022
- Invited Participant, Next Leader Program, CIGR, 2019
- Recipient, New Faces of ASABE, ASABE, 2019
- First Place, Giuseppe Pellizzi Prize, The Club of Bologna, 2018

Dr. Daeun (Dana) Choi is an Assistant Professor of Agricultural and Biological Engineering at the University of Florida in the United States. She received her B.S. in Bio-mechatronics Engineering and Economics from Sungkyunkwan University, South Korea, in 2011, followed by M.S. and Ph.D. degrees in Agricultural and Biological Engineering from the University of Florida in 2013 and 2017, respectively. Her research interests lie in the field of precision agriculture, with a focus on the use of machine learning, synthetic data, and digital twins to improve crop production. She is particularly interested in the development of intelligent sensors to accurately monitor agricultural variables, and the automation of multi-robot systems using an array of technologies such as drones, robotics, and data analytics. She aims to design low-cost field devices and machines using the newest data processing and automation techniques to make them accessible to all growers. She has worked on a variety of projects, including the development of machine learning algorithms for crop identification and yield prediction, the creation of synthetic data sets for training machine learning models, and the use of digital twins to simulate agricultural field and hardware development.

Mobile Robotic Strawberry Monitoring and Harvesting in Precision Indoor Farms

Abstract

Intelligence driven and empowered agricultural systems (IDEAS) are viewed as one of the key features in modern and futuristic agriculture. Precision indoor farms have high readiness levels for implementing machine capabilities of perception, reasoning/learning, communication, task planning/execution, and systems integration. This presentation describes an IDEAS research project that involves the development of a mobile robotics platform for use in indoor strawberry farms to carry out the tasks of fruit detection, yield monitoring, and harvesting. The key points covered include mobile robotics platform (MRP); MRP navigation; strawberry fruit sensing/detection, yield monitoring, and harvesting. Results from experiments conducted in a commercial indoor farm are also reported. Detailed information can be found in: "Ren, G., Wu, T., Lin, T., Yang, L., Chowdhary, G., Ting, K.C., Ying, Y. (2023) Mobile robotics platform for strawberry sensing and harvesting within precision indoor farming systems. *Journal of Field Robotics*, 1-19. <https://doi.org/10.1002/rob.22207>" and "Ren, G., Wu, H., Bao, A., Lin, T., Ting, K.C., Ying, Y. (2023) Mobile robotics platform for strawberry temporal-spatial yield monitoring within precision indoor farming systems. *Frontiers in Plant Science* 14:1162435, doi: 10.3389/fpis.2023.1162435."

Professor K.C. Ting
Department of Agricultural and Biological Engineering
University of Illinois at Urbana-Champaign



RESEARCH AREAS AND EXPERTISE

- General area: Agricultural and Biological Engineering
- Specific area: Intelligent Driven and Empowered Agricultural Systems (IDEAS)

AWARDS AND RECOGNITION

- National Taiwan University Bioenvironmental Systems/Agricultural Engineering Distinguished Alumni Award, 2023
- National Taiwan University Biomechanics/Agricultural Machinery Engineering Distinguished Alumni Award 2023
- ASABE Lalit and Aruna Verma Award for Excellence in Global Engagement, 2021
- University of Kentucky Biosystems and Agricultural Engineering Lifetime Achievement Award, 2019
- China National Teaching Achievement Award-2nd class, 2018
- Zhejiang Teaching Achievement Award-1st class, 2016
- ASABE James R. and Karen A. Gilley Academic Leadership Award, 2011
- ASABE Kishida International Award, 2008
- Fellow of ASME, 2002
- Fellow of ASABE, 2001

Professor K.C. Ting is Professor and Head Emeritus, Department of Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign. He was Vice Dean of International Campus, Zhejiang University, China (2017-2020). He served as department head/chair at four U.S. universities. He has been advancing holistic automation and systems informatics & analytics approaches to developing intelligent driven and empowered agricultural systems (IDEAS). He has participated in proposal developments for four large successful research programs funded by NASA, BP, ADM, and USAID. He has delivered over 140 invited presentations in 17 countries. He was an Editor-in-Chief for *Computers and Electronics in Agriculture* (2007-2010). He has participated in and led external committees to review academic and research units and programs, strategy formulation meetings, and workshops on academic leadership in many countries. He has participated in establishing international collaborative education, research, and administrative programs between institutions in the U.S. and countries in Asia, Europe, Middle East, South America, and Africa.

Non-destructive Measurements of Vegetable and Poultry Products for Quality Assessments: Opportunities of Thermal Imageries Using Deep Learning Algorithms

Abstract

Thermal imageries play an important role in non-destructive measurements of quality assessment for fruits, vegetables and poultry products. However, this sector faces issues of disease detection and quality assessment. Specially in poultry, there is a lack of robust techniques and affordable equipment for avian embryo detection and sexual segregation at early stages, which still drives farmers to low-precision hatching and the culling of undesirable one-day-old male chicks on breeding farms. To bring a significant solution using machine vision domain, thermal imageries are explained how to address the above-mentioned challenges for fruits, vegetables and poultry in this short talk.



Tofael Ahamed
Associate Professor, Institute of Life and Environmental Sciences
University of Tsukuba, Japan

RESEARCH AREAS AND EXPERTISE

- General area: Agricultural Automation
- Specific area: Agricultural Robotics and Precision Agriculture

AWARDS AND RECOGNITION

- Associate Editor, *Computer and Electronics in Agriculture*, 2022~
- BEST FACULTY MEMBER, University of Tsukuba, 2016 and 2022
- Shin-Nourin Shinbun International Award, Japanese Society of Agricultural Information (2021)
- University Gold Medal Award, Outstanding Academic Results for Undergraduate (1996) and Graduate (2001) Programs, Bangladesh Agricultural University

Short Biography:

Tofael Ahamed is an Associate Professor, Institute of Life and Environmental Sciences, University of Tsukuba, a leading research university in Japan relocated at the Tsukuba Science City during 1973 from Tokyo University of Education. Tofael has also teaching and research experiences as a Lecturer, Assistant, and Associate Professor in the Department of Farm Power and Machinery, Bangladesh Agricultural University, established with academic support from the Texas A&M University during 1961. He received PhD from the University of Tsukuba and conducted postdoctoral research at the University of Illinois at Urbana-Champaign, USA. Tofael performs research in the field of precision agriculture technology, agricultural robotics and decision support systems. He focuses on enabling smart application using Internet of Things (IoT) and Artificial Intelligence (AI) in agriculture, where crop, orchard and livestock production varies spatially and temporally within the field boundaries depending on the soil, nutrient and environmental conditions. Tofael is also serving as one of the Associate Editors for *Computer and Electronics in Agriculture* (Elsevier), *Agricultural Information Research* (JSAI), Editorial Member for *Asia-Pacific Journal of Regional Science* (Springer-Nature). He is also serving as a Guest Editor of Special Issues for *Remote Sensing and Regional Application of Remote Sensing*. Tofael has published in journals such as '*Computers and Electronics in Agriculture*', '*Biosystems Engineering*', '*Transactions of ASABE*', *Sensors*, *Remote Sensing* and *Japanese Society of Agricultural Machinery and Food Engineering* (JSAM). By far, he has published more than 100 journal articles and Lead Author and Editor of 6 Books.

Tofael is actively collaborating with International Research Institutes and Universities from Japan and abroad. Tofael has supervised more than 20 PhD students, 30 Masters and 20 undergrad students and received more than 10 funded projects in the past 10 years. Currently he is supervising 11 PhD students, and 10 Masters students at the University of Tsukuba, Japan.

Tofael also recognized as one of the best faculty members for 2016 and 2022 at the University of Tsukuba, Japan

The Applications of Machine Vision in Agriculture – The Current Status in Taiwan

Abstract

Food security is always one of the top priorities globally. As estimated by the United Nations, the global population will reach 9.7 billion in 2050. However, food production is facing issues of labor shortage and workforce aging. Nowadays, few in the young generation are willing to work in agriculture because of the harsh working environments and disproportionate wages. Conventional, the observation of farming or animal conditions relies on manual observation. This is because the environments for crops and animal husbandry are usually complex. However, manual observation is slow and labor-intensive. To solve this problem, machine vision is applied for managing farms. This speech introduces the current status of the machine vision applications to agriculture, aquaculture, and animal husbandry in Taiwan. Several examples of the applications are given in the speech.



Professor Yan-Fu Kuo
Department of Biomechatronics Engineering
National Taiwan University

RESEARCH AREAS AND EXPERTISE

- General area: Agricultural Automation
- Specific area: Machine Vision for Automation

AWARDS AND RECOGNITION

- Associate Editor, Journal of the ASABE, 2022-
- Outstanding Teaching Award, National Taiwan University, 2015 and 2022
- First Place, 2021 CTCI Foundation AI Innovation Competition, 2021
- Associate Editor, Computers and Electronics in Agriculture, 2021-2022
- Invited Participant, Next Generation Leaders Event, CIGR, 2019

Yan-Fu Kuo is a Professor in the Department of Biomechatronics Engineering at National Taiwan University (NTU). He received his Bachelor degree in Agriculture Machinery Engineering at NTU, and Master's and Ph.D. degrees in Mechanical Engineering at Purdue University, U.S.A. After graduation from Purdue University, he became an Assistant Professor at NTU in 2011. His research interests include machine vision and automation in agriculture. Some of his current research topics include crop disease and pest identification using smart phones, wood species recognition using smart phones, shrimp length measurement using underwater system, and behavior monitoring of husbandry animals. Yan-Fu has published in journals such as 'Computers and Electronics in Agriculture', 'Biosystems Engineering', and 'The Transactions of ASABE'. By far, he has published more than 30 journal articles as well as more than 60 papers in conference proceedings. Yan-Fu is currently an associate editor for 'The Transactions of ASABE'. He teaches Machine Learning and Microcontrollers at NTU. He received outstanding teaching award from NTU twice. Yan-Fu has supervised more than 50 graduate and undergrad students and received more than 20 funded projects in the past ten years. Yan-Fu participated in 2019 class of the CIGR Next Leaders Event.