2021

UCSD-NCHU

ENABLE / IDCSA / IARC / SSNARDC

Joint Symposium

15th Dec. 08:00 A.M. - 17:00 P.M.

興大圖書館7樓國際會議廳

7F, International Conference Hall of National Chung Hsing University Library

AGENDA / 研討會議程

Time (US) 14th Dec. 2021	Time (TW) 15th Dec. 2021.	Speaker and Topic
16:00-16:10	08:00-08:10	**Registration**
16:10-16:30	08:10-08:30	**Opening Remarks** **Prof. Charles Tu(杜武青), Mt. Jade Professor, NCHU** **Prof. Ramesh R. Rao, UCSD** **Prof. Jenn-Wen Huang(黃振文), Vice President, NCHU**
● **ENABLE Workshop 1**		**| Chair : Prof. Zingway Pei(裴靜偉), *i*CAST, NCHU**
16:30-16:50	08:30-08:50	**A. P. Shu-Chi Chang(張書奇),** Department of Environmental Engineering, NCHU **Title:** Microbiome reengineering for rapid bioremediation of trichloroethylene contamination
16:50-17:10	08:50-09:10	**Distinguished Prof. Jyh-Yih Hsu(許志義),** Chung-Hua University and Affiliated with National Chung Hsing University **Title:** Innovative Operation Model Planning of Integrating Green Energy Technologies in Intelligent Agricultural and Pastoral Areas: Construction of Photovoltaic System, Energy Storage Facilities System, and Autonomous Electric Mower as an Empirical Case
17:10-17:30	09:10-09:30	**Asst. Prof. Ching-Yu Yang(楊謦瑜),** Department of Foreign Languages and Literatures, NCHU **A. P. Yao-Chung Fan(范耀中),** CSE Department, NCHU **Title:** Evaluating Automatic Generation of English Assessments
17:30-17:50	09:30-09:50	**A. P. Han-Yu Hsueh(薛涵宇),** Department of Material Science and Engineering, NCHU **Title:** Fabrication of Frog-Skin-Inspired Slippery Antibiofouling Coatings Through Degradable Block Copolymer Wrinkling
17:50-18:10	09:50-10:10	**Prof. Lee-Tian Chang(張力天),** Department of Veterinary Medicine, NCHU **Title:** Conduct novel intelligent agriculture 3.5 AI vision recognition and smart separation fertilized eggs hatching systems
18:10-18:30	10:10-10:30	**Coffee Break**
● **UCSD-NCHU Workshop**		**| Chair: Charles Tu(杜武青), Mt. Jade Professor, EE Department, NCHU**
18:30-19:30	10:30-11:30	***10:30-11:00*** **Plenary Talk 1: Prof. Ramesh R. Rao**, ECE Department, UC San Diego **Title:** Health interventions based on decoding and modulation of electrical signalling in humans ***11:00-11:30*** **Plenary Talk 2: Prof. Joseph Wang,** Department of Nanoengineering, UC San Diego **Title:** Flexible Bioelectronics Devices: Wearable Sensing and Energy Systems
19:30-19:50	11:30-11:50	**Plenary Talk 3: Prof. Chun-Rong Huang(黃春融)**, CSE Department, NCHU **Title:** Few-Shot Self-Supervised Learning for AI-based Automatic Optical Inspection
19:50-20:10	11:50-12:10	**Plenary Talk 4: Prof. Yin-Tsung Hwang(黃穎聰)**, EE Department, NCHU **Title**: iAMEC, an Intelligent Autonomous Mover for Navigation in Indoor People Rich Environments
20:10-21:30	12:10-13:20	**Poster Session & Lunch**

Time (US) 14th Dec. 2021	Time (TW) 15th Dec. 2021.	Speaker and Topic
● **IDCSA/IARC Workshop**		**| Chair: Distinguished Prof. Ching-Chou Wu(吳靖宙), Department of Bio-industrial Mechatronics Engineering, NCHU**
21:30-22:00	**13:30-14:00**	**Invited Talk: Dr. Kai-Yun Li** Junior Research Fellow in Environmental Sciences and Applied Biology, Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences **Title:** Towards Automation in Unmanned Aircraft Systems (UAS) for Precision Agriculture and Crop Phenotyping in Estonia
22:00-22:20	**14:00-14:20**	**Prof. Cheng-Hua Huang(黃政華),** Department of Soil and environmental science, NCHU **Title:** Effects of different fertilizer treatments on soil bacterial microbiome and tomato growth
22:20-22:40	**14:20-14:40**	**Dr. Tao-Ho Chang(張道禾),** Department of Plant Pathology, NCHU **Title:** Uncovering the molecular mechanism of beneficial microorganisms inducing stress tolerance in plants and its application on sustainable agriculture
22:40-23:00	**14:40-15:00**	**Prof. Hsiharng Yang(楊錫杭),** Graduate Institute of Precision Engineering, NCHU **Title:** Development of hydrogen production with zero carbon emission for energy storage
23:00-23:20	**15:00-15:20**	**Prof. Hsing-Juh Lin(林幸助),** Department of life Sciences, NCHU **Title:** Strategy for reducing greenhouse gas emission from rice paddies
23:20-23:40	**15:20-15:40**	**Coffee Break**
● **ENABLE Workshop 2**		**| Chair: Prof. Chin-Fa Lee(李進發), Department of Chemistry, NCHU**
23:40-24:00	**15:40-16:00**	**Prof. Hui-Min David Wang(王惠民),** Graduate Institute of Biomedical Engineering, NCHU **Title:** A fast estimation platform of anticancer drugs for personal precision medicine by using double reaction hydrogel droplet and dielectrophoretic separation technique
24:00-00:20	**16:00-16:20**	**Prof. Pi-Fang Linda Chang(張碧芳),** Department of Plant Pathology, NCHU **Title:** Integrated application of nanomaterials and agricultural chemicals to interfere the antifungal resistance of phytopathogens
00:20-00:40	**16:20-16:40**	**Asst. Prof. Chifumi Takagi(高木知芙美),** International Master Program Agriculture, NCHU **Title:** Cultural Ecosystem Services of Agroecosystem from Nantou County in Taiwan
00:40-01:00	**16:40-17:00**	**Distinguished Prof. Kun-Yi Andrew Lin(林坤儀),** Department of Environmental Engineering, NCHU **Title**: Development of Continuous Catalytic Oxidative Processes for Selective Conversion and Valorization of Lignocellulosic Compounds to Non-toxic Antibacterial Sponge
01:00~	**17:00~**	**Closing Remarks** **Prof. Jenn-Ming Song(宋振銘), Dean of the Office of Research and Development, NCHU**

01 ENABLE Workshop 1

Chair : Prof. Zingway Pei(裴靜偉), ACAST, NCHU

Presentation Title :

Microbiome reengineering for rapid bioremediation of trichloroethylene contamination

Speaker's Name and Affiliation :

A. P. Shu-Chi Chang (張書奇)

Associate Professor and Chair, Department of Environmental Engineering, National Chung Hsing University

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Speaker's Name and Affiliation :

Dr. Shu-Chi Chang obtained his bachelor degree from National Cheng-Kung University, Taiwan, and both master and doctoral degrees from the University of Michigan at Ann Arbor, USA. He has more than 10 years working experiences before teaching in the governments, an oil company, a research institute, and an American consulting firm. He is now a cofounder of a startup company in bioremediation enhancers and degrading microbes. His research interests lie in the bioremediation of soils, groundwater, and sediments. Currently, he is working on integrated remediation technologies, such as in situ phase inversion emulsification and biological reductive dechlorination, microbiome reengineering for rapid bioremediation , vitrification for circular economy.

Abstract:

Trichloroethylene (TCE) was a widely-applied industrial solvents but now a notorious contaminant in groundwater. Due to the wave of green remediation, anaerobic reductive dechlorination was considered as a more sustainable remediation strategy for TCE-contaminated aquifer. However, the accumulation of toxic intermediates, cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC), and longer remediation time are of high concerns. To accelerate the bioremediation, biostimulation and bioaugmentation have been developed for decades. The former may not be effective and the latter may introduce foreign genes. Here, we have developed a new approach, microbiome reengineering (MBRE), by heat selection of indigenous cultures and has achieved more than 70-folds improvement in TCE biodegradation rate. However, other major environmental variables have not been tested yet. Thus, in this study, we tested heat, pH, salinity, and desiccation by using Taguchi method. A full-length sequencing technology was applied to the 16S ribosomal RNA (rRNA) genes of all samples. The results showed that the optimum selecting conditions were 50ºC, pH 9, 100% sea water salinity, and 60% water content. In the batch test, group 7 (G7) and original culture (OC) performed best, and these two groups were selected to proceed a re-spike test. In this re-spike test, G7 have finished the complete conversion of TCE to ethene in three days, the fastest in the literature. In the 16S rRNA sequencing data, a new association was found of Dehalococcoides mccartyi with Desulfuromonas michiganensis and Cloacibacillus porcorum. Four environmental variables can enhance or inhibit different functions of the microbial community based on FAPROTAX function prediction and redundancy analysis also confirmed that all variables showed different directions that they can modify the structure of the community. These results suggested that MBRE could be an ideal approach for rapid bioremediation of TCE-contaminated aquifers.

Presentation Title :

Innovative Operation Model Planning of Integrating Green Energy Technologies in Intelligent Agricultural and Pastoral Areas: Construction of Photovoltaic System, Energy Storage Facilities System, and Autonomous Electric Mower as an Empirical Case

Speaker's Name and Affiliation :

Distinguished Prof. Jyh-Yih Hsu (許志義)

Chung-Hua University and Affiliated with National Chung Hsing University

City/Country : Taichung, Taiwan

E-mail : ghsu313@gmail.com

Speaker's Name and Affiliation :

Jyh-Yih Hsu is a Distinguished Professor of College of Innovative Industries and Department of Business Administration of Chung Hua University, Distinguished Chair Professor, National Taipei University of Business, and Distinguished Research Fellow, Intelligent Transportation Development Center, National Chung Hsing University, Taiwan. He was a Chair Professor of Asia University, Taiwan(2018-2019). He completed his PhD at University of Hawaii under East-West Center Grant in USA. His main research interests are AI application & management, multi-objective optimization, industrial development & policy, and energy & environmental policy. He has published numerous papers in Energy Policy, Energy Economics, Utility Policy, Applied Economics Letters, Journal of Industry Studies, International Journal of Production Economics, IEEE Access, and Mathematical Problems in Engineerin, etc. He has served as an advisor of Chung-Hua Institution for Economic Research (CIER) and Taiwan Economic Research Institute(TERI). He also served as an Independent director of Taiwan Power Company (2017-2021).

Abstract:

This study aims on evaluating the economic benefits of smart green energy systems in farms and ranches. We use the NCHU Hsi Hsin Pa Farm as the empirical site. As a matter of fact, farms and ranches have relatively large land areas and barns, in which we can deploy a variety of smart green energy facilities. Furthermore, there exists a regular pattern in the daily electricity consumption of farms and ranches. In particular, the NCHU Hsi Hsin Pa Farm provides a ready-made educational field, gathered with talents consist of graduate students and teachers, where we could easily develop our PoCs.

In the case of the NCHU Hsi Hsin Pa Farm, the two daily main electricity consumption peaks occur respectively at 6am~8am and at 5pm~ 7pm, when the peaks exceed the contracted capacity (76kW) almost every month, while at other times the electricity load is much lower than the contracted capacity (only about 50kW or less). Under these circumstances, if proper planning can be made to add PV and energy storage facilities in the farm, not only can we avoid the fines imposed by Taipower for exceeding the contract capacity, but we can even further increase other power generation methods to reduce Taipower's contract capacity and form a so-called virtual power plant (VPP), which is the motivation for this study. In order to achieve the above objectives, this study adopts cost-effectiveness analysis (CEA), including the net present value (NPV), and benefit-cost ratio (BCR), to discuss three main scenarios. Some assumptions were made in this study, including 20 years of life cycle, an interest rate of 0.02366, according to the base rate announced by the bank of Taiwan. We also assume that the annual electricity consumption pattern in the life cycle is the same as the actual electricity consumption data of the NCHU Hsi Hsin Pa Farm collected from April 1, 2020 to March 31, 2021. Furthermore, we assumed that the PV system generates 3.62kWh per kW per day.

In scenario 1, based on the historical electricity consumption pattern (from April 1, 2020 to March 31, 2021), without any green energy facilities constructed, the result suggested that the farm should increase Taipower's electricity contract capacity from original 76kW to 119 kW and adopt the three-block TOU rate (instead of the two-block TOU rate in operation), by which the NCHU Hsi Hsin Pa Farm could benefit from saving electricity bills (including both the fines for exceeded electricity capacity and the TOU tariff). Under the above conditions, our empirical results showed that the BCR is 2.515, and the NPV is NT$2,346,687.

In scenario 2, we construct solar photovoltaic power generating system with capacity of 13.2kW, a 10kWh power storage system, and a 5kWh autonomous electric mower in the farm. We further discuss whether the farm should change Taipower's electricity contract capacity to 105 kW, 110kW, or 115kW, and compare the benefits of adopting different types of TOU rate under each contract capacity. The results in scenario 2 showed that the farm should increase contract capacity to 110kW, and adopt the three-block TOU rate announced by Taipower. the BCR under the above circumstances is 1.606, and the NPV is NT$2,540,094.

In scenario 3, we consider the NCHU Hsi Hsin Pa Farm to become a net zero emissions field. To accomplish this goal, we construct solar photovoltaic power generating system with capacity of 337kW, and a 5kWh autonomous electric mower in the farm. The results showed that without constructing any additional power storage systems, the farm could gain the highest benefit by outsourcing all of the green power generated and keep on using the gray electricity provided by Taipower. Under the above circumstances, our empirical results showed that the BCR is 2.076, and the NPV is NT$21,451,206.

The outcomes are pretty outstanding, especially the NPV of the optimum strategy in scenario 3. It is suggested that later researchers could further discuss the cost-effective analysis from social perspective, with CO2, SOx and other external costs included and neglecting the transferring payments, such as RECs and the fines from Taipower.

Keywords: Intelligent farm, green energy technologies, net zero emissions, cost-effectiveness analysis, net present value, benefit-cost ratio, photovoltaic system, energy storage facilities system, autonomous electric mower, electricity contract capacity, time of use rate, two-block TOU, three-block TOU

Presentation Title :

Evaluating Automatic Generation of English Assessments

Speaker's Name and Affiliation :

Asst. Prof. Ching-Yu Yang (楊謦瑜)

Department of Foreign Languages and Literatures, National Chung Hsing University.

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Speaker's Name and Affiliation :

Ching-Yu Yang has been an assistant professor in the Department of Foreign Languages and Literatures at National Chung Hsing University since 2020. She received her PhD in Linguistics from National Tsing Hua University in 2017. Since then, she has been involved in several projects developing computer-assisted language learning (CALL) systems (e.g., Linggle, Ewriting and Querator AI). Her current research interests lie in corpus linguistics, computational linguistics and CALL.

Speaker's Name and Affiliation :

A. P. Yao-Chung Fan (范耀中)

Department of Computer Science and Engineering, National Chung Hsing University.

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Speaker's Name and Affiliation :

Yao-Chung Fan received the PhD degree in computer science from National Tsing Hua University, Taiwan. Dr. Fan's Phd dissertation received the 2011 Taiwan Institute of Electrical and Electronic Engineering Doctoral Dissertation Award. Dr. Fan was funded by Taiwan National Science Council Award for visiting the Pennsylvania State University. His current research interests including natural language processing, social data management, and text mining. You can also check Dr. Fan's research group at NLP Lab @ NCHU https://nlpnchu.org/

Abstract:

Testing and assessment play an important role in language education. However, controlling the difficulty level and the validity of a test can be a challenge because of the differences in teachers' standards. In addition, as a time-consuming task, constructing test items takes up too much of teachers' time. Using technology to assist teachers in creating test questions can reduce teachers' workload and standardize the testing difficulty level, and therefore will be a future trend. One purpose of this project is to create datasets with questions from a reliable source. The datasets will be used as training data to optimize the BERT Highlight Sequential Question Generation model for reading comprehension questions generation. New models will be developed as well to generate questions of other types. Additionally, English tests generated by the automatic test-generation system will be administered by NCHU Language Center in Freshmen English courses to measure whether these questions are good at discriminating language learners' proficiency. Large-scale evaluation of the generated questions as well as language teaching experts' evaluation on the question quality will be carried out to fine-tune the machine learning models. It is expected that the results will help develop an innovative automatic test-generation system that meets the assessment needs of English language learners and teachers.

Presentation Title :

Fabrication of Frog-Skin-Inspired Slippery Antibiofouling Coatings Through Degradable Block Copolymer Wrinkling

Speaker's Name and Affiliation :

A. P. Han-Yu Hsueh（薛涵宇）

Department of Material Science and Engineering, National Chung Hsing University

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Speaker's Name and Affiliation :

Han-Yu Hsueh received his PhD in Chemical Engineering from National Tsing Hua University (Taiwan) under the supervision of Professor Rong-Ming Ho. He did his postdoctoral research in Rong-Ming Ho's lab for the military service starting and then joined Professor Alfred J. Crosby's group as a visiting scholar, working in University of Massachusetts Amherst (USA). After that, He joined TSMC in Taiwan as a R&D principal engineer for advanced technology module development. In August of 2016, Dr. Hsueh joined the faculty of NCHU in the Department of Materials Science and Engineering as an assistant professor and got promoted to associate professor in February 2021. His current research interests are polymeric hybrid materials and interfaces for applications, including bioinspired materials, surface wrinkling, optical-mechanical sensors, and stimuli-responsive materials.

Abstract:

Marine biofouling is a severe problem with a wide-reaching impact on ship maintenance, the economy, and ecosystem safety, among others. Inspired by complex multifunctional frogskins, wrinkled slippery coatings are created that exhibit remarkable antifouling, anti-icing, and self-cleaning properties through a combination of degradable di-block copolymer self-assembly [i.e., polystyrene-b-polylactide (PS-b-PLA)] and hydrolysis-driven dynamic release-induced surface wrinkling. Microwrinkled patterns can generate curved surfaces that are resistant to biofouling. Gyroid-forming PS-b-PLA can be used to produce nanoporous templates with cocontinuous nanochannels, which generate strong capillary forces for trapping and storing infiltrated lubricants. In this study, block-copolymer-derived hierarchically wrinkled slippery liquid-infused nanoporous surfaces (i.e., micro wrinkles with nanochannels infused with slippery fluids) are successfully fabricated after silicone oil infiltration. The antibiofouling performance of these surfaces is examined against different foulers under various conditions. The produced coatings exhibited flexible, stable, transparent, and easily tunable antibiofouling characteristics. In particular, the formation of an eco-friendly silicon-based lubricant layer without the use of fluorinated compounds and costly material precursors is an advantage in industrial practice that can be adopted in various applications, such as fuel transport, self-cleaning windows, anticorrosion protection, nontoxic coatings for medical devices, and optical instruments.

Presentation Title :

Conduct novel intelligent agriculture 3.5 AI vision recognition and smart separation fertilized eggs hatching systems

Speaker's Name and Affiliation :

Prof. Lee-Tian Chang (張力天)
Department of Veterinary Medicine, National Chung Hsing University

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Speaker's Name and Affiliation :

2002-2007: PDF of ABRC, Academia Sinica
2007-2012: Assistant Professor of Department of veterinary medicine, NCHU
2012~2016: Associate Professor of Department of veterinary medicine, NCHU
2016~: Professor
2018~:Distinguished Professor
2013 National Invention and Creation Award / 2013 National Innovation Award / 2015 Taiwan Healthcare and Agricultural Biotech Industries Innovation and Excellence Awards/ 2019 FutureTech Demo and Breakthrough Award/ 2019~2020 National Innovation Award renewal and issue the Excelsior Award

Abstract:

Chicken fertile eggs are usually hatched after artificial insemination. Sterile eggs, poor embryonic development and irregular specifications of fertile eggs will decrease hatching rate. Heat and transport stresses on hatched chicks without food and water supply will influence growth performance and feed conversion rate. This project intends to develop an artificial intelligence (AI) chicken breeding eggs candling system by using infrared thermography (IRT) biological perception visual recognition/deep learning technology. Hatching equipment with inline automatically conveyor of incubation tray/setters were also designed and connected to the real-time infrared thermographic AI visual recognition and intelligent grading equipment. The coordinates of the target fertilized chicken eggs identified by IRT are then synchronously transmitted to the egg suction device of the sorting pneumatic system, and the fertilized egg transfer path organization is carried out. AI fertilized eggs path planning equipment required by chickens breeding market is completed to ensure the accuracy of the fertilized chicken eggs from incubator to generator. The feasibility of on farm hatching of fertilized chicken eggs will be tested in future. The AI of IRT detection equipment on fertilized chicken eggs developed by this project can reduce the production cost of related poultry industries, and also upgrade the chicken breeding industry, breeder industry and hatching industry to the scale of precision agriculture with AI.

02 UCSD-NCHU Workshop

Chair :
Charles Tu(杜武青), Mt. Jade Professor, EE Department, NCHU

Plenary Talk 1

Presentation Title :

Health interventions based on decoding and modulation of electrical signalling in humans

Speaker's Name and Affiliation :

Prof. Ramesh R. Rao

Department of Electrical and Computer Engineering, University of California, San Diego

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Speaker's Name and Affiliation :

Dr. Ramesh R. Rao. has been a faculty member at UC San Diego since 1984, and Director of the Qualcomm Institute, UCSD division of the California Institute for Telecommunications and Information Technology (Calit2), since 2001. He holds the Qualcomm Endowed Chair in Telecommunications and Information Technologies in the Jacobs School of Engineering at UCSD, and is a member of the school's Electrical and Computer Engineering department.

Prior to QI (Calit2), Professor Rao served as the Director of UCSD's Center for Wireless Communications (CWC). Dr. Rao is involved on a day-to-day basis with a wide variety of research initiatives at QI. He leads several major interdisciplinary and collaborative projects and has been a PI on dozens of federal-, state-, foundation- and industry-funded grants. Dr. Rao is an IEEE Fellow and Senior Fellow of the California Council on Science and Technology. He was named a Member of the Board of the Academy of Neurosciences for Architecture, a Member of the Rady Children's Hospital and Health Center Board IT Task Force and serves on the Board of Directors of CONNECT. Dr. Rao has been a long time member of the San Diego Indian American Society and currently serves as the Vice President for the Board of Governors.

Dr. Rao earned his Ph.D. in Electrical Engineering from the University of Maryland, College Park in 1984, after receiving his M.S. from the same institution in 1982. He earned his Bachelor's degree in 1980 from the University of Madras (the National Institute of Technology, Tiruchirapalli). Dr. Rao received the distinguished alumnus award from the National Institute of Technology in 2010, the ECE Distinguished alumni award from the University of Maryland in 2012, the Professional Gordon Engineering Leadership Award from UCSD's Gordon Engineering Leadership Center in 2010. He also received the 2011 Casa Familiar Abrazo Award for engagement with underprivileged area of San Diego.

Abstract:

We will describe the transformative value of work on communications and information technology, underway at the Qualcomm Institute, in addressing societal scale priorities such as health, energy and the environment. In particular, we will focus on the development of robust wearable sensors that have enabled the gathering of copious amounts of ambulatory data about the state of the human autonomic nervous system. Advanced methods for data cleaning and data analysis now make it possible to obtain insights that can enable near real time interventions to restore a healthy state in individuals that carry the burden of conditions such as diabetes, chronic pain, PTSD and sepsis. A common thread that binds such conditions is the body's inflammatory response to external stimuli. In this talk we will review some recent interdisciplinary team work that was developed in response to the Covid pandemic. Transcutaneous Vagus nerve sensing of electrical and magnetic signals was found to enable the detection, classification and quantification of the extent of exposure to classes of pathogens, such as SARS-CoV-2. We will also present promising results on ways to modulate the inflammatory response by externally applying focussed ultrasound to specific organs, such as the spleen. We will also share some early findings that document the role of somatic practices, such as meditative breathing, that induce similar measurable effects on the human autonomic nervous system.

Plenary Talk 2

Presentation Title :

Flexible Bioelectronics Devices: Wearable Sensing and Energy Systems

Speaker's Name and Affiliation :

Prof. Joseph Wang

Department of Nanoengineering, University of California, San Diego

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Speaker's Name and Affiliation :

Joseph Wang is Distinguished Professor, SAIC Endowed Chair, and former Chair of the Department of Nanoengineering at University of California, San Diego (UCSD). He is also the Director of the UCSD Center of Wearable Sensors (CWS). Prof. Wang has published more than 1175 papers, 11 books and he holds 30 patents (H Index=180, >140,000 citations). He received 2 American Chemical Society National Awards in 1999 (Instrumentation) and 2006 (Electrochemistry), ECS Sensor Achievement Award (2018), IEEE Sensor Achievement Award (2021), and 5 Honorary Professors from Spain, Argentina, Czech Republic, Romania, China and Slovenia. Prof. Wang has been the Founding Editor of Electroanalysis (Wiley), is RSC, ECS and AIMBE Fellow and a Thomson Reuters Highly Cited Researcher. His scientific interests are concentrated in the areas of bioelectronics, wearable devices, biosensors, bionanotechnology, nanomachines and microrobots, flexible materials, and electroanalytical chemistry.

Abstract:

Flexible electrochemical devices have received a considerable recent attention in the fields of wearable devices and mobile health. This presentation will describe stretchable and self-healed printable electrochemical devices, based on novel ink materials, that endure extreme deformations commonly experienced by the human skin. These advances have thus led to the development of printable bioelectronic devices that can fold, stretch, and repair, while maintaining remarkable analytical and energy-harvesting performance. Technical challenges and opportunities for fabricating such reliable stretchable textile-based and skin-worn electrochemical sensors and biofuel cells will be discussed, along with demonstrations of variety of wearable electrochemical sensing and energy platforms and prospects for diverse biomedical applications.

Plenary Talk 3

Presentation Title :

Few-Shot Self-Supervised Learning for AI-based Automatic Optical Inspection

Speaker's Name and Affiliation :

Prof. Chun-Rong Huang (黃春融)

Department of Computer Science and Engineering, National Chung Hsing

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Speaker's Name and Affiliation :

Chun-Rong Huang received the bachelor's and Doctor of Philosophy degrees from the Department of Electrical Engineering, National Cheng Kung University, Tainan, Taiwan, in 1999 and 2005, respectively. In 2005, he joined the Institute of Information Science, Academia Sinica, Taipei, Taiwan, as a Postdoctoral Fellow. He joined the Department of Computer Science and Engineering, National Chung Hsing University, Taichung, Taiwan, in 2010, where he became a Full Professor in 2019. His research interests include computer vision, computer graphics, multimedia signal processing, image processing, and medical image processing. Prof. Huang is a member of the IEEE Circuits and Systems Society, the IEEE Signal Processing Society, the IEEE Computational Intelligence Society, and the Phi Tau Phi Honor Society.

Abstract:

According to the Cognilytica's report, an industry AI project usually takes 80% time for labeling sufficient training images. If a factory produces different products, labeling data becomes a very time-consuming process and leads to the difficulty of applying AI methods. Expensive GPU devices are required for AI training/testing. To solve these problems, we develop a novel AI-based few-shot self-supervised learning method for detecting components in AOI. Our method iteratively learns feature representations of components by using self-similarity of pixels of these components from few training images. During testing, feature representations are generated and compared by the AI model to identify target components. Our method only considers the self-similarity from pixels of the target component to generate the self-learned representations. The computation load of our method is significantly light-weight. These innovations make our method outperform deep learning methods in the industry.

Plenary Talk 4

Presentation Title :

iAMEC, an Intelligent Autonomous Mover for Navigation in Indoor People Rich Environments

Speaker's Name and Affiliation :

Prof. Yin-Tsung Hwang (黃穎聰)

Department of Electrical Engineering, National Chung Hsing University

City/Country : Taichung, Taiwan

E-mail : hwangyt@dragon.nchu.edu.tw

Speaker's Name and Affiliation :

Yin-Tsung Hwang received his PhD degree in EE from the University of Wisconsin, Madison, USA, in 1993. He then returned to Taiwan and became a faculty member of the Department of Electronic Engineering, National Yunlin University of Science & Technology. In 2004, he joined the Department of Electrical Engineering, National Chung Hsing University, and is now a professor. Dr. Hwang served as the director of Meng-Yao Chip Center, National Chung Hsing University, from 2007 to 2010. He also led a nationwide, inter-collegiate talent cultivation program sponsored by MoE for Intelligent IoT from 2017 to 2021. He has been a council member of Taiwan Integrated Circuits Design Association since 2014. His research interests include VLSI designs for wireless base band signal processing, beamforming and radar signal processing, image based indoor positioning schemes, and hardware accelerator for AI applications.

Abstract:

This talk addresses the key sensing, navigation techniques, and edge AI computing chip design for an autonomous mover, iAMEC, tailored to indoor and people rich environments such as shopping centers. iAMEC aims at serving as a platform for service robots and features swift maneuverability and collision avoidance in navigation. It is equipped with a smart sensing module consisting of a Lidar, a camera and an ultrasonic array radar. Camera images are analyzed on the fly by using 2-stage CNN models for not only object recognition but also pedestrian behavior prediction. The ultrasonic array radar can detect both the distance and the direction of the surrounding objects in short distance. The low cost 1-ray Lidar performs SLAM as well as scanning for a wider range. Data fusion results of these three sensing techniques are passed to the navigation/control module, which determines the optimal path and also steers iAMEC to the destination. Navigation is based on a reinforcement learning model, which is trained in a virtual environment by using a simulation engine, UNITY. DLA (deep learning architecture) acceleration chip design and the associated model-to-DLA mapping tool are also developed to facilitate real time edge computing of CNN based image analysis. A 4-wheeled autonomous mover prototype has been built and mounted with developed sensing, navigation and control modules. The evaluation results indicate preliminary success of iAMEC in navigating under a controlled environment.

03 IDCSA/IARC Workshop

Chair:
Distinguished Prof. Ching-Chou Wu(吳靖宙),
Department of Bio-industrial Mechatronics Engineering, NCHU

Invited Talk

Presentation Title :

Towards Automation in Unmanned Aircraft Systems (UAS) for Precision Agriculture and Crop Phenotyping in Estonia

Speaker's Name and Affiliation :

Dr. Kai-Yun Li
Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences.

City/Country : Tartu, Estonia

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Speaker's Name and Affiliation :

Kai-Yun, Li, a Junior Research Fellow /Doctoral Candidate in Environmental Sciences and Applied Biology of Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences. Our team mainly focuses on the utilization of remote sensing technology to address environmental protection, agriculture, ecology, forestry, and urban planning issues. In the field of agriculture, our development direction includes crop phenotyping, precision/smart agriculture, automation technology, sustainable agriculture. The Cooperation institution includes the Estonian Crop Research Institute (ECRI) and the organizations i.e., Variety Testing Centre and Plant Breeding Institute under ECRI.

Abstract:

The recent growth in environmental protection awareness under the concepts of sustainable agriculture, the flexibility of environmentally friendly cultivation methods are being developed globally and in Estonia. However, complexities become a drawback in variety performance trials (VPT) since desired models need to contain training and testing databases and are often restricted by the number of seeds, various management pretties (fertility test, tillage category, disease resistance, etc.), and confined areas with small sampling sizes to compensate for the labour-intensive fieldwork. Likewise, environmental factor interventions enhance obstacles in parameter selection in ML systems owing to the differences in location, climate, and soil properties. Therefore, the recent trend of automated machine learning (AutoML) has been driving further significant technological innovation in the application of artificial intelligence from its automated algorithm selection and hyperparameter optimization of the deployable pipeline model for unravelling substance problems, such as unmanned aircraft systems (UAS) within image-based data classification tasks. Our framework presents new insights into plant–environment interactions with capable classification and regression capabilities. It further illustrated the automatic system would become an important tool in furthering the understanding for future sustainable smart farming and field-based crop phenotyping research across a diverse range of agricultural environmental assessment and management applications. environmental assessment and management applications.

Presentation Title :

Effects of fertilizer types on soil bacterial microbiome and tomato growth

Speaker's Name and Affiliation :

Prof. Cheng-Hua Huang (黃政華)

Department of Soil and Environmental Sciences, National Chung Hsing University

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Speaker's Name and Affiliation :

Dr. Cheng-Hua Huang earned his bachelor's and master's degrees in soil science from National Chung Hsing University (NCHU). Before he went to the United States to pursue his PhD degree, he was an organic inspector who examined the process of organic handling by a business seeking organic certification in Taiwan. Dr. Huang received his PhD degree in plant pathology from the University of Florida. He is currently an Associate Professor in the Department of Soil and Environmental Sciences, NCHU. Dr. Huang's research focuses on application of biofertilizers as an alternative to chemical fertilizers and as a tool for soil fertility management and crop health in changing climate. In addition, his research utilizes traditional and contemporary approaches to study the interactions between plants and soil microbial communities.

Abstract:

Fertilization influences soil properties and microbiome, and consequently plant growth. However, the relationship among fertilizer types, soil properties, soil bacterial community, and tomato growth has not been well evaluated. This study aimed to investigate effects of fertilizer types on soil properties, soil microbiome, and tomato growth. Tomato seedlings were grown in soils applied with ten fertilizer treatments including a no fertilization control, a chemical fertilization control, and eight organic amendments (castor cake, manured compost applied at 5, 10, and 20 g kg-1 soil, neem cake, rapeseed meal, soybean meal, and tea seed meal). Changes in soil properties, soil microbiome, and tomato growth were evaluated after application of these fertilizers. Compared with the chemical fertilization treatment, application of the manure compost at 10 and 20 g kg-1 significantly increased the shoot dry weight of tomato plants by 54.0 and 168%, respectively. Additionally, the manure compost applied at 10 and 20 g kg-1 remarkably increased soil organic matter by 15.5 and 35.2%, respectively. Use of neem cake or the manure compost at 5 g kg-1 showed a significantly higher Chao1 index than that of the chemical fertilization treatment, and application of rapeseed meal and the manure compost at 5 g kg-1 resulted in a significantly higher ACE index than that of the chemical fertilization treatment. Moreover, application of neem cake and the manure compost at 20 g kg-1 showed a significantly higher Shannon index in comparison with the chemical fertilization treatment. Proteobacteria was the dominant phylum and the relative abundance of Bacillus was the highest in all the fertilization treatments. The relative abundance of Lysobacter, one of the top 7 abundant genera, was positively related to shoot and total dry weights of tomato plants. In conclusion, fertilization treatments can influence soil properties, soil microbiome, and tomato growth, and increase in the relative abundance of Lysobacter may promote tomato growth.

Presentation Title :

Uncovering the molecular mechanisms of beneficial microorganisms inducing stress tolerance in plants and its application on sustainable agriculture

Speaker's Name and Affiliation :

Dr. Tao-Ho Chang (張道禾)

Department of Plant Pathology, National Chung Hsing University

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E-mail : taudch@gmail.com

Speaker's Name and Affiliation :

Tao-Ho Chang is a postdoctoral research fellow from the Department of Plant Pathology at National Chung Hsing University. He received doctoral degree from the Institute of Molecular Plant Science at the University of Edinburgh, UK. Recently, he was awarded as the 2020 postdoctoral researcher in academic category from the Ministry of Science and Technology, Taiwan based on the works on developing novel sustainable materials in agriculture. His expertise are the plant immune system and molecular biology. Currently, his works within the Project of Innovation and Development Center of Sustainable Agriculture involve in assessing the beneficial efficacy of novel materials on plants and uncovering the mechanisms.

Abstract:

Beneficial microorganisms are bacteria, fungi, nematodes, and viruses that offer beneficial impacts in agriculture. In our recent research, Bacillus mycoides BM103, a soil-borne rhizobacterium, has been found to promote the growth of plants both in shoot and root developments. In addition, BM103 has been confirmed to control the strawberry Fusarium wilt and Taiwan jewel orchid stem rot. We used BM103 to further investigate its beneficial potential in the model plant Arabidopsis thaliana under abiotic (heat and osmotic) stresses and to uncover the molecular mechanisms through transcriptome analysis. In the differentially expressed genes (DEGs) analysis, we identified 23 DEGs that BM103 triggered under both stresses conditions and 129 DEGs that stresses triggered when applied with BM103. Furthermore, the hub genes related to Arabidopsis-BM103-stresses interactions were identified through weight correlation network analysis (WGCNA). The pathway analysis demonstrated that selected hub genes were mostly related to the phenylpropanoid pathway. The core genes involved in Arabidopsis-microbe-stress interactions may be applied for further identification of beneficial microorganisms in the future.

Presentation Title :

Development of hydrogen production with zero carbon emission for energy storage

Speaker's Name and Affiliation :

Prof. Hsiharng Yang (楊錫杭)
Graduate Institute of Precision Engineering, National Chung Hsing University

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Speaker's Name and Affiliation :

Hsiharng Yang is a Distinguished Professor in the Graduate Institute of Precision Engineering at National Chung Hsing University (NCHU) in Taiwan. He studied in the Institute for Micromanufacturing at Louisiana Tech University (USA) and graduated in 1998. He was a researcher in the Industrial Technology Research Institute (ITRI)working on MEMS related products. In 2000, he joined the Graduate Institute of Precision Engineering at NCHU as an Assistant Professor. He has been an Associate Professor and full Professor in 2006. His current research interests include anion exchange membrane fuel cells, enzymatic biofuel cells, carbon fiber related electrodes, gas diffusion electrodes.

Abstract:

The objective aims to develop water electrolysis to produce hydrogen as energy storage. The water can be electrolyzed to hydrogen and oxygen by an external power supply. Such the electrolyzer can be integrate with conventional power and renewable energy. The electricity can be stored in a hydrogen tank by the electrolyzer when the low power demand period and the electricity can be released when the high power demand period comes. It's useful for the power management for stable supply. The resulted product is water only, no carbon dioxide emission. It's realized by using non-Pt catalyst to reduce the production cost. The catalyst CoOOH with three dimensional structure with high surface area and uniform coverage by electrodeposition. Other catalyst FeP coated onto carbon nanotubes showed excellent electro-catalytic activities. It showed that its overpotential is 260 mV and the current density can keep 94% after 100 hours operation. Such catalyst also exhibited low voltage drop (only 26 mV) after 30,000 cycles. It proved its excellent catalytic activity and stability for electrolysis. The electrolyzer module is able to produce 1 Nm3/hr and consumed 4.8 Kw which is high efficiency than the other electrolysis. It can replace the noble catalyst for the electrolysis to produce hydrogen and achieve the low production cost.

Presentation Title :

Strategy for reducing greenhouse gas emission from rice paddies

Speaker's Name and Affiliation :

Prof. Hsing-Juh Lin (林幸助)

Department of Life Sciences and Center for Environmental Restoration and Disaster Reduction (CERDR), National Chung Hsing University

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Speaker's Name and Affiliation :

I am interested in system ecology and trying to solve ecological problems from a holistic view, especially under climate change. I obtained my Ph.D. in oceanography from the University of Rhode Island's Graduate School of Oceanography (USA) in 1994 and was promoted to "Distinguished Professor" in the Department of Life Sciences at National Chung Hsing University (NCHU) since 2007 and "Lifetime Distinguished Professor" now. Since that time I have served as the chair of my department, as well as 1) the Director of NCHU's Research Center for Global Change Biology 2) an adjunct research fellow at Academia Sinica's Biodiversity Research Center from 2008 to July 2018. I was also an Adjunct Professor at the Chinese Medical University (Taichung) and National Taiwan Ocean University (Keelung). I am Adjunct Professor at the National Sun Yat-sen University (Kaohsiung) and Director of NCHU's Center for Environmental Restoration and Disaster Reduction (CERDR). My specialty is on the structure, function, and services of coastal and aquatic ecosystems, particularly in tropical/sub-tropical regions. Over the past 26 years, I have been studying a variety of tropical aquatic ecosystems, including rice paddies, tea gardens, lakes, streams, estuaries, coastal lagoons, coastal wetlands, mangroves, seagrass beds, and coral reefs, and I have a particular interest in Blue Carbon.

Abstract:

Agricultural practices not only supply food for human being, but also provide ecosystem services such as regulation, support and culture. Agriculture and related land use can contribute about 25% of greenhouse gas (GHG) emissions for global economic activities. Particularly, rice paddy cultivation contributes more methane (CH4) emissions compared to other crops. Rice is the primary crop in Taiwan. However, GHGs emissions from rice paddies and regulating factors remain unclear. We determined in situ monitoring for GHG emissions from rice paddy fields under the conventional (CA) and sustainable agricultural (SA) measures in Xikuo and other sites around Taiwan since 2016. The results indicate that a great quantity of CH4 was produced since irrigating water was introduced into rice paddies and then created anaerobic environments during fertilization and active tillering stages. There was no significant difference between CA and SA for accumulated CH4 emissions. However, much more accumulated CH4 and CO2 emissions were observed in the 2nd seasons than in the 1st seasons. Thus, this study indicates that to mitigate the GHGs emissions from rice paddies and improve the lack of irrigation water during the drought years, cultivating rice in the 1st seasons and planting other drought-resistant crops in the 2nd are recommended if the rice supply is met. Overall, the patterns of CH4 and CO2 emissions from CA and SA were similar. The CH4 and CO2 emissions in Taiwan were comparable with other countries. This research provides scientific information to stakeholders for managing agricultural GHGs and can be applied to develop related policies for adapting climate change and the goal of "Agriculture Net-Zero 2050" in Taiwan.

04

ENABLE Workshop 2

Chair :
Prof. Chin-Fa Lee(李進發),Department of Chemistry, NCHU

Presentation Title :

A fast estimation platform of anticancer drugs for personal precision medicine by using double reaction hydrogel droplet and dielectrophoretic separation technique

Speaker's Name and Affiliation :

Prof. Hui-Min David Wang (王惠民)
Graduate Institute of Biomedical Engineering, National Chung Hsing University

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Speaker's Name and Affiliation :

Hui-Min David Wang, a Full Professor at Graduate Institute of Biomedical Engineering. During the past five year, he has published almost **80** international papers. Impact factor > 5: **30** articles. The overall impact factor amount is over 300 points. **The cited number is over 8000 in Google Scholar and H-index: 51.**

- Associate Editor-in-Chief, Food Science and Human Wellness (Elsevier) (IF: 5.154; Ranks: Food science & Technology, 40/160, 25.0%)
  https://www.sciencedirect.com/journal/food-science-and-human-wellness
- Associate Editor-in-Chief, BMC Complementary and Alternative Medicine (Elsevier) (IF: 3.659; Ranks: Integrative & Complementary Medicine, 6/29, 20.69%)
  https://www.editorialmanager.com/bcam/Default.aspx

Abstract:

Hydrogel provides a biocompatible microenvironment for three-dimensional cell culture to mimic in-vivo circumstances. Through microfluidic systems, hydrogel-based droplets can be generated. The cell-laden hydrogel droplets have been utilized for tissue engineering and drug screening. It is vital to control the droplet volume and cell number in each droplet for these applications. However, the cell number in hydrogel droplets is nonhomogeneous due to cell sedimentation or aggregation during droplet generation in microchannels. Therefore, the different cell number-containing droplets need to categorize for particular applications. In this study, a droplet-based microfluidic chip integrated with 3D electrodes was established as a platform for sorting different cell-laden hydrogel droplets. After generation, droplets flow in U-shaped sorting channels containing two outlets to separate empty droplets from the prepared droplets by using dielectrophoresis (DEP) force. The cell-laden droplets with high conductivity due to cellular metabolites can be collected to the cell-laden outlet, while empty droplets did not change movement direction due to flow inertia force to the waste outlet. This DEP-assisted collection platform has promise potential for the drug-screening application due to the effect of drug on cell metabolism.

Presentation Title :

Integrated application of nanomaterials and agricultural chemicals to interfere the antifungal resistance of phytopathogens

Speaker's Name and Affiliation :

Prof. Pi-Fang Linda Chang (張碧芳)
Department of Plant Pathology, National Chung Hsing University

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Speaker's Name and Affiliation :

Professor Pi-Fang Linda Chang was an assistant Professor in Department of Botany, National Taiwan University from 1997 to 1999, she then joins Department of Plant Pathology, National Chung Hsing University in February of 1999. She received doctoral degree from the Department of Horticulture at Purdue University, USA. Dr. Chang's research topics focus on: (1) Using genomic probes to assay the mechanisms of plant tolerance/resistance to abiotic and biotic (pathogen) stresses, (2) Studying the mechanisms of biocontrol agents and nanoparticles on plant growth promotion and plant protection, and (3) Development of molecular detection techniques for plant fungal pathogens.

Abstract:

The antimicrobial resistance of phytopathogens reduces the effectiveness of agricultural chemicals, thus causing severe damage in agricultural crops. In Taiwan, Colletotrichum spp., causing strawberry anthracnose, have reportedly become resistant to trifloxystrobin (a strobilurin fungicide), thus increases the cost of strawberry production and the risk for human consumption. Therefore, novel methods to alleviate the antimicrobial resistance and to increase chemical control efficiency are important topics for current disease control in agriculture. Nanotechnology could be a potential novel solution. Nano zinc oxide with antimicrobial activity on phytopathogens and its beneficial effects on plants have been reported. In this research, we obtained zinc oxide nanoparticles through hydrothermal synthesis. These nanoparticles could significantly inhibit plant fungal pathogens by causing physical damages on the pathogens, which illustrated their novel antifungal activity. Therefore, our goal is to apply the zinc oxide nanoparticles together with fungicides to control fungal phytopathogens which have become fungicide-resistant. We found that the integrated application of zinc oxide nanoparticles and trifloxystrobin significantly enhanced the fungicide sensitivity on trifloxystrobin-resistant Colletotrichum spp. More importantly, the synergistic effect of this integrated application significantly lowered the needed concentrations of trifloxystrobin and zinc oxide nanoparticles. The in planta results demonstrated that the integrated application of zinc oxide nanoparticles and trifloxystrobin significantly control strawberry anthracnose. Our results implied the promise of using the integrated application of nanomaterials and agricultural chemicals on tackling the fungicide-resistant phytopathogens.

Presentation Title :

Cultural Ecosystem Services of Agroecosystem from Nantou County in Taiwan

Speaker's Name and Affiliation :

Asst. Prof. Chifumi Takagi (高木知芙美)

International Master Program Agriculture, National Chung Hsing University

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Speaker's Name and Affiliation :

Chifumi Takagi is an assistant professor of the International Master Program of Agriculture at National Chung Hsing University, Taiwan. Her research interests are international agricultural development, agricultural extension systems in developing countries and organic agriculture. She received her Ph.D. in Community, Agriculture, Recreation, and Resource Studies from Michigan State University in the US and her MSc in Bioproduction (Agricultural Economics) from the University of the Ryukyus in Japan.

Abstract:

Agroecosystem, including peri-urban farmlands, are important providers of various services, for example food and fiber (provision), purification of water and air (regulating), provides inhabitancy (supporting) and cultural services such as recreational experiences, spiritual, historical and aesthetic experiences, and community identities. These are categorized to be ecosystem services (ES). Among them, the value of cultural ecosystem service (CES) has not been well understood and knowledge gaps exist because they are difficult to quantify and value.

Nantou county has various well-known tourists' attractions including Sun Moon Lake and Yushan Mountain as well as it is heavily dependent on farming. Rustic areas and an abundance of agricultural products are Amon the county's major tourists draws. There is no doubt that Nantou country provides CES to many visitors.

In Taiwan's context of ES studies, there are several studies related to marine ES, grass ES, urban ES, wetland ES, river ES and agroecosystem. Among ES studies, there are very few studies focusing on CES. The main purpose of this research is to estimate willingness to accept ecological compensation to maintain CES though well-managed farmlands (farmers survey) and to estimate willingness to pay to maintain farm land, value of CES (consumers survey).

For farmers' survey, we have interviewed 12 organic farmers from 9 organic farms, and 2 organizations (1 Association of Taiwanese indigenous People's Development and 1 Xinyi County Farmers' association) in Nantou from May 15th to October 25th. During the interviews, we asked organic farmers' perception of CES & 玉山 organic farmers' cooperative, production cost of organic crops and their demographic information. After the interviews, the recorded data were transcribed and translated to English. The English interview transcribed notes will be used for organic crop production cost analysis and content analysis. For consumer survey, the online survey (choice experiment) was first initiated from November 19 and it was concluded on November 30. A total of 199 respondents completed answering the questions. Collected data are analyzed to estimate the willingness to pay to preserve cropland, which is considered as the value of cultural ecosystem services from agroecosystems.

Due to the COVID-19 pandemic in Taiwan, especially from May to July 2021, we could not conduct the farmers' interview and the consumer survey as planned initially. Preliminary analyses reveal the following from the farmers' survey: 1) None of the respondents knew the word "ES", but most of them understood the contents of each ES through their farming experiences, 2) respondents' area of farmland were from 0.4 ha to more than 2 ha; their growing crops were much diversified from leaf vegetables to fruits. 3) A production cost analysis showed that revenue from an organic passion fruits was NT22,750/0.1 ha; profit excluding family labor cost was NT18,800/0.1 ha; profit including family labor cost was –NT56,200/0.1 ha. It is considered the compensation of maintaining CES from agroecosystem in Nantou.

From the consumers' survey; 1) Many respondents (84%) have visited Nantou county for recreation, relaxation, health and exercise (camping, hiking, cycling, fishing etc.) ; 2) even so, somewhat surprisingly, majority of survey respondents (73%) do not know ES and 76% of respondents have not heard CES; 3) much of respondents strongly agree that agroecosystem provide four types of ecosystem services. The use of the choice experimental survey allowed us to elicit the (marginal) willingness to pay to preserve cropland which is considered as the economic benefit. The regression model showed the statistically significant result with positive value on farmland management, which implies that visitors were more likely to see well-managed farmland. A typical visitor is willing to pay 995 NTD. Again, it is considered the value of CES from agroecosystem in Nantou.

Presentation Title :

Development of Continuous Catalytic Oxidative Processes for Selective Conversion and Valorization of Lignocellulosic Compounds to Non-toxic Antibacterial Sponge

Speaker's Name and Affiliation :

Distinguished Prof. Kun-Yi Andrew Lin (林坤儀)
Department of Environmental Engineering , National Chung Hsing University
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Speaker's Name and Affiliation :

Dr. Lin received his Ph.D. from the Department of Earth and Environmental Engineering at Columbia University (USA). He is currently working as a distinguished professor in the Department of Environmental Engineering. His research focuses on development of advanced materials and catalysts for energy and environmental applications. In the past few years, he has been becoming one of leading experts for environmental applications (including adsorptive and catalytic treatments) of metal organic frameworks (MOFs) and their derivatives. He has also served as editors and editorial members for more than 10 journals (including Associate Editor, Korean Journal of Chemical Engineering (IF:3.309); Associate Editor, Energy & Environment (IF: 2.945); Associate Editor, Materials Science for Energy Technologies (Elsevier)) and reviewers for more than 100 high-impact journals. Dr. Lin has co-authored more than 250 SCI journal papers.

Abstract:

Oxidation of lignin-derived molecules, vanillyl alcohol (VAL), to vanillin (VN) constitutes a crucial step towards sustainable valorization of lignocellulosic biomass. Although catalytic oxidation of VAL by Cu and 2,2,6,6-tetramethylpiperidine 1-oxyl (TEMPO) with oxygen gas as a direct oxidant represents a promising oxidation technique for VAL oxidation, the traditional Cu/TEMPO adopts homogeneous Cu ions and TEMPO, which are extremely difficult for recovery. In this study, a unique sandwich-like catalytic system (SCS) comprised of HKUST-1 mesh and TEMPO-grafted on carbon fiber cloth (TEMPO@CC) is developed and fabricated as an integrated heterogeneous catalyst for VAL oxidation. Through the electro-chemical technique, Cu mesh is adopted as a source of Cu to grow HKUST-1 directly, whereas CC is functionalized by TEMPO via covalent bonds. Especially, such a SCS exhibits much higher conversion of VAL to VN under microwave irradiation than conventional oven heating. SCS could achieve 100% of conversion, 100% of selectivity and 100% of yield of VN at 120 °C for 60 min. As vanillin possesses an aromatic structure and can be used as a hydroxyl monomer, polyurethane (PU) foams can prepared from castor oil with 0, 10, and 20% molar ratio vanillin as a polyol and aliphatic isocyanate. The results demonstrate the density and compressive strength of PU foam decrease as the amount of vanillin increases. Vanillin-based foam has antibacterial activity in Staphylococcus Aureus and Escherichia coli. PU foams can be used as cushions and insulation foam for building materials

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主辦單位 | ORGANIZER

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UC San Diego

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