Conference Program

March 27-29, 2018
Kyoto, Japan

ACEAIT

Annual Conference on Engineering and Information Technology

APLSBE

Asia-Pacific Conference on Life Science and Biological Engineering

Content

General Information for Participants

■ **Registration**

The registration desk will be situated on the **4st floor** at **Kyoto Research Park** during the following time:

15:00-17:00, Tuesday, March 27, 2018
08:30-17:00, Wednesday, March 28, 2018
08:30-17:00, Thursday, March 29, 2018

■ **A Polite Request to All Participants**

Participants are requested to arrive in a timely fashion for all addresses. Presenters are reminded that the time slots should be divided fairly and equally by the number of presentations, and that they should not overrun. The session chair is asked to assume this timekeeping role and to summarize key issues in each topic.

Sandals or Slippers   Tank Top   Shorts

■ **Certificate**

Certificate of Presentation or Certificate of Attendance

A certificate of attendance includes participant's name and affiliation, certifying the participation in the conference. A certificate of presentation indicates a presenter's name, affiliation and the paper title that is presented in the scheduled session.

Certificate Distribution

Oral presenters will receive a certificate of presentation from the session chair at the end of the session. Poster presenters will receive a certificate of presentation from the conference staff at the end of their poster session.

The certificate of presentation will not be issued, either at or after the conference, to authors whose papers are registered but not presented. Instead, the certificate of attendance will be provided after the conference.

■ **Preparation for Oral Presentations**

All presentation rooms are equipped with a screen, an LCD projector, and a laptop computer installed with Microsoft PowerPoint. You will be able to insert your USB flash drive into the computer and double check your file in PowerPoint. We recommend you to bring two copies of the file in case that one fails. You may also connect your own laptop to the provided projector; however please ensure you have the requisite connector.

Preparation for Poster Presentation

Materials Provided by the Conference Organizer:

1. X-frame display & base fabric canvases (60cm×160cm)
2. Adhesive tapes or binder clips

Materials Prepared by the Presenters:

3. Home-made poster(s)
4. Material: not limited, can be posted on the canvases
5. Recommended poster size: 60cm*120cm

A 60cm*160cm poster illustrates the research findings.	1. Wider than 60cm (left) 2. Copy of PowerPoint slides in A4 papers (right)

International Committees

International Committee of Natural Sciences

Abdelwahab Elghareeb	Cairo University	Egypt
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Special Thanks to Session Chairs

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Ku-Chin Lin	Kun Shan University

Conference Venue Information

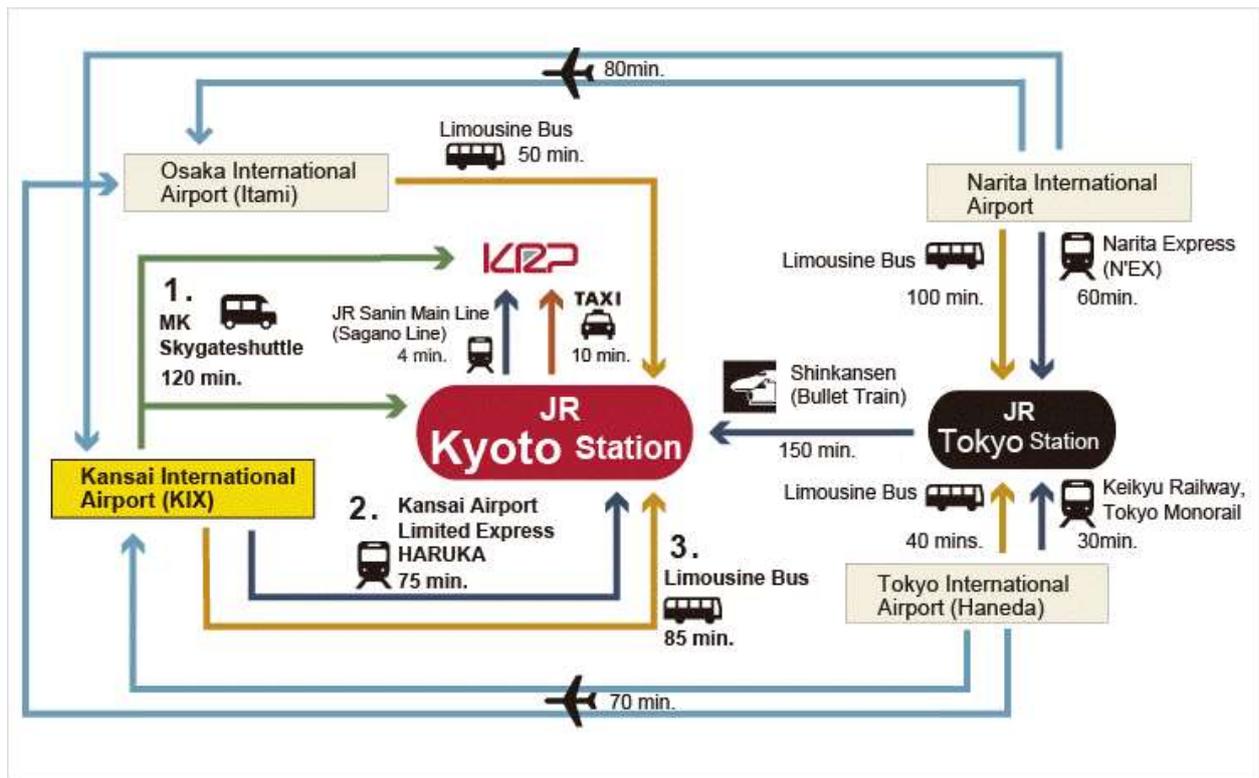**Kyoto Research Park**

134, Chudoji Minami-machi, Shimogyo-ku, Kyoto 600-8813, Japan

Phone: + 81-75-322-7800

Location

Transportation

From Kansai International Airport to Kyoto city

A. Take MK Skygateshuttle taxi (Terminal 1, gate H)

This service takes you directly to your destination. A Shuttle reservation is required 2 days before your arrival date. The Meeting point (MK counter) is located next to Gate H of the airport South Exit at terminal 1. Traveling time is about 120 minutes. JPY 4,200 per person.

B. Take Limousine Bus
1. Take Limousine Bus from gate 8 at terminal 1 or gate 2 at terminal 2 to Kyoto Station. JPY 2,550 per person.
2. From Kyoto Station, take JR E Line (San-in Line) to Tambaguchi station. (1 stop)

C. Take Kansai Airport Limited express Haruka

Purchase your ticket from JR-WEST ticket office in the airport. It takes 1 hour and 10 minutes from Kansai International Airport to Kyoto station.

From Osaka International Airport to Kyoto City

A. Take Limousine Bus
1. Take Limousine Bus from gate 5 at North terminal or gate 15 at South Terminal to Kyoto Station. JPY 1,310 per person.

From Tokyo Station

A. Take Tokaido Shinkansen to Kyoto station.

You can purchase your ticket at Tokyo station. It takes 2 hours and 20 minutes to reach Kyoto station.

From Tambaguchi station to Kyoto Research Park.

1. Take the path to the station ticket gate.
2. Go down the hallway and turn left.
3. Walk two blocks and turn left.
4. Kyoto Research Park will be on the right.

Kyoto Research Park

The 4ᵗʰ East block floor plan
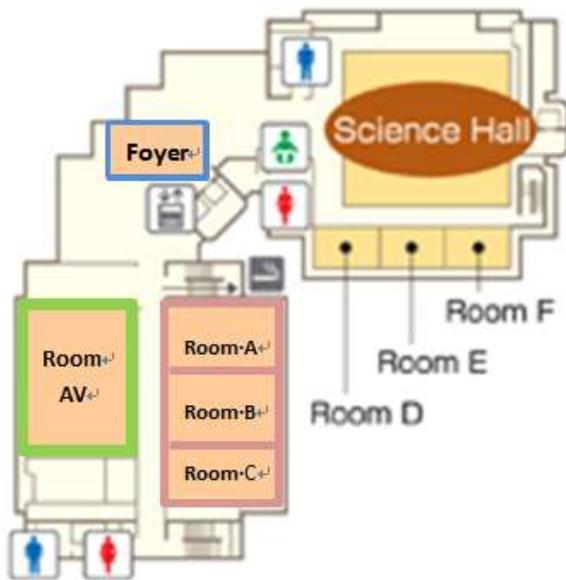
The 1ˢᵗ East block floor plan
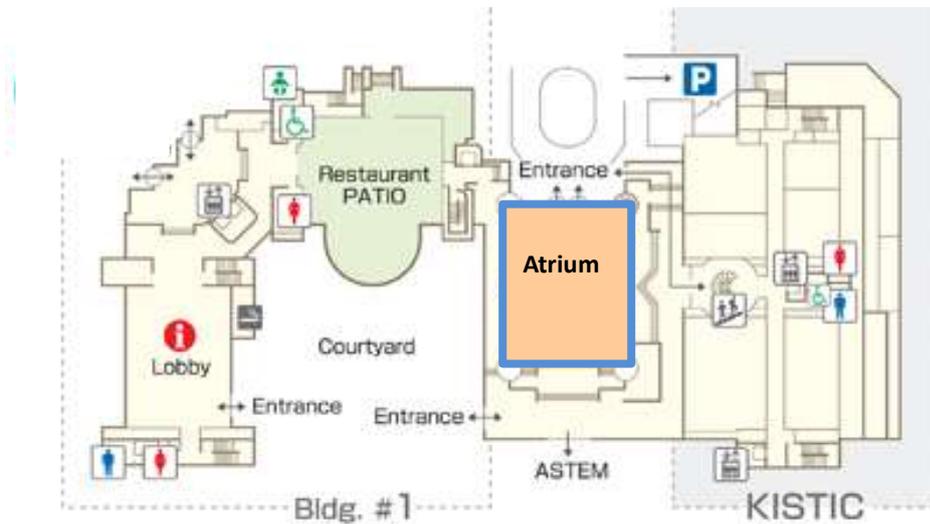
Registration: Foyer area, 4ᵗʰ floor

Poster Session: Room AV

Tea Break & Networking: Foyer area and Room AV

Oral Session: Room A, B and C

Lunch: Atrium, 1ˢᵗ floor

Conference Schedule

Tuesday, March 27, 2018		
15:00-17:00	**Pre-Registration**	Foyer Area, 4F
17:00-17:30	**Gathering for Gala Dinner Party**	Foyer Area, 4F
17:30-20:00	**Optional Socializing Event- Gala Dinner Party**	GANKO restaurant

	Wednesday, March 28, 2018	
	Oral Session	
	Kyoto Research Park ,4F	
Time	**Schedule**	**Venue**
08:30-17:00	**Registration**	Foyer Area, 4F
08:45-10:15	Computer and Information Sciences(1)	Room A, 4F
	Mechanical Engineering (1)	Room B, 4F
10:15-10:30	**Tea Break & Networking**	Foyer Area, 4F
10:30-12:00	**Natural Sciences Keynote Speech (1)** **Dr. Anthony Johnson** *Topic:* Sustainability: First Aid for Planet Earth **Natural Sciences Keynote Speech (2)** **Dr. Hogan Yu** *Topic:* Mobile Electronics as Quantitative Point-of-care Diagnostic Tools: from Disc Players to Smartphones	Room A, 4F
	Environmental Science	Room B, 4F
12:00-13:00	**Lunch Time**	Atrium, 1F
13:00-14:30	Life Science (1)	Room A, 4F
	Chemical Engineering	Room B, 4F
14:30-14:45	**Tea Break & Networking**	Foyer Area, 4F
14:45-16:15	Biological Engineering (1)	Room A, 4F
16:15-16:30	**Tea Break & Networking**	Foyer Area, 4F
16:30-18:00	Electrical and Electronic Engineering	Room A, 4F

Wednesday, March 28, 2018	
Poster Presentation	
Room AV, 4F	
Time	**Schedule**
13:00-13:50	**Poster Sessions (2)** Computer and Information Sciences / Electrical and Electronic Engineering / Fundamental and Applied Sciences
14:00-14:50	**Poster Sessions (3)** Life Science
15:00-15:50	**Poster Sessions (4)** Mechanical Engineering
16:00-16:50	**Poster Sessions (5)** Material Science and Engineering / Biological Engineering / Chemical Engineering
17:00-17:50	**Poster Sessions (6)** Civil Engineering / Environmental Science

Thursday, March 29, 2018		
Oral Session		
Kyoto Research Park ,4F		
Time	**Schedule**	**Venue**
08:30-17:00	**Registration**	Foyer Area, 4F
08:45-10:15	Computer and Information Sciences (2)	Room A, 4F
	Biological Engineering (2)	Room B, 4F
10:15-10:30	**Tea Break & Networking**	Foyer Area, 4F
10:30-12:00	Life Science (2)	Room A, 4F
12:00-13:00	**Lunch**	Atrium, 1F
13:00-14:30	Life Science (3)	Room A, 4F
13:00-14:30	Civil Engineering	Room B, 4F
14:30-14:45	**Tea Break & Networking**	Foyer Area, 4F
14:45-16:15	Mechanical Engineering (2) / System and Naval Mechatronic Engineering	Room A, 4F
14:45-16:15	Fundamental and Applied Sciences / Geosciences and Petroleum Engineering	Room B, 4F
16:15-16:30	**Tea Break & Networking**	Foyer Area, 4F
16:30-18:00	Material Science and Engineering	Room A, 4F

Natural Sciences Keynote Speech (1)

Room A, 4th floor
10:30–12:00, Wednesday, March 28, 2018

Topic:
Sustainability: First Aid for Planet Earth

Dr. Anthony Johnson

Seoul National University of Science and Technology

Abstract

Some of the earliest recorded environmental protection efforts were during the seventh century A.D. but environmental protection has been common throughout the centuries, gaining ground during the Industrial Revolution (circa 1750) and becoming increasingly important up to the present day. In 1987 the United Nations, Brundtland report introduced concept of sustainable development covering almost every aspect of human existence which might impact the planet. In the intervening years a great deal of work has been done by many researchers, companies and nations to define environmental systems and explain and identify environmental problems. General environmental awareness and action has markedly grown but the question must be asked, "Is the current effort enough against the backdrop of a burgeoning population and its ravenous need for goods and products?"

This paper reviews how humans use and abuse the planet and goes on to define sustainability by suggesting improvements to current practice to reduce waste and improve the longevity of "Lifeboat Earth". Furthermore attention is given to the increasing needs of the population in terms of consumerism and the general impact that this leaves on the planet. Some defining examples are included.

Natural Sciences Keynote Speech (2)

Room A, 4th floor
10:30–12:00, Wednesday, March 28, 2018

Topic:

Mobile Electronics as Quantitative Point-of-care Diagnostic Tools: from Disc Players to Smartphones

Dr. Hogan Yu

Department of Chemistry, Simon Fraser University, Vancouver, Canada

Abstract

Current guidelines for healthcare emphasize rapid testing and reporting, which can be better satisfied by point-of-care (POC) diagnostic tools rather than centralized medical laboratories using automated multi-analyte analyzers by trained professionals. With POC testing, the turn-around time is significantly reduced, leading to earlier decision making and more efficient medical treatment. At present, POC protocols are predominantly based on rapid-test immunoassay strips/cassettes that combine gold nanoparticles for colorimetric (mostly qualitative) detection and flow-through systems for sample delivery. Mobile electronics provides a promising alternative to today's POC testing protocol; we have established both the chemistry and signal readout methodology for running assays with disc players, and recently explored the feasibility of using smartphones as the detection platform for quantitative colorimetric analysis.

Computer and Information Sciences (1)

Wednesday, March 28, 2018　　　　08:45-10:15　　Room A

Session Chair: *Prof. Azween B. Abdullah*

ACEAIT-0008

PrivAegis – Enhancing Privacy and Confidentiality on Web Browsers

Azween B. Abdullah｜*Taylor's University*

Noor Zaman Khan｜*King Faisal University*

Ramachandran Ponnan｜*Taylor's University*

Samir Brahim Behaouari｜*Hamad Bin Khalifa University*

ACEAIT-0022

Click-and-Mortar Social Networking with Business Intelligence

Frank S.C. Tseng｜*National Kaohsiung University of Science and Technology*

Annie Y.H. Chou｜*ROC Military Academy*

ACEAIT-0038

Approximation Algorithms for Minimizing Total Busy Time on Parallel Machines

Chi-Yeh Chen｜*National Cheng Kung University*

ACEAIT-0051

HEVC Fast Multiple Frame Selection Based on Data Mining

Chou-Chen Wang｜*I-Shou University*

Song-Hui Hong｜*I-Shou University*

Liang-Chun Chen｜*I-Shou University*

ACEAIT-0119

An AR Music Game for the Dementia Elderly

Chen Yi Lin｜*National Taichung University of Science and Technology*

Wan-Hsuan Liu｜*National Taichung University of Science and Technology*

You-Lian Lin｜*National Taichung University of Science and Technology*

Pei-Tzu Chiu｜*National Taichung University of Science and Technology*

Jia-Yun Chiang｜*National Taichung University of Science and Technology*

Ko-Yi Hsieh｜*National Taichung University of Science and Technology*

ICBASS-0173

A Study of Internship Training in Computing: Student Perceptions

Kelvin Chi Kuen Wong｜*Hong Kong Baptist Universityy*

Fion Sau Ling Lee｜*Hong Kong Baptist University*

Martin Man Ting Choy｜*Hong Kong Baptist Universityy*

PrivAegis – Enhancing Privacy and Confidentiality on Web Browsers

Azween B Abdullah[a,*], Noor Zaman[b], Ramachandran Ponnan[c], Samir Brahim Behaouari[d]

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[d] College of Science and Engineering, Hamad Bin Khalifa University, Qatar

Abstract

For long, web browsers have had the aim of improving the experience of their users and with that purpose, several mechanisms, for instance predictive browsing have emerged. However, privacy and confidentiality of users while browsing on the internet are at high risk of breach since majority of the browsers tend to focus on performance rather than protection. As such, preservation of privacy and confidentiality of users while browsing on the internet has become indispensable since a breach of the 2 aforementioned properties can lead to exposure of crucial information like IP addresses and the search history and as such, reputation of the victim users is at stake. As such, an approach to halt privacy and confidentiality breaches on web browsers by combining several existing mechanisms is under scrutiny in this paper. The proposed system is a Google Chrome extension which tackles the issue of privacy and confidentiality breach in 2 ways: securing the predictors on Google Chrome and also relaying and encrypting communication between a user's web browser to the servers using the concept of onion routing and henceforth, preventing man-in-the-middle attacks. Comparative to other existing systems, the proposed system merges RSA, proxy chaining as well as predictors' security which makes it unique to Google Chrome only.

Keywords: Confidentiality breaches, privacy breaches, encryption

ACEAIT-0022

Click-and-Mortar Social Networking with Business Intelligence

Frank S.C. Tseng[a,*], Annie Y.H. Chou[b]

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Abstract

The shared but scattered resource pool in on-line social network sites is becoming an influential repository for the analysis of many kinds of business activities. However, most of the research projects utilize the data in social network sites only. They do not take enterprises' data into account to link the data from both sides. Such integration models may face a gigantic pool of "dynamic" relationship data with noisy entities, and suffer from inefficiency for on-line applications due to the labor-intensive, error-prone, and time-consuming process. In contrast to the "dynamic" relationships, we can actually find "static" relationships stored in traditional enterprises' relational databases, which change in a slowly fashion or may be even kept unchanged forever. In this paper, we try to advocate a preliminary framework for every enterprise by using the internal operational database as a base consisting of customers, employees and product entities with their "static" relationships. This base can be converted into a graph database, which evolves to connect to interested on-line social network sites by linking their employees, customers, product manufacturers and related staffs through linkage analysis (or entity resolution) methods. We call this *click-and-mortar social networking*, as it makes everything virtually or physically engage in the enterprise operation not only semantically-related, but also socially relevant. Based on our framework, the constructed graph database can be easily linked to traditional relational technologies, including data warehouses and business intelligence, with the pre-existed applications being linked to social intelligence seamlessly. We believe this framework helps us pave a way for developing people-centric technologies for the needs of social resource integration and social business intelligence in every domain.

Keywords: Graph Database, Graph Cube, Social Business Intelligence, Social Networking.

Approximation Algorithms for Minimizing Total Busy Time on Parallel Machines

Chi-Yeh Chen

Department of Computer Science and Information Engineering, National Cheng Kung University, No. 1, University Road, Tainan, Taiwan.

E-mail address: chency@csie.ncku.edu.tw

Abstract

This work considers a fundamental scheduling problem in which a bounded number of jobs can be processed simultaneously by a single machine. The input is a set of jobs of which each must be processed within a particular interval. The jobs are scheduled on a set of identical machines with bounded parallelism g, which is the maximal number of jobs that can be processed simultaneously by a single machine. Each machine operates in a busy interval, which contains all the contiguous intervals. The goal is to schedule all of the jobs in their time intervals, subject to the machine capacity constraint, such that the total busy time of all machines is minimized. This work firstly describes a novel polynomial-time randomized approximation algorithm for clique instances. The expected approximation ratio is $\max\{f_1(\alpha_1, g), f_1(\alpha_2, g)\}$ for $g \geq 4$ where $f_1(\alpha, g) = (g-1) \cdot e^{-\alpha} + 1$, α_1 is the root of $(\alpha - 1) \cdot (e^\alpha - 1) - g = 0$ and α_2 is the root of $f_1(\alpha, g)^2 - (g + \alpha) \cdot f_1(\alpha, g) + g \cdot \alpha = 0$. When $g = 2$ and $g = 3$, the expected approximation ratio is $(g \cdot H_g)/(\alpha + H_g - 1)$ where H_g is the g-th harmonic number.

Keywords: Abstract, preparing a manuscript, writing skills, Grammar

HEVC Fast Multiple Frame Selection Based on Data Mining

Chou-Chen Wang[*], Song-Hui Hong, Liang-Chun Chen

Department of Electronic Engineering, I-Shou University, Kaohsiung, Taiwan

E-mail: chchwang@isu.edu.tw

1.   Background

High efficiency video coding (HEVC) is the newest video encoding standard for ultrahigh definition (UHD) video applications. HEVC adopts some new coding structures including coding unit (CU), prediction unit (PU) and transform unit (TU) [1]. In the PU structure, HEVC adopts motion estimation (ME) module to achieve inter prediction. In order to improve the accuracy of PU prediction, HEVC allows the ME module performing on multiple reference frames (MRF) motion estimation (MRF-ME). Although the ME-MRF can enhance the PU performance and allow the encoder to search a better reference frame from several previous pictures, the computational complexity of the ME-MRF dramatically increases. Thus, the real-time applications of HEVC will be limited.

In order to reduce the computational complexity of MRF-ME module in HEVC, Yang et al. proposed a HEVC fast reference picture selection recently [2]. After the statistical analysis in performing ME-MRF process, they found that a high correlation exists between the best reference frame and lowest rate-distortion cost (RD cost) associated with advanced motion vector prediction (AMVP). Therefore, they use the predefined threshold to determine whether the AMVP-selected reference frame is the best reference frame. However, the predefined threshold is inefficient when the video sequence with active motion and complicate background.

2.   Simulation Results

The coding performance is evaluated by the comparisons of BD-rate, BD-PSNRY [5] and time improving ratio (TIR) between Yang's [2] and the proposed method under the HEVC software platform (HM16.7) [6]. The TIR is defined as following

$$TIR = \frac{TIME_{HM16.7} - TIME_{method}}{TIME_{HM16.7}} \times 100\% \qquad (1)$$

Table 1 shows the performance comparisons between Yang's and the proposed method when performing 8 reference frames (MRF=8) based on HM 16.7. Simulation results show that the proposed method and Yang's both can achieve average TIR about 82.49% and 66.70%, respectively. In addition, we also can find that the TIR of our method is more than Yang's method about 16%. On the other hand, it is clear that the proposed method can efficiently increase the speed of HEVC encoder with insignificant loss of image quality.

Keywords: Data mining, Video coding standard, HEVC, Motion estimation

ACEAIT-0119

An AR Music Game for the Dementia Elderly

Chen-Yi Lin[a,*], Wan-Hsuan Liu[b], You-Lian Lin[c], Pei-Tzu Chiu[d], Jia-Yun Chiang[e], Ko-Yi Hsieh[f]

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Abstract

The world's older population continues to increase at an unprecedented rate, and the prevalence of dementia is rising dramatically. In this paper, a music game with augmented reality is developed for the dementia elderly, which combines the game module, the song module, the personal settings module, and the personal record module into one mobile device. The goal of the music game proposed is to help the elderly with dementia to recall old memories and keep their minds active, along with deep brain stimulation and reactive training to prevent the dementia.

Keywords: Dementia Elderly, Music Game, Augmented Reality

A Study of Internship Training in Computing: Student Perceptions

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Abstract

It is commonly accepted that the integration of students' classroom learning with real world practical experience is an important component of student engagement and development in higher education. Due to the growing popularity of internships, a lot of studies across different disciplines in higher education can be found in literatures. However, little research related to computing is available. This study aims to investigate the effectiveness of internship in an undergraduate computing programme. Findings highlight the relevance of the courses to the internship tasks and enhancement in some soft skills. Two further research directions are proposed.

Keywords: Internship, Undergraduate, Computing

Mechanical Engineering (1)

Wednesday, March 28, 2018   08:45-10:15   Room B

Session Chair: *Prof. Rong-Hua Yeh*

ACEAIT-0049

Laminar Fully Developed Flow in a Heat Exchanger with Internal Longitudinal Fins

Rong-Hua Yeh｜*National Kaohsiung Marine University*

ACEAIT-0056

The Performance Investigation of an Organic Rankine Cycle with Mixture for Waste Heat Recovery

Min-Hsiung Yang｜*National Kaohsiung Marine University*

ACEAIT-0063

The Study of Sensing Performance on Open-Cavity Fiber-Optic Interferometer Sensor Fabricated by CO_2 Laser

Jyun-Hao Chiu｜*National Pingtung University of Science and Technology*

Yan-Xian Li｜*National Pingtung University of Science and Technology*

Yi-Cheng Hsu｜*National Pingtung University of Science and Technology*

ACEAIT-0149

Secondary Mirror Focusing Mechanism for a Small Satellite Camera

Jai-Hyuk Hwang｜*Korea Aerospace University*

Dae-Gi Hong｜*Graduate School of Korea Aerospace University*

ACEAIT-0152

Experimental Study of Yaw Angle Effect on the Aerodynamic Performance of Rear Spoiler

Cheng See Yuan｜*Universiti Teknikal Malaysia Melaka*

Chin Kwang Yhee｜*Universiti Teknikal Malaysia Melaka*

ACEAIT-0161

Transient Distributions of Flow Velocity and Temperature in an Inertance Pulse Tube Cryocooler

Gilhwan Lee｜*Graduate School of Sunchon National University*

Kyunghwan Lee｜*Sunchon National University*

Jongwook Choi｜*Sunchon National University*

Jaesoo Kim｜*Chosun University*

Laminar Fully Developed Flow in a Heat Exchanger with Internal Longitudinal Fins

Rong-Hua Yeh

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Abstract

The laminar velocity and temperature distribution in an internal finned tube is investigated numerically. The flow is assumed to be both hydrodynamically and thermally developed with uniform outside wall temperature. Giving specified frontal area of flow, the friction factor as well as Nusselt number is obtained for different fin number, fin length and fin thickness. This study starts with non-dimensionalizing the governing equations of steady-state, fully developed laminar flow. To solve the difficult boundary value problem, the cross-section of flow was divided into upper and lower subdivisions. In the adjacent region of the two subdivisions, principle of continuity of velocity is employed to solve the temperature profile by finite difference method with successive over-relaxation. The effects of fin numbers of 4, 6, 8, 12, 14 and 16 and dimensionless fin length of 0.1, 0.3, 0.5, 0.7and 0.9 on flow characteristics are studied. The results show that the friction factor has a significant raise as fin number or fin length increases whereas the friction factor decreases for a larger Reynolds number. In addition, it is found that the emergence of closed loop isotherms between the area of two neighboring fins leads to heat transfer enhancement in the internally finned tube. Finally, a simple experiment is conducted to verify the numerical results

Keywords: Heat exchanger; Laminar flow; Friction factor, Closed loop; Heat transfer

The Performance Investigation of an Organic Rankine Cycle with Mixture for Waste Heat Recovery

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Abstract

The organic Rankine cycle (ORC) has great potential to recover the waste heat from low temperature heat source and produce useful work because of the low boiling temperature working fluids. In this study, to overcome the fixed thermodynamic performances of the pure-component working fluids, R245fa/R236fa mixture is selected and employed as the working fluids in power cycle for WHR. The aim of this study is to investigate the effects of the evaporator inlet temperature and the concentrations an of organ ORC system employing R245fa/R236fa a mixtures as the working fluid for waste heat recovery. The results indicate that the ORC cycled with R245fa/R236fa behaves higher thermodynamic performance than cycled with pure R236fa or pure R245fa.

Keywords: R245fa/R236fa, mixture, organic Rankine cycle, waste heat recovery

The Study of Sensing Performance on Open-Cavity Fiber-Optic Interferometer Sensor Fabricated by CO2 Laser

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Abstract

In this study, an open-cavity fiber-optic Fabry-Pérot interferometer sensor fabricated by CO_2 laser is demonstrated. The single-mode optical fiber is cut into two sections and formed two symmetric end-faces by laser processing. The two fiber end-faces are adhered to the acrylic stage in the manner of coaxial alignment. The light signal transmits through the one end-face is reflected by the other end-face to form an open-cavity. When light enters the open- cavity, it reflects on two different end-faces to form two reflective light signals. The two reflective light signals will eventually interfere to form the interference spectrum. The interference spectrum shifts due to the refractive index of the surrounding in the cavity. In this research, the change of refractive index of surrounding is achieved by sucrose aqueous solution with the refractive index of 1.3333 to 1.3680 RIU. The corresponding interference spectrum shift is measured and sensing sensitivity with coefficient of determination is also calculated. The parameter of end-face shape and distance are also discussed.

Keywords: CO_2 Laser processing, Open-cavity fiber-optic Fabry–Pérot interferometer sensor, Refractive index, Sensing sensitivity.

Secondary Mirror Focusing Mechanism for a Small Satellite Camera

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1. Introduction

Satellites are gradually becoming smaller and lighter to reduce development, production and launch costs. Small satellite cameras for high-resolution Earth observation require submicron accuracy for alignment to ensure optimum telescope performance. Despite precise alignment processes prior to launch, misalignment occurs between optical components due to external factors during launch and operation. These misalignments cause serious degradation in satellite image quality. To compensate for this, most high-resolution satellite cameras go through a precise realignment process called refocusing before and during operation. In this study, a servo type mechanism that enables the x-axis, y - axis tilt and de-space movement of the secondary mirror (M2) was proposed. The optical system that adopts the focus mechanism was chosen a s Schmidt-Cassegrain type. The focus mechanism was installed behind the secondary mirror for the efficient spatial utilization of the Cassegrain type optical system as shown in Fig. 1. To minimize deformation of the secondary mirror surface when the focus mechanism is driven, the flexures were attached to the M2 connection.

2. Conclusion

In this paper, a three-axis focus mechanism was designed for carrying out the on-line refocusing of a small satellite camera. The position servo performance test for verification of the designed focus mechanism was also conducted. According to test results, the de-space movement precision was shown as 0.06 μm, which is much less than 0.5 μm requirement. The accuracy of the x- and y- axis tilt is a 3.5 μrad, which is less than a requirement of 5 μ rad. It has been found that the focusing mechanism is designed to satisfy the system requirements sufficiently.

Keywords: Focusing Mechanism, Misalignment, Secondary Mirror, Small Satellite Camera

Experimental Study of Yaw Angle Effect on the Aerodynamic Performance of Rear Spoiler

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1. Background/ Objectives and Goals

Various studies had shown the effectiveness of rear spoiler in improving the aerodynamic drag and downforce (i.e. negative lift) of road vehicles. In most studies, the aerodynamic forces were measured at zero yaw angle, which corresponds to a vehicle running on a straight path and without any crosswind. However, in practice, the use of rear spoiler to improve the downforce is most needed during cornering (i.e. none zero yaw condition) due to drive stability and safety reasons. Therefore, it is important to examine how yaw angle could modify the aerodynamic characteristic of vehicle fitted with a rear spoiler.
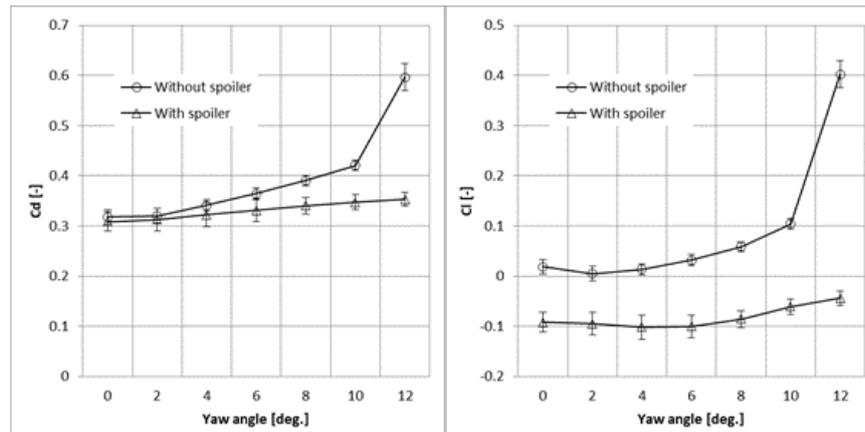
2. Expected Results/ Conclusion/ Contribution

Fig. 1: Effect of yaw angle on the drag (left) and lift (right) coefficients

When without the spoiler, yaw angle is found to have negative influence on both the coefficients of drag Cd and lift Cl of the model from two degree onwards (Fig. 1). The influence was most apparent above $10°$ yaw with a surge of the two coefficients at $12°$. However, when the rear spoiler was employed, the negative influence has been greatly suppressed. Most noticeably, the sudden large increase in the two coefficients at the maximum yaw angle has been eliminated. In addition, when employing the rear spoiler, the values of Cd and Cl were also generally lower than the case without the spoiler for the range of yaw angle tested. When comparing the standard deviations of Cd and Cl at each yaw angle, the model without the spoiler exhibits large deviation at the maximum yaw angle. The large Cd and Cl fluctuation ranges suggest the model without the spoiler was experiencing more severe flow unsteadiness at the maximum yaw angle. The high level of flow unsteadiness is undesirable because it could lead to buffeting, a phenomena associated to wind noise and driving stability issue. Contrary, when the rear spoiler is applied, apart from preventing the surge of the two coefficients, the large flow deviation ranges had also been eliminated. As a conclusion, the application of rear spoiler not only reduces the aerodynamic drag and lift of the hatchback model at moderate yaw angle, it also prevents the surge of the forces at high yaw angle. In addition, it can prevent severe flow unsteadiness at high yaw angle which is undesirable because of the potential wind noise and drive stability issues.

Keywords: spoiler, yaw angle, aerodynamics, vehicle, hatchback, wind tunnel

Transient Distributions of Flow Velocity and Temperature in an Inertance Pulse Tube Cryocooler

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1. Background/ Objectives and Goals

The inertance pulse tube cryocooler (IPTC) has been applied in various fields, especially in the cooling of detectors for infrared imaging, radio frequency filters, and medical equipments. The cryogenic cooling is necessary to reduce the background photon noise and any residual dark current or thermal noise induced in the detector for the high sensitivity. It can also reduce the noise of detector in gamma-ray spectrometers and shot noise in the amplifier. It was intended to understand the complicated fluid motion and heat transfer in the components of IPTC and to improve the cooling performance of IPTC. The effect of volume ratio between the volume behind the piston and the cylinder volume of compressor was investigated with two dimensional axisymmetric modeling.(with the transient distribution of flow velocity and temperature in the IPTC system)

2. Expected Results/ Conclusion/ Contribution

It was confirmed that the model considering the effect of leakage through the crevice between the piston and cylinder wall of compressor showed a significant effect on the flow velocity in the compressor, consequently temperature distribution. The effect of volume ratio between the volume behind the piston and the cylinder volume of compressor was compared with the averaged temperature history at the cold heat exchanger. It showed that the history of averaged temperature at the cold heat exchanger drops rapidly by 6K per each cycle during initial 1~2sec after starting and after approximately 10seconds it drops relatively slowly at each cycle and decayed to 98.7K after 30seconds. After 40 seconds it doesn't show any meaningful temperature drop with the moving of piston and converged to the lowest temperature it can produce. As the piston compresses and expands, the temperature at the cold heat exchanger repeats the rise and drop in temperature oscillatory. As the volume ratio increases, the averaged temperature at the cold heat exchanger drops faster and lower. The temperature at the cold heat exchanger at 12 seconds shows approximately 158K in the case of volume ratio 1, which is the highest averaged temperature. As the volume ratio increases, the temperature at the cold heat exchanger drops rapidly until the volume ratio 4. In the cases over the volume ratio 5, the temperature at the cold heat exchanger doesn't change so much. The temperature after 12sec shows that the volume ratio 6 is the optimum volume ratio. The case of volume ratio 7 showed slower temperature drop after 9~10sec. The pressure history in the cylinder of compressor showed that it increases rapidly at the beginning until 10seconds and converged to approximately 3.75MPa. It also increases a little amount during compression and expansion as the cycle elapsed. Through this work it is found that the leakage through the crevice can affect the flow field and temperature distribution in the IPTC and the volume ratio between the volume behind the piston and the cylinder volume of compressor has the optimum value which can affect cooling capacity and performance of IPTC.

Keywords: Inertance pulse tube cryocooler, CFD, compressor, numerical modeling

Environmental Science

Wednesday, March 28, 2018   **10:30-12:00**   **Room B**

Session Chair: *Prof. Somjai Karnchanawong*

ACEAIT-0032

Effect of Fly Ash Addition on Performance of Composting of Waste from Pineapple

Somjai Karnchanawong｜*Chiang Mai University*

Atittaya Tapang｜*Chiang Mai University*

ACEAIT-0010

Application of Response Surface Methodology (RSM) in Wastewater Treatment by Ozonation

Thangavel Sangeetha｜*National Taipei University of Technology*

Bakthavachallam Subha｜*Korea Maritime and Ocean University*

Chin-Tsan Wang｜*National ILan University*

Wei-Mon Yan｜*National Taipei University of Technology*

ACEAIT-0021

Effects of Alkaline Solution and TFT–LCD Waste Glass on the Simulation of Metakaolin-Based Geopolymers

Kang-Wei Lo｜*National Taipei University of Technology*

Kae-Long Lin｜*National ILan University*

Ta-Wui Cheng｜*National Taipei University of Technology*

Yan-Yu Lin｜*National ILan University*

ACEAIT-0025

Rice Husks as a Resource - Critical Characteristics and Current Applications of Rice Husk Silica -

Ryoko Sekifuji｜*Toyama Prefectural University*

Masafumi Tateda｜*Toyama Prefectural University*

ACEAIT-0096

Blending of Inheriting Technology with Modern Technology by "Wellassa Nawodaya"

S.M. Anura Nelugolla ｜*Director of Irrigation*

Gamini Wijith Wijayamuni De Zoysa ｜*Department of Irrigation*

Wasantha Bandara Palugaswewa ｜*Department of Irrigation*

B.G. Thanura Lasantha Guruge ｜*Department of Irrigation*

ACEAIT-0114

Mass Balance Estimation of Dokriani Glacier in Central Indian Himalaya using Remote Sensing Data

Har Amrit Singh Sandhu ｜*PEC University of Technology*

H.S. Gusain ｜*Snow and Avalanche Study Establishment (SASE)*

M.K.Arora ｜*PEC University of Technology*

Arun Bawa ｜*PEC University of Technology*

Effect of Fly Ash Addition on Performance of Composting of Waste from Pineapple

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Abstract

The objective of this research was to study the effect of fly ash addition on performance of composting of pineapple wastes. The experiment consisted of 4 sets and each set was performed in duplicate. The composting was conducted in a 55 L polystyrene box. The compost mixes in all sets included pineapple waste, sawdust, cow dung and biomass fly ashes. The proportions of fly ash in the experiment set 1 to 4 were 0, 5, 10 and 15% wet weight, respectively. The initial C/N ratio of compost mix was 27/1. The temperature at the middle portion of compost mix was measured everyday while the compost sample was taken weekly for the analysis. The composting was performed for 56 days. The results showed that the composts in fly ash amended treatments were found to be stable around one week faster than the control treatment. Around half of the total mass decreasing of the compost mixes in all treatments had been investigated while more than half of the total fly ash-free mass reductions were found in the fly ash amended treatments. More neutral pHs were investigated in the higher percentage of fly ash amended. The higher germination index was found in the higher ratio of fly ash treatment. The C/N ratios of the finished composts from experiment 1 to 4 were 10.1, 7.74, 8.04 and 7.90, respectively. The results obtained from this study clearly showed the increasing rate of mineralization of compost in the fly ash treatment. It can be concluded that the addition of fly ash in proportion 15% gave the best composting performance and the best finished compost quality.

Keywords: Composting, acidic waste, pineapple waste, biomass fly ash

Application of Response Surface Methodology (RSM) in Wastewater Treatment by Ozonation

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1.   Background/ Objectives and Goals

This research study was focused on investigating the feasibility of Ozonation process in the treatment of Sago-starch wastewater. Optimization of this process was computationally evaluated by using the Design Expert software (Central Composite Design Expert) and the statistical tool Response surface methodology (RSM). Sago, the edible starch globules processed from the tubers of tapioca (*Mannihot utillisema*), is the staple diet of middle income populations in Southern India with more than 1000 industries in the state of Tamilnadu. Sago wastewater is complex and acidic in nature with high organic matter, intense COD and BOD, suspended solids, obnoxious odor and irritating color. This wastewater was attempted to be treated by ozonation process and optimization was performed using a computational software Response surface methodology (RSM) in central composite design. Ozonation is one of the most significant Advanced Oxidation Process (AOP) employed for wastewater treatment as ozone is a very powerful oxidant. Response surface method (RSM) is an efficient statistical tool to optimize the operating conditions in multivariable systems by considering the interactions between variables and responses. This research study demonstrated the practical applicability of ozonation process for effective organic load removal from sago wastewater.

2.   Results and Conclusion

An increase in the COD removal efficiency was observed with increasing pH, ozone dose and ozonation time. Maximum removal efficiency was at pH 9-9.8, ozone dose 37% and ozonation time of 88 min. Potassium levels rose at neutral pH 7, with maximum ozone dose, but decreased at alkaline pH. On the other hand the level of sodium increased with increasing pH, time and dose, but decreased at highly acidic and alkaline pH. Phosphate value was found to increase at highly acidic and highly alkaline conditions, whereas it decreased at neutral pH. Studies were conducted to find out the efficiency of ozonation on the bacterial count of sago wastewater. Prior to ozonation the bacterial count was 10×10^2/ CFU/ml, but after ozonation the bacterial count was nil. Conclusively, it can be reported that RSM was effectively employed with the computational aid of central composite design software for the assessment of the interaction effects of variables on responses. This study had promising insights into better understanding of the ozonation process and its integration with technology. This will in turn prioritize future application of this process.

Keywords: Sago wastewater, Ozonation, Response surface methodology (RSM), computational software

Effects of Alkaline Solution and TFT–LCD Waste Glass on the Simulation of Metakaolin-Based Geopolymers

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[b,d] Department of Environmental Engineering, National Ilan University, Yilan city, 260, Taiwan

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Abstract

This study investigated the effects of constituent thin-film transistor liquid crystal display waste glass (TLWG) (0%–40%) and the solid/liquid (S/L) ratio on the properties of metakaolin-based geopolymers (MKGP). For MKGP with a 10% TLWG replacement level, after a curing time of 1 day, the S/L ratio increased from 0.8 to 1.0 with a corresponding strength increase of 5.6 to 8.8 MPa. In the heat revolution of MKGP with 10% TLWG, the first exothermal peak of TLWG-MKGP with an S/L ratio of 1.0 was more intense than that with an S/L ratio of 0.4. When the TLWG replacement level was increased from 10% to 40%, after a curing time of 28 days, the weight loss of MKGP in the 230–400 ℃ temperature range decreased from 15.42% to 15.19%. When the S/L ratio was increased from 0.8 to 1.0, after a curing time of 60 days, the weight loss of 10% MKGP between 230 and 400 ℃ decreased from 16.97% to 14.94%. However, the weight loss from 600 to 750 ℃ increased from 0.55% to 0.85%. When the S/L ratio was increased from 0.6 to 1.0, the fractions of Q^4(3Al) (30.13%–35.07%) and Q^4(2Al) (30.40%–35.13%) increased, whereas the fractions of Q^4(4Al) (23.36%–22.57%) and Q^4(1Al) (10.15%–9.57%) decreased. MKGP with 10%–40% TLWG and an S/L ratio of 1.0 can partially replace metakaolin as a geopolymer because of its useful mechanical characteristics.

Keywords: TFT-LCD waste glass, SiO_2/Na_2O ratio, deconvoluted fractions

Rice Husks as a Resource
- Critical Characteristics and Current Applications of Rice Husk Silica -

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Abstract

Rice husks could be a valuable and sustainable biomass resource because they are regenerated one to three times every year as a by-product of rice agriculture. Rice husks, however, are still considered waste material. Our history of comprehensive research demonstrates that rice husks could be a resource for raw materials in industrial applications.

Keywords: Rice husks, amorphous silica, industrial use, reusing waste

Blending of Inheriting Technology with Modern Technology by "Wellassa Nawodaya"

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Abstract

In 1818 the English Emperor concurred whole Ceylon (Sri Lanka) and deliberately ruined the great hydraulic heritage. It is 200 years to 2018 for a dark era for irrigation and agriculture.

South central part of Sri Lanka which was known as "Wellassa" was the most difficult and final part to concur. Wellassa was so prosperous with agriculture due to its astonishment of irrigation system. However that wonders have ruined and abandoned for two hundred years.

" Wellassa Nawodaya" in the sense of re-awakening of South central is a project launched in late 2016 under parliament approval to reestablish the ruined irrigation heritage and bring back the prosperity with ecological sustainability to South Central.

Studying analyzing comparing and implementing the past hydraulic technology mixing with modern engineering is the major task of this project. Accordingly the learnt knowledge and its applications with progress are discussed in this paper. However the land use has changed after 200 years. Most of the forest cover is destroyed and new cities, settlements and plantations have come in. Therefore restoration the same as it was before 200 years is not that easy. Therefore upper catchment and stream reservation forest cover must be enhanced. This reforestation and environment protection with sustainable ecology are mingling with modern Engineering, and inherited knowledge.

Keywords: re-awakening, sustainability, hydraulic, civilization, reforestation

Mass Balance Estimation of Dokriani Glacier in Central Indian Himalaya Using Remote Sensing Data

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Abstract

Dokriani Glacier is one of the important glaciers of Bhagirathi River basin which fed river Ganges. The length of the glacier is about 4.6 km and snout elevation is about 4028 m m.s.l.. The mass balance of the glacier was estimated using glaciological field based measurements for a few years during 1994 to 2000. However, due to remote and poor accessibility, the field based measurements could not continue. Remote sensing based methods provide an opportunity to estimate the long-term mass balance of the glacier. In this study, the mass balance of the glacier has been estimated using Accumulation Area Ratio (AAR) method. Remote sensing datasets (Landsat) have been used to estimate AAR for different years from 1994 to 2014. Firstly, a mathematical relationship has been developed between remote sensing derived AAR and field observed mass balance data of the glacier. This mathematical relationship has been used to estimate the mass balance of the glacier for other years using remote sensing derived AAR. Estimated mass balance was validated from ground observed mass balance for few years. A High correlation was observed between ground observed and remote sensing estimated mass balance. It has been observed that AAR for the Dokriani glacier varies from 0.64 to 0.71. The Mass balance of the glacier was observed between -15.54 cm to -50.95 cm during the study period. The study highlights the application of remote sensing in a mass balance study of the glaciers and impact of climate change on glaciers of Central Indian Himalaya.

Keywords: Mass Balance, AAR, Dokriani Glacier, Landsat

Life Science (1)

Wednesday, March 28, 2018　　　　13:00-14:30　　　Room A

Session Chair: *Prof. Kartiawati Alipin*

APLSBE-0016

The Effect of Temulawak (*Curcuma Xanthorrhiza* Roxb.) Rhizome and Belimbing Wuluh (*Averrhoa Blimbi* L.) Fruits Extract on Liver of Streptozotocin-Induced Diabetic Rats

Kartiawati Alipin｜*University of Padjadjaran*

Annisa Maryani｜*University of Padjadjaran*

Madihah｜*University of Padjadjaran*

APLSBE-0014

Inhibitory Efficacy of Thai Medicinal Plant Extracts on Enteric Pathogenic Bacteria

Thida Kaewkod｜*Chiang Mai University*

Yingmanee Tragoolpua｜*Chiang Mai University*

APLSBE-0015

Anti- Herpes Simplex Virus Activities of Mulberry Silk Cocoon and Leaf Polysaccharide Extracts

Kanyaluck Jantakee｜*Chiang Mai University*

Yingmanee Tragoolpua｜*Chiang Mai University*

APLSBE-0018

Function of Mitochondria-Targeting Antimicrobial Peptides against Human Pathogen *Candida Albicans*

Yao-Peng Xue｜*National Tsing Hua University*

Chung-Yu Lan｜*National Tsing Hua University*

APLSBE-0019

***Candida Albicans* Rap1 in Micronazole Resistance**

Wen-Chi Huang｜*National Tsing Hua University*

Ming-Feng Lin｜*National Taiwan University Hospital Chu-Tung Branch*

Chung-Yu Lan｜*National Tsing Hua University*

The Effect of Temulawak (*Curcuma xanthorrhiza* Roxb.) Rhizome and Belimbing Wuluh (*Averrhoa blimbi* L.) Fruits Extract on Liver of Streptozotocin-Induced Diabetic Rats

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Abstract

Diabetes is a metabolic disorder characterized by high blood glucose levels or hyperglycemia due to deficiency or ineffectiveness of insulin. Complications due to diabetes can affect liver structure. Curcuma xanthorrhiza and Averrhoa blimbi known to reduce blood glucose levels. This study aims to determine the effect of combination of C. xanthorrhiza rhizome and A. blimbi fruit extract on the liver structure repair of diabetic male Wistar rats induced by streptozotocin. Twenty-one rats were divided into eighteen diabetic and three nondiabetic rats. The diabetic rats were divided equally into six groups; treated with CMC 0.5% (diabetic control), glibenclamide at dose 0.45 mg/kg BW (reference), extract of C. xanthorrhiza by dosage 17.5 mg/kg BW, extract of A. blimbi by dosage 750 mg/kg BW, combined extract by dosages 767.5 and 383.75 mg/kg BW for 21 constitutive days. The combined extracts treatment by dosage 383.75 mg/kg BW could reduce diameter of central vein and percentage necrotized cells of hepatocytes which significantly different with reference and diabetic control ($p<0.05$), and comparable with nondiabetic rats. In conclusion, the combination of extract by dosage 383.75 mg/kg BW showed a liver structural repairing activities in streptozotocin-induced diabetic of male Wistar rats.

Keywords: Diabetic, extract C. xanthorrhiza, extract A. blimbi, liver histological, rat.

Inhibitory Efficacy of Thai Medicinal Plant Extracts on Enteric Pathogenic Bacteria

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Abstract

Enteric pathogenic bacteria can cause diarrheal disease with several distinct pathogenic mechanisms. They can adhere and multiply at the epithelial cells before enter to internal tissues and leading to severe diseases in humans.   Medicinal plants are interesting as sources of effective and safe alternative natural agents for the treatment of human infection. The aqueous extracts of sixteen Thai medicinal plants were determined for their inhibitory activity against enteric pathogenic bacteria; *Escherichia coli*, *E. coli* O157:H7, *Shigella dysenteriae*, *Salmonella* Typhi and *Vibrio cholerae*. The result showed that the extract of *Psidium guajava*, *Terminalia catappa* and *Sandoricum koetjape* were effective against all tested bacteria with the diameters of inhibition zone ranging from 9.3 mm to 17.3 mm.   The extracts showed minimal inhibitory concentrations ranging from 7.8-62.5 mg/ml and minimal bactericidal concentrations ranging from 62.5-250 mg/ml.   Moreover, inhibition of bacterial adhesion to Caco-2 cell line was tested in this study.   The highest percentage of adhesion inhibition of   *E. coli*, *E. coli* O157:H7, *S. dysenteriae*, *S.* Typhi and *V. cholera* on Caco-2 cell line was observed after testing with *T. catappa* extract by 64.57, 81.60, 84.01, 82.12 and 87.35%, respectively.   The extract of *T. catappa* also showed the highest antioxidant activity, phenolic compound and flavonoid content of 101.18 mg gallic acid equivalent/g extract, 53.19 mg gallic acid equivalent/g extract and 28.23 mg quercetin equivalent/g extract, respectively.   Therefore, *T. catappa* extract should be further developed as a new supplementary product to inhibit enteric pathogenic bacteria and free radicals.

Keywords: Enteric pathogenic bacteria, Medicinal plant, Antibacterial, Antioxidant, Adhesion inhibition

Anti-Herpes Simplex Virus Activities of Mulberry Silk Cocoon and Leaf Polysaccharide Extracts

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Abstract

Herpes simplex virus (HSV) can be divided into 2 types and cause a variety of diseases such as oral herpes and genital herpes. The infections are commonly found worldwide and are distributed in humans of different ages. Acyclovir drug is commonly used for remedy while emergence of the resistant viruses is found and causes a problem in the treatment. Consequently, this study is to search for new effective antiviral agents that can inhibit HSV infection. Mulberry silk cocoon was extracted by boiling and mulberry leaf polysaccharide was extracted using distilled water at 98 °C in water bath. Then, the anti HSV activity of mulberry silk cocoon and leaf polysaccharide extracts was determined when treatment before, during and after viral attachment using plaque reduction assay. The cytotoxicity of the extract on Vero cells were performed by MTT assay. Mulberry silk cocoon and leaf polysaccharide extracts showed low cytotoxicity on Vero cells, and 50 % cytotoxic doses were 8.44 and 6.78 mg/ml. Mulberry silk cocoon extract showed inhibitory activity against HSV-1 and HSV-2 before viral infection with 50% effective dose (ED50) values of 8.08 and 3.99 mg/ml. The inhibition of viral infection with ED_{50} values of 1.98 and 0.79 mg/ml was observed when treatment of HSV-1 and HSV-2 with mulberry silk cocoon extract during viral attachment. Moreover, mulberry leaf polysaccharide demonstrated anti-HSV-2 activity when treatment before, during and after viral attachment with ED_{50} values of 1.40, 0.78 and 2.41 mg/ml, respectively. Therefore, mulberry silk cocoon and leaf polysaccharide extracts exhibited the inhibitory effect against herpes simplex virus and they could be used to produce anti-HSV products.

Keywords: anti-viral activity, herpes simplex virus, polysaccharide, silk cocoon

Function of Mitochondria-Targeting Antimicrobial Peptides against Human Pathogen *Candida albicans*

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1. Background/ Objectives and Goals

Candida albicans is an important human fungal pathogen, which can cause life-threatening infections particularly in immunocompromised patients. Moreover, drug resistance in *C. albicans* has also emerged as a serious problem due to the widespread use of fungicides. Therefore, developing new anti-fungal drugs and studying their mechanisms of actions are very important. In this study, we investigated the mechanisms of several histatin 5-derived antimicrobial peptides (AMPs) involved in eradicating *Candida albicans* cells.

2. Methods

To study the mechanisms of the histatin 5-derived peptides, a mutant library of *C. albicans* was used. The susceptibility of mutants to the AMPs was examined and the results indicated a number of mutants exhibiting resistance to the AMPs were defective in mitochondria. These results raise a possibility that the mitochondria may be a target for the AMPs. Therefore, the intracellular ROS level and the oxygen consumption after peptide treatment were measured. Finally, the ROS scavenger was introduced to verify the role of ROS derived from the AMPs in *C. albicans* killing.

3. Expected Results/ Conclusion/ Contribution

The AMPs testing increase the intracellular ROS levels of *C. albicans*. The oxygen consumption rate of the cell is also significantly decreased after the treatment with AMPs. These results indicate the peptides exert their fungalcidal activity through attacking the mitochondria.

Keywords: *Candida albicans*, pathogen, antimicrobial peptide, drug, ROS, mitochondria

Candida albicans Rap1 in Micronazole Resistance

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1. Background/ Objectives and Goals

Candida albicans is a pathogenic fungus and causes serious infections particularly in immunocompromised patients. Moreover, *C. albicans* is recognized as a major agent of nosocomial infection. Many studies have showed a marked increase in drug resistance of *C. albicans* isolated from patients. Additionally, the generation of toxic reactive oxygen species (ROS) is a well-known mechanism for antifungals to kill planktonic or hyphal *C. albicans* cells. Therefore, antioxidative system is important for survival of *C. albicans* with antifungal treatment. In this study, the transcription factor Rap1 and its possible functions in regulation of antioxidative system are characterized.

2. Expected Results/ Conclusion/ Contribution

We found that the *rap1*-deletion mutants were resistant to oxidative stress and showed a better viability with the treatment of miconazole compared to wild type SC5314. Moreover, the *rap1*-deletion mutants could not be rescued by co-culture miconazole with 50 mM ascorbic acid. Furthermore, *rap1*-deletion mutants had higher mRNA levels and total superoxide dismutase activity compared to SC5314 after miconazole treatment for 4 h. The expression level of *GLR1* gene encoding an essential glutathione reductase was also increase. Glutathione reductase functions in reducing toxic H_2O_2 and is closely related to glutathione content. The total glutathione content in *rap1*-deletion mutants was higher than that in the control after miconazole treatment. Finally, our results showed that not only planktonic but also biofilm cells of the *rap1*-deletion mutants were resistant to miconazole. Together, this study provides new insights into antioxidative activity of *C. albicans*.

Keywords: Rap1, *Candida albicans*, miconazole, drug resistant

Chemical Engineering

Wednesday, March 28, 2018   13:00-14:30   Room B

Session Chair: *Prof. Shingjiang Jessie Lue*

ACEAIT-0061

Agarose Gel Electrolyte Containing Colloidal Titanium Dioxide Nanoparticles and Iodide/Tri-Iodide Redox Couple for Dye Solar Cell

Chao-Ming Shih ｜ *Chang Gung University*

Yun-Ling Wu ｜ *Chang Gung University*

S. Rajesh Kumar ｜ *Chang Gung University*

Shingjiang Jessie Lue ｜ *Chang Gung University*

ACEAIT-0015

Flotation of Silicate Apatite from Lao Cai, Vietnam

Chairoj Rattanakawin ｜ *Chiang Mai University*

Nonpavit Lamlue ｜ *Chiang Mai University*

Wanpita Iam-Mee ｜ *Chiang Mai University*

Wijit Panompiboon ｜ *Chiang Mai University*

Weeraphong Chaiyaeng ｜ *Chiang Mai University*

ACEAIT-0116

Bioethanol Production via Consolidated Bioprocessing of Alkali-Pretreated Rice Straw under Solid-State Conditions using *Fusarium Moniliforme*

Ariel Raye Rica ｜ *University of the Philippines Diliman*

Almajoy Ilao ｜ *University of the Philippines Diliman*

John Steven Magboo ｜ *University of the Philippines Diliman*

Marco Lao ｜ *University of the Philippines Diliman*

Rizalinda L. de Leon ｜ *University of the Philippines Diliman*

ACEAIT-0081

Antimicrobial Activity of Novel Chitosan-Polyethyleneimine-Graphene Oxide Nanocomposites

Jem Valerie D. Perez｜*University of the Philippines*

Joy Vanessa D. Perez｜*University of the Philippines*

Raniv D. Rojo｜*University of the Philippines*

Maria Lourdes P. Dalida｜*University of the Philippines*

Debora F. Rodrigues｜*University of Houston*

ACEAIT-0087

Characterization and Modelling of the Degradation of Hydroxypropyl Cellulose-Blended Sodium Alginate Microcapsules

Julius Nino P. Doctor｜*University of the Philippines Diliman*

Justin Richmond C. Domingo｜*University of the Philippines Diliman*

Ludhovik Luiz B. Madrid｜*University of the Philippines Diliman*

Terence P. Tumolva｜*University of the Philippines Diliman*

ACEAIT-0178

Photocatalytic Hydrogen Production from Seawater using Ag_2O-TiO_2 under Visible Light Irradiation

John Andrew Kane P. Jovellana｜*University of the Philippines Diliman*

Charlene A. De Guzman｜*University of the Philippines Diliman*

Monica Louise N. Trivino｜*University of the Philippines Diliman*

Rizalinda L. De Leon｜*University of the Philippines Diliman*

Agarose Gel Electrolyte Containing Colloidal Titanium Dioxide Nanoparticles and Iodide/Tri-Iodide Redox Couple for Dye Solar Cell

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1.   Background and Objectives

The objective of this work is to develop quasi-solid electrolyte for dye solar cell (DSC) in order to improve photovoltaic efficiency and life time. Dye solar cell containing dye Ruthenizer 520-DN and iodide/tri-iodide (I^-/I_3^-) redox couple serves as the model system. Agarose is added to the electrolyte to help stabilize electrolyte and reduce solvent volatility. Colloidal titanium dioxide (TiO_2) nanoparticles are nano-additive to facilitate ion transfer. The DSCs with various electrolytes are fabricated to evaluate characteristics with relation to their photovoltaic performance. The interactive effects of the agarose and TiO_2 nanoparticles on the ion transport and DSC performance are investigated.

2.   Conclusion

Although the agarose in the electrolyte lowered the diffusivities of I^- and I_3^- ions and limited the conductivity, it offered benefits to stabilize the TiO_2 nanoparticles as mono-dispersed colloids and to facilitate polyiodide formation (I_3^- or I_5^-).. The charged TiO_2 nanoparticles enhanced polyiodide formation in the electrolyte (as revealed in the XPS and Raman spectra). These polyiodides are effective for $I^-/I_3^{-/}I_5^-$ ionic conduction via Grothuss-type charge transfer channels and provided $I^-/I_3^{-/}I_5^-$ ionic conduction paths to expedite the ion transfer rates. The DSC with the agarose electrolyte containing TiO_2 nanoparticles showed improved photocurrent density and photovoltaic efficiency, and prolonged lifetime.

Keywords: Gel electrolyte, colloidal titanium dioxide, dye solar cell, polyiodide ions

Flotation of Silicate Apatite from Lao Cai, Vietnam

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Abstract

The purpose of this research is to study about flotation of phosphate rocks from Lao Cai, Vietnam. Both rocks (Type I and III) are characterized, using X-ray diffraction technique and wet-chemical analysis, as silicate apatite. Run-of-mine Type I apatite is conformed to U.S. fertilizer specification. But Type III apatite must be processed using flotation to meet the need of the fertilizer industry. Direct flotation of Type III apatite with oleic acid gives higher %yield, but lower %P_2O_5. Sodium silicate enhances the direct flotation due to depression and dispersion of silicate minerals. Double flotation with oleic acid followed by amine gives lower %yield, but higher %P_2O_5. The final concentrate from double flotation is suitable for the industry. In order to produce a synergistic performance of apatite flotation, and reduce reagent consumption, using of surfactant mixtures of fuel oil, kerosene, etc. is suggested. To lower the reagent cost, alternative fatty acid and its salts from vegetable oil should be used instead of the expensive oleic acid. It is also suggested that further research about flotation of carbonate apatite (Type II and IV) should be studied due to their huge reserves.

Keywords: Amine, apatite, flotation, oleic acid, phosphate rock

Bioethanol Production via Consolidated Bioprocessing of Alkali-Pretreated Rice Straw under Solid-State Conditions Using *Fusarium moniliforme*

Ariel Raye Rica, Almajoy Ilao, John Steven Magboo, Marco Lao, Rizalinda L. de Leon[*]

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Abstract

The production of bioethanol by the fungus *Fusarium moniliforme* via consolidated bioprocessing under solid-state fermentation conditions was conducted using milled rice straw pretreated with 0.1 M NaOH in 125-mL Erlenmeyer flasks at 28°C and pH 7. The experiment was run in aerobic condition during the first four days and shifted to anaerobic condition for the next 21 days. Nine experimental runs were terminated at different fermentation times for data analysis, and two trials were conducted. The liquid fraction was analyzed for ethanol while the biomass solids were analyzed for cellulose, hemicellulose, and lignin content. A maximum ethanol concentration of 5.37 g/L was obtained after 17 days, corresponding to a yield of 26.4 mg ethanol per g of substrate. Both cellulose and hemicellulose contents of biomass showed decreasing trends as fermentation progressed, suggesting that the fungus was able to ferment both pentose and hexose sugars. Also, relative humidity measurements **showed** that the water activity or relative humidity in the flasks did not decrease appreciably throughout the fermentation.

Keywords: bioethanol, consolidated bioprocessing, solid-state fermentation, *Fusarium moniliforme*, rice straw

Antimicrobial Activity of Novel Chitosan-Polyethyleneimine-Graphene Oxide Nanocomposites

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1. Background/ Objectives and Goals

Bacterial proliferation and biofilm formation has emerged as a significant concern in the medical, environmental, engineering, and food industries. This leads to major economic loss and demonstrates serious public health threat. This study reports the use of a multi-functional nanocomposite material with chitosan (CS), polyethyleneimine (PEI), and graphene oxide (GO) and explores for the first time its antimicrobial activity against *Escherichia coli* by direct and dynamic contact and the possible mechanisms by which these occur.

2. Expected Results/ Conclusion/ Contribution

The antimicrobial effect of storage water in contact with the CS-PEI-GO beads for > 7 days and for 2 hours are similar (1.90% and 2.01%, respectively), indicating stable crosslinking of the beads where there is no leaching or dispersibility of glutaraldehyde or graphene-based materials in the storage water that could increase the antimicrobial toxicity of the samples. In the dynamic contact study, the results show that longer exposure to the beads increases the antimicrobial activity in a dynamic setting, with almost 50% of bacterial inactivation achieved with 3 hours of dynamic contact. Correspondingly, in the direct contact study using live and dead assay, it was shown that at 2 hours of exposure to the nanocomposite film, 59% of bacterial cells were already non-viable (compared to 3% of the control) which increased to 92% at 3 hours (compared to 8% of the control). The antimicrobial activity of the CS-PEI-GO nanocomposite is therefore contact-time-dependent, with direct contact (92% bacterial inactivation after 3h exposure) having superior results compared with dynamic contact (~50% inactivation after 3h exposure). In addition, the incorporation of GO also translated to enhanced production of ROS—oxidation of GSH was higher in CS-PEI-GO (31.78%) as compared to CS-PEI alone (5.69%), indicating inherent oxidative capabilities of GO that could translate to enhanced antimicrobial activity by induction of oxidative stress. These results may be attributed to previously proposed mechanisms of mechanical membrane damage and reactive oxygen species production that may be more pronounced with prolonged contact. The mechanical membrane stress induced by graphene-based materials may have a more important role in the first 2 hours of exposure, whereas oxidative stress may be more significant beyond 2 hours when the graphene-based materials have already covered the bacterial cells. This may be due to the positively charged chitosan and the negatively charged cell membrane facilitating the coating of cells that could allow the oxygen-containing functional groups of GO to induce oxidative stress and lead to cell death.

Characterization and Modelling of the Degradation of Hydroxypropyl Cellulose-Blended Sodium Alginate Microcapsules

Julius Niño P. Doctor[a], Justin Richmond C. Domingo[b], Ludhovik Luiz B. Madrid[c], Terence P. Tumolva[d,*]

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Abstract

The pH-sensitive degradation of 50:50 (by weight) hydroxypropyl cellulose-sodium alginate microcapsules was analyzed via a macroscopic approach by using hydrogel slabs instead and subjecting it to a diffusion test that only permits unidirectional transport of the pH medium across its thickness. The weight and size measurements of the slab were monitored across time to develop a degradation model. The devised model had a reasonably good fit to the experimental data from the three pH levels initially considered (pH = 2, 4, and 7), and more importantly, from the validation run (pH = 6) with an R^2 value of 0.9394.

Keywords: hydroxypropyl cellulose, sodium alginate, hydrogel, degradation, diffusion model

Photocatalytic Hydrogen Production from Seawater Using Ag_2O-TiO_2 under Visible Light Irradiation

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Abstract

Hydrogen gas, regarded as clean and high-energy fuel, has been known to be photocatalytically generated from pure water. Methods of efficiently producing hydrogen from abundant seawater and sunlight are currently scarce without water purification. This research investigated the feasibility of using Ag_2O-TiO_2 composite visible-light photocatalyst to produce hydrogen from seawater. The 1 wt% Ag_2O-TiO_2 photocatalysts were prepared by impregnation and calcination of Ag_2O into the TiO_2 structure. Fresh and used catalysts are characterized by SEM, UV-Vis DRS, and FTIR spectroscopy. SEM analysis confirmed the particle attachment of Ag_2O to the TiO_2 surface, and the presence of these species was further established by FTIR analysis. The shift of response into the visible light spectrum and decrease in band gap to 3.05 eV was confirmed by DRS analysis. The photocatalytic activity tests were performed in distilled water and seawater with 10% methanol as sacrificial reagent. The gas headspace was analyzed by GC and determined a maximum of 1.490 and 0.439 µmol/h-g cat in distilled water and seawater, respectively. It is proposed that the generated electron-hole pairs in the Ag_2O component enhanced electron-hole separation, thus promoting water cleavage in the TiO_2 component and producing hydrogen. The lower production rate in the seawater is attributed to the inhibitory behavior of the chloride ions. This study can significantly contribute to the field of constructing efficient and cheap photocatalytic reactors for the production of hydrogen from seawater using visible light by developing a stable and cost-effective core photocatalyst component of the reactors.

Keywords: Photocatalysis, hydrogen production, silver oxide, titanium dioxide

Biological Engineering (1)

Wednesday, March 28, 2018　　　　**14:45-16:15**　　　**Room A**

Session Chair: *Prof. Hsin Hsiu*

ACEAIT-0129

Complexity Analysis of Noninvasive LDF Signals in Metabolic Syndrome

Hsin Hsiu｜*National Taiwan University of Science and Technology*

ACEAIT-0035

Physical Modeling of Nanowire Electron Transfer in Batch Type Dual-Chamber Microbial Fuel Cells (MFCs)

Tzu-Hsuan Lan｜*National Taipei University of Technology*

Yung-Chin Yang｜*National Taipei University of technology*

Chin-Tsan Wang｜*National I-Lan University*

Thangavel Sangeetha｜*National Taipei University of Technology*

ACEAIT-0107

Demonstration of Boronate Affinity Integrated Guided Mode Resonance Spectroscopy for HbA1c Biosensor

Boonrasri Seeleang｜*Mahidol University*

Sakoolkan Boonruang｜*National Electronics and Computer Technology Center (NECTEC)*

Songpol Ongwattanakul｜*Mahidol University*

Romuald Jolivot｜*Bangkok University*

Waleed S. Mohammed｜*Bangkok University*

Chamras Promptmas｜*Mahidol University*

APLSBE-0069

The Effect of Fermented Palm Kernel Cake with Sclerotium rolfsii Added with Humic Acid in Rations on Production Performance and Quail Egg Quality.

Gita Ciptaan｜*Andalas University*

Mirnawati｜*Andalas University*

Ferawatiom｜*Andalas University*

APLSBE-0024

Interference Engineering for Molecular Communication

Dung Phuong Trinh｜*Kyung Hee University*

Youngmin Jeong｜*Kyung Hee University, Massachusetts Institute of Technology*

Jinsung Cho｜*Kyung Hee University*

Hyundong Shin｜*Kyung Hee University*

Moe Z. Win｜*Massachusetts Institute of Technology*

ACEAIT-0059

A Gold Hybrid Nanocostruct for Targeted Cancer Imaging and Therapy

Resmi V Nair｜*Sree Chitra Tirunal Institute for Medical Sciences and Technology*

Hema S｜*Sree Chitra Tirunal Institute for Medical Sciences and Technology*

Jayasree Ramapurath S｜*Sree Chitra Tirunal Institute for Medical Sciences and Technology*

Complexity Analysis of Noninvasive LDF Signals in Metabolic Syndrome

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1. Background/ Objectives and Goals

Metabolic syndrome (MetS) is a cluster of cardiometabolic abnormalities associated with an increased risk of cardiovascular diseases. MetS is associated with dysfunction of both the large and small microcirculation, with MetS patients exhibiting both macro- and microvascular impairments. Skin-surface laser-Doppler-flowmetry (LDF) measurements are considered to be well suited to noninvasive and real-time investigations of microcirculatory-blood-flow (MBF) responses. At the microcirculatory level, nonlinear analysis has been suggested to provide information about the variability structure of skin blood-flow oscillations. Complexity analysis of beat-to-beat LDF signals has also been used to study the MBF response induced by a pathological state or the application of external stimulation. The present study applied beat-to-beat, spectral, and ApEn analyses to skin-surface LDF signals with the aim of discriminating the following three age-matched groups: MetS patients, premetabolic syndrome (preMetS) patients, and control subjects. The present findings may be pertinent to the early detection of impairment of MBF perfusion accompanying MetS.

2. Expected Results/ Conclusion/ Contribution

DC_ApEn was significantly smaller in MetS and preMetS patients than in controls, whereas there were no significant differences in DC. The REC of FR1 was significantly smaller while the REC of FR4 was significantly larger in preMetS than in MetS. This study found that DC_ApEn was significantly smaller in Groups A and B than in Group C. Skin microvascular abnormalities in response to ischemia have been observed in MetS patients. It is possible that such a defect in the peripheral blood flow supply reduces the microcirculatory regulatory activity. The number of participating regulatory mechanisms may be decreased or the degrees of freedom of the regulatory activities may be reduced due to an impaired MBF supply. These factors may decrease the complexity in the skin-surface LDF signals and thus decrease the ApEn value. The REC of FR1 was significantly smaller in Group preMetS than in Group MetS. The differences in REC of FR1 noted between Groups MetS and preMetS could be at least partly attributable to endothelial function being more severely impaired in the former group. An impaired endothelial function may decrease the amount and types of vasoactive agents secreted, reduce the degrees of freedom for local microcirculatory endothelial regulation, and decrease the complexity in MBF fluctuations, thereby leading to decreases in the ApEn value in Group MetS. The REC of FR4 was significantly smaller in Group MetS than in Group preMetS. It has been suggested that changes in the REC of FR4 are associated with baroreflex regulatory functions in the microcirculation. It is possible that during the early stage of MetS progression, the baroreflex regulatory functions can be activated to compensate the effects of an increased BP. This could have resulted in the REC of FR4 being slightly larger (although nonsignificantly) in Group preMetS than in Group Control. These results indicate the presence of significant differences in ApEn and spectral indexes, which may be partly attributable to changes in microcirculatory regulatory activities accompanying the progression of MetS. The present findings may be pertinent to the early detection of the microcirculatory impairments associated with MetS.

Keywords: metabolic syndrome; laser Doppler; approximate entropy; spectral analysis

Physical Modeling of Nanowire Electron Transfer in Batch Type Dual-Chamber Microbial Fuel Cells (MFCs)

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Technology, Taipei, Taiwan

1.   Background/ Objectives and Goals

This study was focused on employing numerical simulation technology to create physical models for electron transfer mechanisms in a batch type dual chamber Microbial Fuel Cell (MFC). MFCs are bio-electrochemical systems that can utilize the chemical energy in the organics and convert it into electrical energy with the aid of microbes. The microbes transfer the electrons to the electrode through various electron transfer mechanisms such as direct electron transfer, Electron shuttle and Nanowire conductive transfer, but among them nanowire transfer mechanism is the most significant and widely accepted. Numerical simulation is a computational technology which is used to predict the biochemical reactions in an MFC and optimize the parameters. So the research purpose was to design physical models for the nanowire electron transfer mechanism employing Numerical simulation techniques.

2.   Expected Results/ Conclusion/ Contribution

This study effectively combined computational techniques with MFC technology. The anode biofilm underwent the effects of substrate concentration and nanowire electron transfer and they were described by Nernst-Monod equation, whereas the biochemical oxidation reactions at the cathode were defined with the aid of Butler-Volmer reaction. The numerical simulation and experiment data yielded similar results in terms of polarization curves. Furthermore, the substrate concentration of acetate had a crucial influence on the Nernst-Monod reaction in the anode of the dual-chamber MFC. These findings provide useful information on the enhancement of the performance of MFCs and especially on the application of numerical simulations for their scale up processes.

Keywords: Dual-chamber MFC, electron transfer mechanisms, numerical simulation, equivalent electrical circuit

Demonstration of Boronate Affinity Integrated Guided Mode Resonance Spectroscopy for HbA1c Biosensor

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Abstract

Guided Mode Resonance (GMR) label-free affinity sensor is proposed here as an alternative low cost optical sensorfor detection of glycated hemoglobin (HbA1c).The GMR surface modified with3-(glycidyloxypropyl)trimethoxysilane (GOPTMS) and 3-amino phenylboronic acids (3-APBA)provides a specific interaction with HbA1c molecule under alkaline conditions. The molecular adsorption on the surface results in resonance shift proportionally to the concentration. In this paper, the 3-APBA with concentration of 25 mM was used to demonstrate the HbA1c sensor. The sensor was validated using a controlled blood sample containing 5% and 10.4 %. By measuring resonance spectrum, %HbA1c is calculated using a ration of resonance shift from an adsorbed HbA1c and from the whole blood ($\Delta\lambda_{HbA1c}/\Delta\lambda_{TotalHb}$). The results indicate the feasibility for HbA1c detection. There resonance-shift ration of 0.095 and 0.2 are introduced when measuring 5% and 10% HbA1c respectively. This boronate-modified GMR affinity biosensor has high potential for monitoring of glycemic status in diabetic patients.

Keywords: Glycated hemoglobin, Guided mode resonance, Optical sensor, Boronate affinity

The Effect of Fermented Palm Kernel Cake with Sclerotium Rolfsii Added with Humic Acid in Rations on Production Performance and Quail Egg Quality

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Abstract

This study aims to determine the effect of fermented palm kernel cake with *Sclerotium rolfsii* added with humic acid in rations on production performance and quail egg quality of quail layer. The material used in this study were two hundred quail layer 14 weeks of age (*Coturnix Coturnix Japonica)* Were randomly into five teatmens with four replication of 10 birds per replication. Treatment research was usage of fermented palm kernel cake (FPKC) with 0 %, 5 %, 10 %, 15% and 20% FPKC. Research method was experimental using completely randomized design (CRD) with five treatments four replications. The research variables were feed intake, egg production, feed conversion, egg weight, thick eggshell and egg yolk of quail layers. The results of this research showed that feed intake, egg production, feed convertion, egg weight, thick eggshell and eeg yolk of quail layers were not significant (P< 0.05) affected. The conclusion that palm kernel cake fermented with sclerotium rolfsii can be used up to 20% in the laying quail ration.

Keyword: Quail, PKC, Humic Acid, Egg Quality

Interference Engineering for Molecular Communication

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1.   Background/ Objectives and Goals

Molecular communication is a new communication paradigm using molecules for transmitting information via nanomachines. The transmit nanomachines (TNs) possibly emit the information molecules to the receive nanomachines (RNs) in diffusion environments. These information molecules are absorbed by the receive RNs, but they can act as inter-symbol interference if the RNs failed to absorb the information molecules within a symbol time. Similar to a classical wireless network, the co-channel interference is also an inevitable uncertainty in the diffusion-based molecular nanonetwork when multiple TNs emit molecules simultaneously. These intrinsic natures of nanonetwork naturally lead to the dynamic variation of molecule concentration in nanonetworks. It is crucial to model the dynamics of molecule concentration caused by not only the information molecules but also the interfering molecules in a stochastic way rather than microscopic ways to account for aggregate behavior. The goal of this work is to model a general distributional structure of molecule concentration in a stochastic nanonetworks and the effect of interfering molecules on the molecular communication.

2.   Expected Results/ Conclusion/ Contribution

In this work, we characterized the effect of interference on the bit error rate (BER) for molecular communication between the lth nearest TN and RN in the (α, β)-anomalous diffusion in the presence of interfering molecules. Using general and practical molecular communication channels (anomalous diffusion channels), and general forms of a spatial stochastic process (Cox process with random concentration), we developed the framework to characterize lth nearest molecular communication in stochastic nanonetworks. With the versatile family of statistical distributions—H-variate—for random distance between the TN and RN in anomalous diffusion, the first passage time can be formulated as again H-variate in a unified fashion. Applying Campbell's theorem, we derived the spatial mean and variance of the number of (aggregate) arrival interfering molecules. Since the interfering molecules significantly degrade the BER in timing modulation, we proposed a simple interference avoidance technique with statistical knowledge of the interference distribution at the RN. It was shown that the BER degradation depends only on the spatial variance of the number of arrival interfering molecules. We also derived the BER expression for the amplitude modulation with statistical knowledge of the interfering molecule distribution. The result in this work is applicable to a variety of nanoscale communication networks and applications such as drug delivery systems, healthcare systems, nano-materials, and nano-machinery.

Keywords: Anomalous diffusion, co-channel interference, Cox process, Fox's H-function, Fox's H-transform, inter-symbol interference, molecular communication, stochastic nanonetwork.

A Gold Hybrid Nanocostruct for Targeted Cancer Imaging and Therapy

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1.   Background/ Objectives and Goals

Cancer is a group of diseases characterized by uncontrolled cell division. Various diagnostic and treatment tools are available for cancer such as CT, MRI, chemotherapy, photodynamic therapy (PDT) and photothermal property (PTT). Different biomaterials have been developed towards this purpose, and engineered to interact with biological systems for augmenting treatment, diagnosis etc. Widely used biomaterials used include metallic and polymeric structures. Nanomaterials are newer class of biomaterial which can be used for various therapeutic and diagnostic applications. These nanomaterials are having size range between 1 to 100 nm and have special properties useful for these applications. Among the nanomaterials, gold particles are getting wide acceptance due to its highly biocompatible nature. Normal gold nanoparticles have surface plasmon resonance property; however, it lacks photothermal and luminescence property. So in order to impart these properties different shapes of gold systems have been developed which have difference in optical properties. One of the anisotropic gold nanosystem is gold nanorod (GNR) which has two absorption peaks due to longitudinal and transverse oscillation in the longer and shorter axis respectively. The longitudinal peak in the near infra red region will lead to phonon-phonon and electron- electron transition which in turn impart photothermal property upon irradiation with suitable wavelength. To improve the luminescent property of gold particle for imaging applications, its size can be reduced to few atomic size range to form gold quantum cluster (AuC) whose size typically are below 2 nm. Due to quantum confinement of energy levels at thse size ranes these particles exhibit fluorescence emission property. This background forms the basis of the present work where we aim to develop a hybrid nanosystem of GNR and AuC having both fluorescence and photothermal property for imaging and cancer treatment.

2.   Expected Results and Conclusion

The hybrid system AuC-GNR was successfully synthesized. Characterization proved that the combined system retains the fluorescence property of AuC and photothermal property of GNR. UV-visible absorption spectrum of AuC-GNR showed NIR longitudinal peak corresponding to GNR. Fluorescence emission spectrum showed emission in the NIR region. Functionalisation was confirmed by FTIR spectra. Zeta potential analysis proves that the system is stable in physiological condition. Imaging property was again confirmed by live imaging system in physiological condition. The photothermal property of the combined system was confirmed by irradiating with 808 nm laser. Within 4 minutes of irradiation, an increase in temperature above $60^{o}C$ was observed. The results of *in vitro* cytotoxicity of hybrid material in L929 proved that the material is safe even for long incubation period 72 hrs. Cytotoxicity of material in different cell lines without laser irradiation showed no cell death. Upon laser for 2 minute irradiation material showed a considerable increase in cell death. HeLa cells showed more cell death which is due to the over expression of folate receptor in this cell compared to the other cells. So further studies are done using this cell only. The live/ dead assay confirmed the photothermal property. Finally, tumor mouse model was developed and the material was intravenously injected, and imaged using live animal imaging system. The images showed that the system has potential imaging property. In conclusion a cancer targeted hybrid gold nanosystem was developed for optical imaging and photothermal therapy. The efficacy of the system was successfully demonstrated *in vitro* and *in vivo*. The system acts as a single biocompatible moiety for cancer imaging and therapy.

Keywords: Gold, nanocluster, gold nanorods, photothermal therapy.

Electrical and Electronic Engineering

Wednesday, March 28, 2018　　　　16:30-18:00　　　Room A

Session Chair: *Prof. Andrew Nafalski*

ACEAIT-0067

Tools of Online Teaching in Electrical and Information Engineering

Andrew Nafalski ｜ *University of South Australia*

Thomas Zawko ｜ *University of South Australia*

Zorica Nedic ｜ *University of South Australia*

Hugh Considine ｜ *University of South Australia*

ACEAIT-0005

A Radiation Noise Source Diagnosis Method of Common Frequency Based on Wavelet and ICA

Geng Lu ｜ *Nanjing Normal University*

Yan Wei ｜ *Nanjing Normal University*

Zhao Yang ｜ *Nanjing Normal University*

Enrong Wang ｜ *Nanjing Normal University*

Zhu Da ｜ *Nanjing Normal University*

ACEAIT-0039

Eavesdropping Detection Based on Power-Comparisons to Reconfigure Signature Keys in Optical Coding Access Networks

Chao-Chin Yang ｜ *Kun Shan University*

Kai-Chun Lin ｜ *National Cheng Kung University*

Jen-Fa Huang ｜ *National Cheng Kung University*

Chien-Sheng Chen ｜ *Tainan University of Technology*

ACEAIT-0052

An Efficient Embedded Rate Control for Video Encoding System Based on ADSP-BF548

Wei-Chen Li ｜ *I-Shou University*

Han-Yu Huang ｜ *I-Shou University*

Chou-Chen Wang ｜ *I-Shou University*

Tsai-Ting Peng ｜ *I-Shou University*

ACEAIT-0073

Power Line Detection using a Fully Convolutional Network and Double-Threshold Method

Hyeyeon Choi｜*Pohan University of Science and Technology (POSTECH)*

Sang Jun Lee｜*Pohan University of Science and Technology (POSTECH)*

Gyogwon Koo｜*Pohan University of Science and Technology (POSTECH)*

Jong Pil Yun｜*Korea Institute of Industrial Technology (KITECH)*

Sang Woo Kim｜*Pohan University of Science and Technology (POSTECH)*

ACEAIT-0094

A Novel Channel Selection Algorithm for Improvement of R-Peak Detecting Accuracy in Capacitive ECG Measurement

Jun Sung Lee｜*Pohang University of Science and Technology(POSTECH)*

Minho Choi｜*Pohang University of Science and Technology(POSTECH)*

Minseok Seo｜*Pohang University of Science and Technology(POSTECH)*

Sang Woo Kim｜*Pohang University of Science and Technology(POSTECH)*

Tools of Online Teaching in Electrical and Information Engineering

Andrew Nafalski[a,*], Thomas Zawko[a], Zorica Nedic[b], Hugh Considine[b]

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Abstract

Online learning is now becoming increasingly common. The number of Australian university students studying online has grown from about 68,000 in 2008 to over 116,000 in 2015. Joyce (2017) acknowledges that "A significant number of Australian universities now have more students who study online than on campus, with up to 85 per cent of students enrolled online at some institutions".

Skype is touted as a global means of communication, yet it operates as a black-box due to proprietary software secrecy and so its reliability for application to teaching processes is important (Guha, Daswani, & Jain, 2006). These matters are significant in light of programme delivery moving increasingly towards online.

Remote laboratories, which involve experimentation on real equipment and real components at a distant location remotely accessible via the internet, bring reality to the online laboratory experiments and represent an equivalent replacement to experiments in situ (Teng, Nedic, & Nafalski, 2016).

The paper describes and analyses the circumstances and environments of online and blended teaching from Australia to Poland, using online tools such as internet telephony service (i.e. Skype), the learning management system Moodle and a remote laboratory.

Polish students have rated online delivery as comparable to face-to-face teaching in the majority of survey responses (71%), and it is anticipated that further surveys will confirm this trend. Students liked the exposure to different teaching/learning culture, the expertise of the lecturers and the variety of teaching and learning techniques.

Keywords: Online teaching, blended teaching, internet telephony, remote laboratories

A Radiation Noise Source Diagnosis Method of Common Frequency Based on Wavelet and ICA

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Abstract

In this paper, the wavelet and ICA algorithm is adopted to diagnose the common frequency radiation noise source, and isolate different radiation noise component. Firstly, radiation noise superposition of nonlinear time domain signals caused by noise source circuit in different location of electric field at the same time are measured by multi-channel high-speed digital oscilloscope. Then, double frequency domain signals of radiation noise are acquired by wavelet and ICA analysis method. What's more, frequency time domain signals of excessive radiation noise are accessed according to the value of over clocking points. Finally, nonlinear signal separation algorithm is used to determine the radiation noise component. So as to realize the effective diagnosis of common frequency radiation noise and help to reduce the radiated noise which electronic device emitted.

Keywords: Wavelet, ICA, Common Frequency Radiation Noise, Nonlinear Superposition Time Domain Signal, Double Frequency Domain Signal

Eavesdropping Detection Based on Power-Comparisons to Reconfigure Signature Keys in Optical Coding Access Networks

Chao-Chin Yang[a], Kai-Chun Lin[b,*], Jen-Fa Huang[c], Chien-Sheng Chen[d]

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Abstract

In this paper, a scheme of signature code reconfiguration over optical code-division multiple-access (OCDMA) network is proposed to enhance multiple-users data transmission security. The security scheme is devised on the basis of two mechanisms: (1). Eavesdropping detection based on power comparison in local node; (2). Signature codes reconfiguration in each node on command of central control station. On eavesdropping detection, we sense significant power change while communicating nodes pair is suffering malicious attack. On signature reconfiguration, central station sends commands to the communicating transceiver nodes to change their signature keys. We illustrate with maximal-length sequence (M-sequence) codes as signature keys to the network nodes. These signatures are structured over arrayed-waveguide gratings (AWGs) devices. When eavesdropping occurs on a specific network user, new code sequence is selected for the signature code reconfiguration in order to combat the behavior of eavesdropping. Simulation result shows that the spectral amplitude drops obviously after eavesdropping and the threshold value can be determined in order to detect the eavesdropping effectively.

Keywords: Maximal-length sequence (M-sequence) codes, Optical code-division multiplexing access (OCDMA), network confidentiality, arrayed-waveguide grating (AWG), eavesdropping detection.

An Efficient Embedded Rate Control for Video Encoding System Based on ADSP-BF548

Wei-Chen Li, Han-Yu Huang, Chou-Chen Wang[*], Tsai-Ting Peng

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1.   Background

Nowadays, H.264 video standard is widely used in many commercial applications, especially used for videophone and surveillance systems. However, most of early surveillance equipment adopts low-resolution (640×480 pixels) video standard due to the consideration of hardware and cost. This leads to an obstacle for image recognition since the quality of enlarged image is poor and blurring. In order to overcome this problem, a highly efficient video rate control system is proposed and embedded on ADSP-BF548 digital signal processor (DSP) [1]. In this paper, we can achieve a H.264 baseline encoder for full high definition (FHD: 1920×1080 pixels) video transmission based on ADSP-BF548 EZ-KIT Lite.

2.   Expected Results

The coding performance is evaluated by the comparisons of skip frames, decoded picture quality (PSNRY) and time improving ratio (TIR) between the JM 11.0 [2] and the proposed method. The TIR is defined as following:

$$\text{TIR} = \frac{\text{TIME}_{\text{JM11.0}} - \text{TIME}_{\text{method}}}{\text{TIME}_{\text{JM11.0}}} \times 100\% \tag{1}$$

Table 1 shows the comparisons of skip frame and PSNRY between JM 11.0 and the proposed scheme. Table 2 shows the performance of encoding machine cycles as re-allocating memory. Experimental results show that our proposed rate control system for FHD video can achieve an average PSNRY gain of about 3.77 dB when compared with JM11.0. In addition, the proposed scheme improves the number of frame skipped and reduces the quality deviations of the initial frames by choosing the best initial QP. Furthermore, we can achieve an average time improving ratio (TIR) about 44.09% when compared with the directly embedded H.264 encoder on ADSP-BF548. It is obvious that the proposed embedded H.264 video rate control system can be directly applied to consumer high-resolution video applications.

Keywords: H.264 video standard, Rate control, Embedded system, Digital signal processor

Power Line Detection Using a Fully Convolutional Network and Double-Threshold Method

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Abstract

Detection of power line in aerial image is an important problem to prevent an accident of unmanned aerial vehicles (UAVs) operating at low altitudes. This paper proposes a power line detection algorithm that is based on deep learning and double-threshold method. The proposed algorithm employs a fully convolutional network (FCN) with deconvolution layers to generate an output prediction map of the same size as the input image. To improve detection accuracy, an optimum threshold value is investigated for the output of softmax layer by using training images. This optimum value is used as high threshold for the double threshold method in post processing. The performance of the proposed algorithm is compared with a conventional deep learning algorithm, and experimental results demonstrate the effectiveness of the proposed method.

Keywords: Deep Learning, Convolutional Neural Network, Object Detection, Power Line

A Novel Channel Selection Algorithm for Improvement of R-Peak Detecting Accuracy in Capacitive ECG Measurement

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Abstract

Capacitive electrocardiogram (CECG) measurement is more practical in daily life than conventional ECG measurement because CECG signal can be measured without skin contact. However, obtaining medically meaningful information from CECG signal is not easy because CECG signal is easily contaminated by noise. This paper proposes a channel selection algorithm using both interval of three successive R-peaks and waveform around R-peaks as an index for channel selection. By using the both information together, the proposed method can effectively gather and utilize valid parts from partially contaminated multi CECG channels; for this reason, CECG measurement can be intensive to noise. To verify the performance of the proposed channel selection algorithm, indoor and outdoor experiments were conducted. From the experimental results, the performance of the proposed algorithm was verified showing increase in R-peaks detecting accuracy. Concretely, the maximum increase in average of sensitivity of positive predictivity was 6.78 % (from 89.09 % to 95.87 %) for indoor experiment data. For outdoor experiment data, the maximum increase was 7.99 % (from 89.83 % to 97.82 %). This improvement of CECG measurement will change the existing health care systems and medical instruments, enabling people to check heart diseases in daily life.

Keywords: Non-intrusive ECG, capacitive ECG sensor, capacitive ECG measurement system, multi-channels, information fusion.

Computer and Information Sciences (2)

Thursday, March 29, 2018   08:45-10:15   Room A

Session Chair: *Prof. Lu Zhang*

ACEAIT-0043

Animating the Mapping Process for Converting an ERD to Relations

Lu Zhang｜*National University*

ACEAIT-0026

A Study of Improved Shuffled Frog Leaping Algorithm Parameters on Dynamic Multi-Zone Dispatching

Pongchanun Luangpaiboon｜*Thammasat University*

Sirirat Juttijudata｜*Kasetsart University (Sriracha Campus)*

ACEAIT-0034

Low-Resolution Face Image Recognition through Deep Learning

Julian Supardi｜*National Taiwan University of Science and Technology*

Shi-Jinn Horng｜*National Taiwan University of Science and Technology*

Tianrui Li｜*Southwest Jiaotong University*

ACEAIT-0037

Classification of Parts and Selection of Purchasing Order Policies: A Case Study

Busaba Phruksaphanrat｜*Thammasat University*

ACEAIT-0189

A Study on Predicting the Timing of Drop by Low Cost Brainwave Device

Wen-Pinn Fang｜*YuanZe University*

Pei-Ru Tsai｜*YuanZe University*

Animating the Mapping Process for Converting an ERD to Relations

Lu Zhang

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Abstract

In teaching the subject of conceptual modeling, it is found that many students have difficulty fully comprehending the mapping process for converting an Entity Relationship Diagram (ERD) into its corresponding set of relations. This is because the traditional way of teaching the mapping process involves "too much math," as characterized by struggling students. In a previous work, the author, along with other colleagues, proposed a different teaching method that utilizes task maps, visual clues, and animations to "un-math" the complexity perceived by students. The details of task maps and visual clues were described and illustrated in the prevous work. However, the subject of the actual implementation of 3D animations that enhance students' learning by turning abstractions into an animated environment was laid out as future research work. This work-in-progress paper is the continuation of the overall effort for the new teaching approach and reports the status of the development of the animations and the experience in this endeavor. It also discusses related future work.

Keywords: Relational Databases, Relations, Tables, Entity Relationship Diagrams, Animations, Visualizatoin, Science Education

A Study of Improved Shuffled Frog Leaping Algorithm Parameters on Dynamic Multi-Zone Dispatching

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Abstract

Metaheuristics have been demonstrated as the iterative searching processes to offer a better trade-off between solution quality and computing time. Their parameter fine-tuning exercises a great influence in both the solution process and in the solution quality of optimisation problems. In this work, the improved shuffled frog leaping algorithm or ISFLA with an additional step search strategy was inspired by foraging behavior of the swarm of frogs. It was adapted to find the near optimal solutions of the dynamic multi-zone dispatching. However, the algorithm performance depends on the proper parameters' setting. They need to be determined and analysed before its implementation. This paper aims to present an approach combining designs and analyses of experiments to improve the performance of the ISFLA. A linear constrained response surface optimisation or LCRSOM and modified simplex methods or MSM were used to determine ISFLA parameters. Experimental results were analysed in terms of best solutions found so far, mean and standard deviation on the imbalance levels including the convergence of the solutions obtained. Broadly, the statistical analyses suggest that both fine-tuning processes improves the solution quality on various different problem sizes. Therefore, by means of this study it can be concluded that the use of these techniques may be a promising and powerful tool for an investigation before applying to the problems. However, additional studies must be conducted to verify the effectiveness of the proposed methodology.

Keywords: Dynamic Multi-Zone Dispatching, Improved Shuffled Frog Leaping Algorithm, Linear Constrained Response Surface Optimisation Method, Modified Simplex Method

ACEAIT-0034

Low-Resolution Face Image Recognition through Deep Learning

Julian Supardi[a], Shi-Jinn Horng[b,*], Tianrui Li[c]

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Abstract

Owing to the difficulty of finding the important features of low resolution face image, the recognition rate is still quite poor. In this paper we used both Restricted Boltzmann Machine and Deep Convolution Neural Network techniques to solve this problem. Using the combined data sets got from Georgia Institute of Technology, Aleix Martinez and Robert Benavente, we did the training and testing. Through the experimental results, the proposed method outperforms other methods in terms of the accuracy of recognition.

Index Terms: Low Resolution Face Image, Restricted Boltzmann Machine, Deep Learning, Convolution Neural Networks, Gaussian filter

Classification of Parts and Selection of Purchasing Order Policies: A Case Study

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Abstract

This research compares inventory classification methods and selects the appropriate purchasing policy for materials group A of a case study factory, which is a washing machine producer. Inventory classification methods such as classical ABC, ABC based on Analytic Hierarchy Process (AHP) and Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS) and Data Envelopment Analysis (DEA) are used to evaluate the classification of the metal structure group of materials, which has 280 items. Criteria for classification are unit cost of material, the value of annual usage and lead time. The result of classification has shown that the dissimilarity and the total inventory cost by AHP based method is the best classification method for the factory. The most appropriate purchasing policy of materials class A items, which has 38 items has presented, considered purchasing policies are Economic Order Quantity (EOQ), Periodic Order Quantity (POQ) and Lot for Lot (L4L). Selection of the appropriate purchasing policy for each item can reduce 40.55% of inventory cost or 468,245.28 Baht per years from the current policy.

Keywords: Classification, purchasing policy, multi-criteria decision making, case study

A Study on Predicting the Timing of Drop by Low Coast Brainwave Device

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1. Background/ Objectives and Goals

This paper proposed a model to predict the timing that a person drops his work by using a cheap brainwave device. Based on observing some tester's behavior by brainwave device, the phenomenon of brain wave has been analyzed. Some cases have been clustered. The cases are enjoying the work, drop the work, and confusion status. The results can suggest teachers the intervention time if necessary. The detail is also shown in the paper.

2. Expected Results/ Conclusion/ Contribution

A preliminary result has been gotten after the experiment. The tester drops his work if specific pattern of low alpha wave appear. This make us can predict the timing of drop work. It can suggest many teachers has correct time to check student's status

Keywords: Brain wave, drop time, teacher, predict, study modal

Biological Engineering (2)

Thursday, March 29, 2018　　　　08:45-10:15　　　Room B

Session Chair: *Prof. Cholid Badri*

APLSBE-0026

Modeling of Custom-Made Alloplastic Temporomandibular Joint Using Rapid Prototyping Technique in Reconstructive Maxillofacial Surgery

Cholid Badri｜*Universitas Indonesia*

Benny S. Latief｜*Universitas Indonesia*

Anwar S. Ibrahim｜*Universitas Indonesia*

Sastra K. Widjaya｜*Universitas Indonesia*

V. Sutarmo Setiadji｜*Universitas Indonesia*

Mohammad Adhitya｜*Universitas Indonesia*

APLSBE-0045

Evaluation and Characterisation of Magnetic Gelatin Nanocarrier for Cartilage Repair

Chin-Yi Yang｜*I-Shou University*

San-Yuan Chen｜*National Chiao Tung University*

Huai En Lu｜*The Bioresource Collection and Research Center*

Shan-Wei Yang｜*Kaohsiung Veterans General Hospital*

Shwu Jen Chang｜*I-Shou University*

APLSBE-0059

Development of Multi-Wall Carbon Nanotube Modified Interdigitated Electrodes as C-Reactive Protein Biosensors

Yu-Xiang Zhou｜*I-Shou University*

Ching-Jung Chen｜*University of Chinese Academy of Sciences*

Jen-Tsai Liu｜*University of Chinese Academy of Sciences*

Shwu Jen Chang｜*I-Shou University*

APLSBE-0031

Thermoplastic Bonding Mediated by Surface Wettability Control and Its Application for Biotechnology

Nae Yoon Lee｜*Gachon University*

ACEAIT-0204

Impact of Wildlife Conservation on Rural Livelihoods in Some Protected Areas in India

R J Rao │ *Jiwaji University, Gwalior*

R.K. Lodhi │ *Jiwaji University, Gwalior*

R.K. Gurjwar │ *Jiwaji University, Gwalior*

Yogesh Singh │ *Jiwaji University, Gwalior*

Modeling of Custom-Made Alloplastic Temporomandibular Joint Using Rapid Prototyping Technique in Reconstructive Maxillofacial Surgery

Cholid Badri[a,*], Benny S. Latief[b], Anwar S. Ibrahim[c], Sastra K. Widjaja[d], V. Sutarmo Setiadji[e], Mohammad Adhitya[f]

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1. Background/ Objectives and Goals

Patients with Ameloblastoma tumors and other diseases causing temporomandibular joint damages may need temporomandibular joint arthroplasty for restoring the shape and function of temporomandibular joint (TMJ). This reconstructive surgery can be performed by using alloplasticmaterials such as some metalsor polyethylenes for replacing damaged temporomandibular joint componentsIn our previous research, the model of mandibular condyle as part of temporomandibular joint (TMJ) has been made using rapid prototyping technique. With an alloplastic mandibular condyle made withtitanium, it make possible that the mandibular fossa as the other TMJ component can be damaged and perforated by the movement and pressure from mandibular condyle. To prevent these adverse effects, anmandibular fossa liner or joint spacer will be made as a joint spacer or liner between mandibular fossa and mandibular condyle for protecting the mandibular fossa from shear andpressure from the titanium basedmandibular condyle. This material should be served as a socket in socket-ball joint mechanism where the movement of the mandibular condyle can take place properly. The mandibular fossa liner will be made from materials those meet the various requirements to fit both anatomically and functionally in conjunction with the alloplastic condylar mandible. The material to be used is ultra-high-molecular-weight polyethylene (UHMWPE), which has been frequently used in current TMJ arthroplasty or in some orthopedic reconstructive surgery. The mandibular fossa liner will be attached to the acetabular fossa with methacrylic bone cement and in addition it will be screwed to the zygomatic process with a couple of screws. The aim of this research is the making of mandibular fossa liner model as part of TMJ arthroplasty which strives for ful fill the optimal anatomic, physiology, biomechanics and biomaterial elements.

2. Results and Conclusion

Of the 10 models made it turns out that the model of group II, which was done semi-manually has a higher average numberof good criteria as compared to group I which was made by virtual models. In a semi-manually way, modeling of the mandibular fossa liner is more satisfactorythan the virtual modeling.

The TMJ component model has been successfully constructed with alloplastic materials i.e mandibular condyle with titanium material and mandibular fossa liner with UHMPVE material. Model making using custom made rapid prototyping techniques is expected to be useful steps for application of alloplastic temporomandibular joint in TMJ arthroplasty for Ameloblastoma and other diseases of temporomandibular joint.

Keywords: ameloblastoma, maxillofacial reconstruction surgery, temporomandibular joint arthroplasty, acetabular fossa, UHMPE material

Evaluation and Characterisation of Magnetic Gelatin Nanocarrier for Cartilage Repair

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1. Background/ Objectives and Goals

Osteoarthritis is a commonly occurring joint disorder characterized by degenerative changes in the articular cartilage. Furthermore, articular cartilage has a limited self healing potential after injury or degeneration, and the healing and repair of injured cartilage remains a difficult clinical problem. The goal of this study was to investigate the potentials of magnetic-guiding nanocarrier combined with chondrocytes to the osteoarthritis treatment. First, this study was dedicated to and aimed at the preparation and characterisation of magnetic-guiding nanocarrier. Amphiphilic gelatin-iron oxide will be prepared into magnetic-guiding nanocarrier for the fundamental characteristics and properties studies. Then, the effects of the magnetic-guiding nanocarrier on the toxicity of chondrocytes were analyzed. Finally, the magnetic-guiding nanocarrier used for applications in chondrocytes guiding aspect.

2. Expected Results/ Conclusion/ Contribution

The preliminary results showed that the magnetic amphiphilic gelatin nanocapsules were synthesized using hexanoic anhydride-grafted gelatin and superparamagnetic iron oxide nanoparticles using double emulsification. The MTT assay showed that magnetic amphiphilic gelatin nanocapsules have insignificant cytotoxicity and are biocompatible to chondrocytes. Furthermore, magnetic amphiphilic gelatin nanocapsules could lead to the success in the cell guidance and cell retention under the application of an external magnetic field. The biochemical analysis demonstrated that introduction of magnetic amphiphilic gelatin nanocapsules with magnetic field would not did not perturb the characteristic phenotype and biochemical activities of chondrocytes. In addition, the gene expression levels of collagen type I were decreased in chondrocytes cultured with magnetic amphiphilic gelatin nanocapsules. It demonstrated that the applications of the magnetic amphiphilic gelatin nanocapsules in cartilage tissue engineering have great potential for further development.

Keywords: Chondrocytes, emulsification, magnetic-guiding nanocarrier, osteoarthritis

Development of Multi-Wall Carbon Nanotube Modified Interdigitated Electrodes as C-Reactive Protein Biosensors.

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1.   Background/ Objectives and Goals

Screen printed technology comprises layer-by-layer depositions of ink upon a solid substrate, through the use of a screen, defining the geometry of the sensor. This technology has advantages of design flexibility, process automation, good reproducibility, a wide choice of materials. Carbon ink is often used in screen printed technology, due to excellent thermal stability, relatively inert in biochemical reaction, non toxicity, low cost and disposability. However, carbon electrodes result in high electron transfer resistance. The carbon nanotubes (CNT) usually used to reduce the resistance of electron transfer based on their high electrical conductivity and improve performance of electrochemical biosensors. C-reactive protein (CRP) is an inflammatory marker believed to be of predicting the risk of coronary heart disease. The purpose of this study was to develop a highly specific amperometric electrochemical biosensor by carbon ink with multi-wall carbon nanotubes and applied to CRP detection.

2.   Expected Results/ Conclusion/ Contribution

In the preliminary experiment, we mixed the multi-wall carbon nanotubes with carbon ink in different ratio to find the optimization value. From the CV results, it showed that 4% CNT has the optimal peak current and the minimal ΔEp. That meant 4%CNT within carbon ink could reduce the resistance of electron transfer and improve the performance of SPEs effectively. After modification with CRP antibodies, the CRP SPEs current showed the logarithmic correlation with the CRP concentration(μl/ml). The results indicated that the CRP SPEs biosensor providing a hopeful candidate for CRP detection. In the future, we will focus on anti interference efficiency of CRP SPEs.

Keywords: C-reactive protein, interdigitated electrodes, carbon nanotubes, cyclic voltammetry

Thermoplastic Bonding Mediated by Surface Wettability Control and Its Application for Biotechnology

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1.   Background/ Objectives and Goals

Thermoplastics are optically transparent, mechanically hard, lightweight, and highly cost-effective materials for the construction of integrated physical, chemical, or biological sensors. Once circuits and channels are designed, thermoplastics are sealed by means of "thermal bonding" which is realized by applying high pressure and temperature. Although simple and fast, channels and microstructures tend to deform or collapse, disabling their functions. In this study, the innate properties of thermoplastics were employed to graft chemical functionalities to tune the wettability of original thermoplastics, which could eventually lead to sealing substrates under relatively low heat and pressure conditions.

2.   Expected Results/ Conclusion/ Contribution

Two hydroxylated surfaces formed robust siloxane bond (Si–O–Si) at the interface, realizing permanent sealing between two thermoplastics. After realizing the sealing, the chemically modified surfaces were further tuned freely into hydrophilic or hydrophobic by subsequent reaction with silane coupling agents bearing versatile organic moieties. In particular, after thermoplastic sealing, microchannel structure engraved on thermoplastic was selectively modified into hydrophobic to realize sequential injection of multiple reagents for solid-phase-based nucleic acid purification, without the need for precise valve control. Three solutions (cell solution, washing solution, and eluent) required for sample purification were successfully introduced into a chamber, where glass beads were packed to capture unpurified DNA, in a stepwise and a valve-free manner, and DNA was successfully purified from whole cell extract by using this microdevice. Also, we extended the concept for sealing thermoplastics with poly(dimethylsiloxane) (PDMS), another widely used material for constructing Lab-on-a-Chip microdevices. Sealing between hard thermoplastic and soft PDMS poses numerous advantages particularly offering construction of microvalves or micropumps where flexible components become necessary. Besides, these heterogeneous assemblies can provide desirable environment for performing cell-based research because PDMS is gas permeable. In this study, simple and room temperature processes for realizing permanent sealing between PDMS and thermoplastics were introduced employing variety of silane coupling agents, and DNA was successfully amplified by performing polymerase chain reaction (PCR) inside a microscale chamber, and then detected subsequently on the site of amplification in a consecutive manner, without having to take out solution from the microdevice, paving the ways for the construction of portable point-of-care test (POTC) diagnostic devices.

Keywords: Thermoplastics, Lab-on-a-Chip, Chemical modification, Surface wettability tuning, Solid-phase-based nucleic acid purification, Polymerase chain reaction (PCR)

Impact of Wildlife Conservation on Rural Livelihoods in Some Protected Areas in India

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1.   Background

In India due to many factors wildlife in different areas are in danger. Major research studies are carried out on the conservation of crocodiles and success of the habitat restoration programmes. Information to evaluate biodiversity, population status of different species, their ecology, habitat and distribution in different protected areas has been collected and analysed to suggest measures for wildlife conservation and people interest in the localities. There are a wide range of activities aimed at reducing the dependency of local communities on resources both within and outside of protected areas as well as mitigating Human-Wildlife Conflicts (Dunham et al, 2010; Fergusson, 2010). One particularly key aspect of working with local communities is to protect the rights of indigenous groups living in and around protected areas. Where traditional resources may be impacted by the implementation of wildlife conservation projects, alternatives have to be developed through consultation and introduced into the project activities. It is necessary to provide alternative livelihoods through the development of business initiatives such as ecotourism and establishing small scale industries. In addition alternative sources of energy and food for livestock should be provided to local communities. It is required for a careful plan for sustainable use of resources in the protected areas in India. Due to successful implementation of wildlife conservation programmes in the country wildlife populations have been increased in many protected areas, however, human populations are also growing alongside, so conflicts will be inevitable. These need to be planned and any mitigation measures need to be introduced towards landscape scale management, together with effective habitat protection and implementation of wildlife conservation measures. These measures help in increase of wildlife populations as well as reducing Wild animal-Human Conflict.

2.   Results

Conservation of aquatic biodiversity in the National Chambal Sanctuary is major subject of research since 1983 (Hussain 2009). The present study is mainly focused on the crocodile-human conflict in the protected areas and the problems faced by locals due to strict conservation management actions being taken up the respective governments. Large numbers of people residing in the riverside villages are directly dependent on the protected areas for their livelihood needs (Plate 1). They collect grass, fuel wood, minor forest products, sand from river banks within the protected areas, grow agriculture along the river banks and collect fish from the rivers. Although fishing is totally banned in the Chambal River to avoid incidental mortality of aquatic animal in the gills nets, occasional illegal fishing is continuing. There are many reports of crocodile and turtles mortalities by drawing in fishing nets. Two dolphins were recorded to be killed in the fishing nets and the fishermen extracted oil from the dolphins. Because of the fishing activities in the Chambal River the animals are facing a lot of disturbance. People use the river for various purposes including drinking water collection, cloth washing etc. Although there are reports of human wildlife conflict in the National Chambal Sanctuary, the present studies revealed that in the study area human beings are not attacked by crocodiles but livestock is attacked by the mugger crocodiles. The findings of this study indicate that major habitats of wild animals are under pressure due to increase in human activities (Table 1 and Plate 2). The major threat at present is habitat loss due to human encroachment, and disruption of populations through fishing and other hunting activities. In the present study it is observed that due to wildlife-human conflict relationships between local communities and wildlife authorities is not cordial. Locals consider that wildlife programmes in the country are major obstacles for poverty alleviation as they depend primarily on the natural ecosystems for livelihood and Government restricts use of resources for wildlife conservation.

Life Science (2)

Thursday, March 29, 2018   10:30-12:00   Room A

Session Chair: *Prof. Dwisari Dillasamola*

APLSBE-0046

Immunomodulatory Effect Test from Moringa Leaf Extract (*Moringa Oleifera L.*) with Carbon Clearance Method in Male White Mice

Dwisari Dillasamola │ *Andalas University*

Yufri Aldi │ *Andalas University*

Mutia Fakhri │ *Andalas University*

Skunda Diliarosta │ *State University of Padang*

APLSBE-0005

Assessment of Materials for Maggot Bag Production: Maggot Debridement Therapy Application

Kwankamol Limsopatham │ *Chiang Mai University*

Kabkaew Sukontason │ *Chiang Mai University*

Kom Sukontason │ *Chiang Mai University*

APLSBE-0012

Melittin Induced Apoptosis Cell Death and Enhanced 5-Fluorouracil (5-FU) Anticancer Drug Susceptibility in Human Melanoma (A375) Cell

Sirikwan Sangboonruang │ *Chiang Mai University*

Khajornsak Tragoolpua │ *Chiang Mai University*

Panuwan Chantawannakul │ *Chiang Mai University*

Yingmanee Tragoolpua │ *Chiang Mai University*

APLSBE-0061

Variation of Quantitative and Qualitative Traits of Kamang Duck as Local Genetic Resources in Kamang Regency West Sumatera

Firda Arlina │ *University of Andalas*

Sabrina Dan Husmaini │ *University of Andalas*

APLSBE-0064

Anthocyanin Derived from Sweet Potatoes (Ipomoea Batatas L) Variety from Kawi Mountain Protect the Reproductive System in Female Rattus Norvegicus Passive Smokers

Retty Ratnawati ｜ *Faculty of Medicine, Brawijaya University*

Astika Gita Ningrum ｜ *Faculty of Medicine, Brawijaya University*

Syahrida Wahyu Utami ｜ *Faculty of Medicine, Brawijaya University*

Baharika Suci Dwi Aningsih ｜ *Faculty of Medicine, Brawijaya University*

Immunomodulatory Effect Test from Moringa Leaf Extract (*Moringa oleifera L.*) with Carbon Clearance Method in Male White Mice

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Abstract

Moringa oleifera leaf (*Moringa oleifera* L) had chemical compounds that have been utilized by the community to cure health problem. one of leaf activity is immunommodulator. The aims of this study is to determine the immunomodulatory effect from *Moringa oleifera* leaf using a *carbon clearance* method to measure the activity of phagocytic cells in exterminating pathogens which enter into body and calculate the total leukocyte cells. The parameters test are phagocytosis index and total leukocyte cells. Twenty white male mice were devide into four groups. Group I (Vehicle control) treated with NaCMC 0,5%, group II, III and IV were treated with *Moringa oleifera* leaf extract with dose 10, 30, 100 mg/kgBB were given to the mice for six consecutive days orally. On the seventh day, white male mice were given an intravenous carbon suspension in the tail of the mice. The value of phagocytosis index (PI > 1) indicated immunostimulant activity. The data was analyzed by using one way ANOVA and Duncan test. The ANOVA results shown that groups treated with moringa leaf extract significantly different with vehicle groups (NaCMC 0,5%) (p > 0,05). The increasing doses of moringa leaf extract is effective to improve the immunomodulator effect. It was included that moringa leaf extract had immunomodulatory capabilities as immunostimulant.

Keywords : Moringa leaf extract (*Moringa oleifera* L.), immunomodulator, carbon clearance

Assessment of Materials for Maggot Bag Production: Maggot Debridement Therapy Application

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1.   Background/ Objectives and Goals

Maggot debridement therapy (MDT) is the application of laboratory-reared blow fly larvae to remove necrotic tissue and disinfect wounds for medical conditions. The blow fly species, *Lucilia sericata*, is routinely used for this purpose. This fly species does not exist naturally in Thailand, and for use, they have to be imported in a set of bags containing prepared maggots. The aim of this study was to determine the possibility of the selected materials for maggot bag production in Thailand. We observed the results by using the closely related blow fly species, *Lulicia cuprina*, which is commonly found in Thailand.

2.   Expected Results/ Conclusion/ Contribution

The fiber composition analysis showed that all types of fabric were polyester (100%). They were therefore named as polyester 1, polyester 2, and polyester 3 bags. It was found that *L. cuprina* larvae could escape from polyester 1 and 2 bags, which related to the fabric pore size area. Active larvae in each type of bag were 51% (polyester 1), 63% (polyester 2), 97% (polyester 3), and 97% (moving freely without a bag). Feeding ability showed well developed larvae, based on the comparison of larval length between day 0 and day 3 (bagged maggots; polyester 1, polyester 2, polyester 3, and freely crawling maggots). Larval length was significantly different between the bagged and freely crawling maggot groups (independent *t-test*, $p<0.05$). However, no significant difference in larval length was found between each type of fabric (independent *t-test*, $p>0.05$). Therefore, the results of this study suggested that polyester 3 is suitable for *L. cuprina* based on non-escaping larvae and their feeding ability. Study with artificial wounds and/or clinical cases (human and animals) merits investigation for future practical application.

Keywords: Maggot debridement therapy, *Lucilia sericata*, *Lucilia cuprina*, maggot bag

APLSBE-0012

Melittin Induced Apoptosis Cell Death and Enhanced 5-Fluorouracil (5-FU) Anticancer Drug Susceptibility in Human Melanoma (A375) Cell

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Abstract

Malignant melanoma is an aggressive and the deadliest form of skin cancer due to its ability in metastasis and drug resistance. To overcome these problems, development of new effective treatment methods is necessary. Additionally, the combination of chemotherapy with natural substance is a potential approach to reduce the dose of chemotherapeutic drugs and the side effects. Bee venom has been selected in this study since it has been reported to exhibit anticancer effects. However, its molecular mechanism remains largely unknown. In this study, the bee venom peptide, melittin was determined for the anti-proliferative activity by MTT assay. It was found that treatment with melittin revealed inhibition of human melanoma (A375) cell proliferation in a dose-dependent manner but not in normal mouse embryonic fibroblast (NIH-3T3) cells. Furthermore, effect of melittin on DNA fragmentation and apoptosis induction were investigated by DNA fragmentation and TUNEL assays. DNA fragmentation was shown on agarose gel electrophoresis. TUNEL assay showed that melittin induced apoptosis as evidenced by TUNEL-positive cells after 2 hours incubation time. This indicated that melittin caused DNA fragmentation which is one feature of apoptosis. Subsequently, quantitative real-time RT-PCR analysis was performed to further examine the expression of apoptotic-related genes including *caspase-3* and *cytochrome-c* after treatment of A375 with melittin for 2 and 6 hours. The results demonstrated that treatment with melittin up-regulated the mRNA level of *caspase-3* and *cytochrome-c* and significantly increased *caspase-3* mRNA expression after 6 hours of treatment. Thus, these results implied that melittin induced DNA damage and apoptosis *via* activation of *caspase-3*. In addition, the effect of melittin in combination with a chemotherapeutic agent on viability of A375 cells, 5-Fluorouracil (5-FU) was observed. Interestingly, after incubation of 5-FU and melittin on the A375 cells for 24 hours, growth inhibition of A375 cells was considerably observed whereas treatment with 5-FU did not have any effect on A375 cells. This finding revealed that using melittin in combination with 5-FU reduced the dose of 5-FU and also enhanced drug susceptibility when treatment of A375 cells. The study suggested that melittin might be an effective agent and could be further developed as a potential chemosensitizer of anticancer agent in melanoma cancer treatment.

Keywords: melittin, malignant melanoma, apoptosis, chemosensitizer, 5-Fluorouracil

Variation of Quantitative and Qualitative Traits of Kamang Duck as Local Genetic Resources in Kamang Regency West Sumatera

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Abstract

This aims of this research was to collect the information about the variation quantitative traits of Kamang duck as local animal genetic resources in West Sumatera as a data base. This research was held in Kamang regency Agam District West Sumatera.using 169 head of Kamang ducks consist of 50 male and 119 female mature sex. Survey method was used in this research. The variable as body weight and mophological oh body were measured in this study. Data were analysed using statistic descriptive method. The result indicated the mean and standard deviation of quantitative traits of male and female Kamang Ducks were body weight 1,34 ± 0,10 kg, 1,32 ± 0,10 kg, beak lenght 5,41 ± 0,36 cm, 5,24 ± 0,26 cm, beak width 2,52 ± 0,09 cm, 2,46 ± 0,13 cm, neck lenght 19,38 ± 1,03 cm, 17,47 ± 1,64 cm, back lenght 23,53 ± 0,96 cm, 22,63 ± 1,72 cm, chest circum 28,06 ± 1,16 cm, 27,41 ± 1,91 cm, wing lenght 29,13 ± 1,55 cm, 28,58 ± 2,32 cm, femur lenght 9,05 ± 0,81 cm, 9,09 ± 1,14 cm, tibia lenhgt 10,91 ± 0,84 kg, 10,84 ± 1,34 kg and pubis witdh 2,78 ± 0,40 cm. The highest variation of quantiataive traits of male Kamang ducks were femur lenght 8,97 % whereas in female Kamang ducks were at pubis width 14,46 %. The good selection was conducted by Kamang duck farmer, therefore it as spesific genetic resources can be sustained.

APLSBE-0064

Anthocyanin Derived from Sweet Potatoes (Ipomoea Batatas L) Variety from Kawi Mountain Protect the Reproductive System in Female *Rattus norvegicus* Passive Smokers.

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Abstract

Passive smokers are potential to develop the impairment of the reproductive system in female. Destruction of the oxidative stress caused by component of cigarette smoke in the will influence the folliculogenesis, increased the Malondialdehyde (MDA) in turn will influence the production of estradiol. However anthocyanin as known of an anti oxidant is potentially to have a prevention to neutralize these disturbance. Therefore, the objective of the study is to observe whether anthocyanin will improve the reproductive system through the increase of FSH, folliculogenesis, MDA, Estradiol and the thickness of endometrium. This study was conducted as true experimental with post test only control group design in 30 female Rattus norvegicus as passive smoker model. Using three different doses of anthocyanin that were 20, 40 and 80 mg/kg BW respectively were given together with the passive smoking rats model for 8 weeks. The variables were MDA, thickness of endometrium, the concentration of 17 β Estradiol, FSH (Follicle stimulating hormone) and folliculogenesis. The results showed that anthocyanin were increase of FSH level, 17 β Estradiol, Folliculogenesis process and the endometrium thickness. But it decrease the MDA level in the female passive smoking animal models rats. It is concluded that anthocyanin would improve the reproductive system in the passive smoking animal model.

Keywords: anthocyanin of sweat potatoes Kawi mountain, Folliculogenesis, FSH, Estradiol, endometrium thickness

Life Science (3)

Thursday, March 29, 2018   13:00-14:30   Room A

Session Chair: *Prof. Tertia Delia Nova*

APLSBE-0070

Numerical Study of Bird Flu Infection Process within a Poultry Farm with Consideration of Age Structure

Tertia Delia Nova｜*Andalas University*

Masaji Watanabe｜*Okayama University*

APLSBE-0022

Halophylism, the Promotion of Growth by NaCl, in a Halophyte *Mesembryanthenum Crystallinum* L.

Dan Tran Quang｜*Ehime University*

Ayako Konishi｜*Kagawa University*

Sakae Agarie｜*Kagawa University*

APLSBE-0025

Cloning of Fumonisin-Degrading Enzyme in Yeast Expression System

Ya Chieh Huang｜*National I-Lan University*

Yu Hsiang Yu｜*National I-Lan University*

Yeong Hsiang Cheng｜*National I-Lan University*

APLSBE-0035

Evaluation of *Bacillus Licheniformis* on Antibacterial Activity against *Brachyspira Hyodysenteriae*

Yi-Bing Horng｜*National I-Lan University*

Yu Hsiang Yu｜*National I-Lan University*

Yung Hsiang Cheng｜*National I-Lan University*

APLSBE-0038

Hyperglycemia Induces Apoptosis in Brain through Down Regulation of Estrogen Receptor & GLUT1 during Early Development of Zebrafish

Dewi Mustika｜*Universitas Brawijaya*

Mitsuyo Kishida｜*Kumamoto University*

APLSBE-0039

Duration of internet gaming associates with internet gaming disorder risk but not academic performance among undergraduate medical students in Universitas Brawijaya, Indonesia

Nia Kurnianingsih ∣ *Faculty of Medicine Universitas Brawijaya*

Retty Ratnawati ∣ *Faculty of Medicine Universitas Brawijaya*

Rizqi Bagus Setyo Prawiro ∣ *Faculty of Medicine Universitas Brawijaya*

Maryam Permatasari ∣ *Faculty of Medicine Universitas Brawijaya*

Heidyana Rachma Putri ∣ *Faculty of Medicine Universitas Brawijaya*

Adilla Surya Ariadi ∣ *Faculty of Medicine Universitas Brawijaya*

Numerical Study of Bird Flu Infection Process within a Poultry Farm with Consideration of Age Structure

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Abstract

Bird flu infection processes within a poultry farm was studied numerically. A mathematical model proposed in a previous study was reformulated with consideration of an age structure. The mathematical model for a susceptible population and an infected population is described. Numerical results show that essential factors for security against bird flu are vaccination and removal of infected bird..

Keywords: bird flu, mathematical modeling, numerical simulation, age structure

APLSBE-0022

Halophylism, the Promotion of Growth by NaCl, in a Halophyte *Mesembryanthenum crystallinum* L.

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Abstract

Some halophytes, high salt tolerant plant species, use NaCl positively at certain level for their growth. This trait is referred as halophylism which is an important characteristic for acquisition of salinity adaption, but its physiological and biochemical mechanism remain unclear. In this study, we established cell suspension culture with 25-100 mM NaCl and investigated the growth-related factors which are promoted by salinity in the cells of a halophyte, the common ice plant, *Mesembryanthemum crystallinum*. The salt-promoted cell growth was related to intercellular accumulation of ions Na^+, K^+, Cl^-, and NO_3^- and the increased expression of genes for ion incorporation. The cell-cycle synchronized cells also showed a significant increase in the activity of cell division with 25 mM NaCl. In addition, ATP synthesis of mitochondria isolated from leaf exhibited an increase up to 34-61% with increase of salt concentration, indicating that the mechanism of salt-activated mitochondria ATP synthesis may exist in the ice plant.

Keywords: Halophyte, halophylism, *Mesembryanthenum crystallinum* L., salt tolerance.

Cloning of Fumonisin-Degrading Enzyme in Yeast Expression System

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1. Background/ Objectives and Goals

Mycotoxins are secondary fungal metabolites that produced in crops and other food commodities both pre-harvest and post-harvest. The structural of fumonisin B1 is similar to sphingolipids, Fumonisin B1 interferes with ceramide synthase, leading to intracellular accumulation of sphingoid bases. The purpose of the study is designed to establish yeast expression vector carrying fuminisin-degrading enzyme gene(*FumD*).

2. Methods

First, the *FumD* gene was synthesized and cloned to plasmid. The *FumD* gene were amplified by PCR and PCR products were purified and ligated to yeast expression vector. Positive clones were screened by agarose electrophoresis and sequencing. The linear recombinant plasmid were cut by restriction enzymes, and were transformed electronically into yeast genome. Transformed yeast were cultivated on plates containing antibiotic. Picking the positive colonies on the plate and purifying on fresh medium were performed. Yeast genomic DNA from medium was extracted and examined by PCR.

3. Expected Results/ Conclusion/ Contribution

We successfully cloned the *FumD* gene derived from *sphingopyxis* and ligated it into two yeast expressing vectors. We also confirmed the DNA sequence of yeast expressing vectors by sequencing. The recombinant efficiency of expressing vector in yeast genome was up to 70%. In conclusion of this study, we successfully established the two yeast lines carrying fumonisin-degrading enzyme. In the future, it could used to produce fumonisin-degrading enzyme by yeast expression system for prevention of mycotoxin contamination in feed.

Keywords: fumonisin B$_1$, gene cloning, yeast

Evaluation of *Bacillus licheniformis* on Antibacterial Activity against *Brachyspira hyodysenteriae*

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1. Background/ Objectives and Goals

Probiotics have been widely used for improving animal health and productivity by altering gastrointestinal microbiota. *Bacillus* species are the most frequently used probiotics in the poultry feed industry. However, the parameters of solid-state fermentation (SSF) of *Bacillus licheniformis* and benefits of fermented products on antibacterial activity remains unclear. In the present study, we established the parameters of *Bacillus licheniformis* in SSF and evaluated the effects of *Bacillus licheniformis* fermented products on inhibition of *Brachyspira hyodysenteriae* growth in vitro.

2. Methods

The *Bacillus licheniformis* was cultured at different fermentation conditions including carbon and nitrogen source, initial moisture percentage, fermentation time, and viable count was measured. The cyclolipopeptide levels in fermentation products were determined and quantified by mass spectrometer (MS) and high pressure liquid chromatography (HPLC). Antimicrobial activity of cyclolipopeptide was analyzed by minimum inhibitory concentration (MIC) and microscope observation.

3. Expected Results/ Conclusion/ Contribution

The results showed that the highest viable biomass was observed at 25% glucose, 10% soybean meal and 50% initial moisture in SSF. The 6 day fermentation product was heat and acid-resistant. The MIC and microscope observation showed that the cyclolipopeptide from *Bacillus licheniformis* was able to inhibit *Brachyspira hyodysenteriae* growth. These result suggest that *Bacillus licheniformis* has potential for development as feed additive to treat *Brachyspira hyodysenteriae*.

Keywords: *Bacillus licheniformis*, *Brachyspira hyodysenteriae*, solid-state fermentation

Hyperglycemia Induces Apoptosis in Brain through Down Regulation of Estrogen Receptor & GLUT1 during Early Development of Zebrafish

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1. Background/ Objectives and Goals

One of anomalies known to be elicited by prolonged hyperglycemia during development is malformation in the fetal brain caused by impairment of apoptosis. In this study we focused on the involvement of estrogen signaling and GLUT1 in the mechanism of hyperglycemia-induced apoptosis in brain using zebrafish embryos *(Danio rerio)* as a model.

2. Methods

Zebrafish embryos were exposed to 1%, 3%, and 5% of glucose from 24 hpf (hourspost-fertilization) until 96 hpf. RT-PCR and acridine orange staining were conducted to reveal the effect of glucose exposure on mRNA expression of some glucoregulation and estrogen signaling related genes, and apoptosis in brain, respectively. Estrogen signalling modulation in the brain was indicated by alteration of estrogen receptor (ER) and brain aromatase (arom B) mRNA expression. To confirm the role of estrogen through estrogen receptor on the expression of GLUT1 mRNA and on apoptosis in the brain we conducted a co-incubation with estrogen (0,1 µM dissolved in 0,1 % DMSO), and ICI (10 µM dissolved in 0,1 % DMSO).

3. Expected Results/ Conclusion/ Contribution

This study showed that hypoinsulinemia-hyperglycemia possibly occurred at 96 hpf embryos exposed to 3% and 5% glucose. Also, that this caused a reduction of ER, arom-B, glucose transporter-1 (GLUT 1) mRNA expression as well as an increase in brain-specific apoptosis, followed by a significant decrease of head size. Further, E_2 co-incubation aimed at preventing hyperglycemia-caused estrogen signaling down regulation successfully rescued embryonic brain from apoptosis and partially prevented a decrease in GLUT1 mRNA expression. The effect of E_2 was reversed by addition of estrogen receptor blocking, 10 µM ICI, suggesting the effect was mediated through ER. Taken together, our result showed for the first time in a whole-animal model that down regulation of estrogen signaling is likely involved in hyperglycemia-induced apoptosis in embryonic brain, mediated by reduced availability of GLUT1.

Keywords: glucose exposure, estrogen signaling, brain apoptosis, GLUT-1, zebrafish embryo

Duration of Internet Gaming Associates with Internet Gaming Disorder Risk but Not Academic Performance among Undergraduate Medical Students in Universitas Brawijaya, Indonesia

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1.   Background/ Objectives and Goals

Undegraduate medical students have higher risk of psychological stress due to medical study loads. Internet gaming activity is often chosen as emotional coping and escaping from negative feeling. Gaming activities have been associated with both positive and negative impacts. However, the effects of time spent on internet gaming in relation to academic performance is remain debatable. This pilot study was aimed to investigate the correlation between duration of internet gaming and academic performance among undergraduate medical students.

2.   Results/ Conclusion/ Contribution

A total of 317 students returned the questionnaires. The study participants mean age was 20,52 years, 66,24% are female, most of them (99,05%) are not yet married, but 94,32% has interpersonal relationship. Study participants from year 1,2,3 and 4 are 10.09%, 41,64%, 15,45% and 32,81% respectively. A number of 74,76% subjects live outside of their hometown, average of GPA was 3,12 (1-4 scale). A portion of 41,64% students spent less than 1 hours per day for internet gaming. Internet gaming disorder identified in 15,56% students. Internet gaming duration significantly associated with internet gaming disorder risk ($p<0.05$). Interestingly, either duration of internet gaming or internet gaming disorder risk were not associated with student's GPA ($p=0,805$). Gaming activities give benefits for cognitive function possibly due to the increase of dopamin during gaming activities which cause increasing sypnatic signals in brain.

Keywords: internet gaming, medical education, dopamin

Civil Engineering

Thursday, March 29, 2018　　　　13:00-14:30　　　Room B

Session Chair: *Prof. Punnawit Parnklang*

ACEAIT-0103

Evaluation of Soil Properties to Identify a "Soft Spot" for Stability of Embankment Road

Punnawit Parnklang｜*King Mongkut's Institute of Technology Ladkrabang*

Thanadol Kongsomboon｜*King Mongkut's Institute of Technology Ladkrabang*

ACEAIT-0012

Shaking Table Testing for Hanging Bracket with Tube by Strain Gauge

Yo-Yo Ma｜*National Kaohsiung Marine University*

Guang-Min Luo｜*National Kaohsiung Marine University*

Chia-Ming Lee｜*National Kaohsiung Marine University*

ACEAIT-0055

Ultimate Axial Strength of RC Slender Walls with Openings

Dongjun Lee｜*Seoul National University of Science and Technology*

Soontaek Oh｜*Seoul National University of Science and Technology*

ACEAIT-0106

Effect of Material and Geometrical Parameters on Peeling Mode of Failure in Steel Plated RC Beam – Predictive Analysis

Mohammad Arsalan Khan｜*Aligarh Muslim University*

ACEAIT-0132

Response Spectrum Analysis of Multistory RC Framed Building with and Without Shear Walls

Arshdeep Singh｜*PEC University of Technology*

Sarita Singla｜*PEC University of Technology*

ACEAIT-0103

Evaluation of Soil Properties to Identify a "Soft Spot" for Stability of Embankment Road

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Abstract

Nowadays, canal embankment road is the one of the most option to use in traveling. However, the budget that is used in stabilized all along the road is too expensive. Therefore, this paper shows how to evaluate the soil properties from soil investigation for predicting a soft spot in slope stability on the canal embankment road on very soft clay (Bangkok clay) that need to be stabilized in a design process. By evaluate the undrained shear strength, unit weight, natural water content and Atterberg limits. Evaluating from the actual failure on the rural road number AY.5042 (Pathum Thani) which has 21 kilometers long and 48 boreholes. Finally found that the parameters of the major factors are the thick layer which has more than 4 meters thick and liquid index exceed 1.0 are soft spot.

Keywords: Slope Failure, Soil Properties and Atterberg Limits, Embankment Road, Soft Spot, Soft Bangkok Clay

Shaking Table Testing for Hanging Bracket with Tube by Strain Gauge

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Abstract

Taiwan is one of the country around the world that massive earthquake might frequently happen. So, without any doubt the disaster prevention of earthquake especially shock-proof and vibration-proof is a focal points to our country. The destructive force of the earthquake is the most important things that we care when we do the prevention study. However, there was rare experiments consider the effect of inner water in the past. On this hand we use three dimensional (3D) shaking table to do a series of tests by different water level in the tube which tie on the structure and also different shaking strength.

Experiment results show that: (1) half full water level makes more strain deviation, we considered it as free surface effect; (2) compare different water level with different shaking strength, we find that different water level makes more reaction. After all, we can know that when we're going to simulate or experiment the destructive force of the earthquake we should consider the inner fluid seriously.

Keywords: free surface effect; earthquake; shaking table test; Hanging bracket.

ACEAIT-0055

Ultimate Axial Strength of RC Slender Walls with Openings

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Abstract

An experimental test of 47 slender wall specimens with high strength concrete up to 100 MPa had been undertaken to investigate the ultimate axial strength of reinforced concrete wall panels with various opening configurations. Background and test rig are stated in detail. A new design equation is proposed as the empirical formula based on the test results. An opening parameter of the formula is described in detail with respect to opening size and location both vertical and horizontal directions

Keywords: Axial strength, RC slender walls, opening configurations, empirical formula

Effect of Material and Geometrical Parameters on Peeling Mode of Failure in Steel Plated RC Beam – Predictive Analysis

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1.   Background/ Objectives and Goals

Structures are strengthened with FRP or steel plates through external retrofitting. This technique has been in practice mainly for two reasons: ease of implementation and minimal aesthetic change in the structural component. However, RC beams strengthened with this technique suffer from premature failure; that is, a beam failing in undesirable modes of failure which are also unpredictable against which the beam is not initially designed. One critical mode of such failure is peeling, leading to a catastrophic failure by ripping off of the covercrete along the rebars and thereby further leaving the rebars exposed. Peeling usually starts from the end of the plate and propagates further depending on wide range of geometrical ad material parameters. Although studies have been conducted in identifying the nature of peeling feeling; however, the role of such parameters in determining the load of initiation and rate of further propagation of peeling is not clear in literature. This can be attributed to the complex nature of material behaviour involved, combined with a mixed mode loading problem.

2.   Expected Results/ Conclusion/ Contribution

It is identified that, among different geometric parameters, plate thickness and plate length are key parameters to define stress concentrations responsible for peeling failure in a 4-point loading problem (mixed mode loading). Combined with plate length in shear-span, a shear-span to depth ratio also plays a role in identifying levels of stress concentration at plate end. And the flexural strength and fracture energy of concrete are key to defining crack initiation and propagation respectively. There material parameters are directly responsible for identifying stress redistribution. In addition, a change in any material property also influences other modes of failure, such as debonding and spacing of flexural cracks. Therefore, a FE model that could model both types of premature failures (peeling and debonding) helped to maintain focus on a mode of failure under investigation, which is peeling. Through model calibration for peeling crack, and with the use of multiple regression analysis, following general equation is proposed in terms of key material parameters, to predict peeling behaviour using CDP model:

$$G_{fc} = a_1 f_{ct}^{a_2} G_{cr}^{a_3} \qquad (1)$$

where G_{fc} is energy release for a concrete, with flexural strength f_{ct} and fracture energy G_{cr}.

The values of constants a_1 - a_3 are identified as:
a_1 = 5.4 E-04
a_2 = 1.8
a_3 = -1.0

Keywords: Premature failure, Peeling, Retrofitting

Response Spectrum Analysis of Multistory RC Framed Building with and without Shear Walls

Arshdeep Singh[*], Sarita Singla

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Abstract

Multistoried buildings have become more and more popular in densely populated cities around the world. The growth of multistoried building construction is due to rapid increase of business activities and housing demand as well as limitation of land. As it becomes taller, different structural system have been developed to meet various requirements and to achieve better efficiencies in different aspect such as structural stability, architectural serviceability and constructional economy. In the past, buildings in India were restricted to six and seven storey because of conventional methods of construction. In these types of low and medium rise structures the analysis and design with respect to lateral load has been a process of checking the vertical load resisting system for its ability to resist lateral forces. However, for all buildings the vertical load resisting system cannot resist lateral forces efficiently. Therefore, it was required to go in for more and more efficient lateral load resisting systems as sky line started rising. A wall that is subjected to lateral load in its plane is referred to as shear wall. Shear wall enhances strength, stiffness and ductility to the frame. In the seismic design of buildings, reinforced concrete structural walls, or shear walls, act as major earthquake resisting members. Structural walls provide an efficient bracing system and offer great potential for lateral load resistance. The properties of these seismic shear walls dominate the response of the high-rise buildings, and therefore, it is important to evaluate the seismic response of the walls appropriately.

In this study, effectiveness of shear wall in buildings with number of storeys as 9, 12 and 15 were studied. In this each different storeyed building has been modeled into different modules having shear walls up to different storey heights. For 9 storeyed building, 4 different building models were studied i.e. B900 (9 storeyed building without shear wall), B903 (9 storeyed building with shear wall up to 3rd storey), B906 (9 storeyed building with shear wall up to 6th storey), B909 (9 storeyed building with shear wall up to 9th storey). Similarly for 12 storeyed and 15 storeyed building 5 and 6 different models respectively were studied as B1200, B1203, B1206, B1209, B1212 and B1500, B1503, B1506, B1509, B1512, B1515. Hence, all 15 buildings were analyzed and studied for parameters like fundamental time period, spectral acceleration, lateral displacement, story drift, peak story shear, forces and moments in columns, beams and stresses in plates. It was concluded that presence of shear wall in the RCC framed building improves the seismic behavior of the building.

Keywords: Shear Wall; Response Spectrum Analysis; Multi-storeyed Building.

Mechanical Engineering (2) / System and Naval Mechatronic

Engineering

Thursday, March 29, 2018   14:45-16:15   Room A

Session Chair: *Prof. Kenjiro Shimano*

ACEAIT-0185

A Basic Study to Calculate 2-D Flow Velocity Profile with Non-Zero Divergence

Kenjiro Shimano │ *Tokyo City University*

ACEAIT-0028

Feedback Control Method for an Optical Profilometer Based on a DVD Pickup Head

Hsien-Shun Liao │ *National Taiwan University*

ACEAIT-0157

A Study of Geometry Parameters of Non-Contact Vortex Grippers

Tzu-Hsuan Feng │ *National Cheng Kung University*

Cha`o-Kuang Chen │ *National Cheng Kung University*

Kuo-Teng Tsai │ *Industrial Technology Research Institute*

Sung-Ho Liu │ *Industrial Technology Research Institute*

ACEAIT-0154

Simulation Model for Strip Warpage of Molding Process

Wan-Chun Chuang │ *National Sun Yat-Sen University*

Wei-Long Chen │ *National Sun Yat-Sen University*

ACEAIT-0011

Structural Adhesives Used to Delay the Shear Failure of FRP-Metal Heterogeneous Joints

Guang-Min Luo │ *National Kaohsiung Marine University*

Yi-Chuan Hsu │ *National Kaohsiung Marine University*

Ya Jung Lee │ *National Kaohsiung Marine University*

A Basic Study to Calculate 2-D Flow Velocity Profile with Non-Zero Divergence

Kenjiro Shimano

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1.   Background/ Objectives and Goals

In this study, the author considers a situation where a profile of one flow velocity component is available over a plane in a three dimensional flow field. It is often difficult to measure multiple components of the velocity vector, and it would be convenient if the other component in the plane could be evaluated. The only method proposed for this purpose is Garcia's method (2010) in which the continuity equation is solved with the assumption of the two dimensional velocity profile being divergence-free. However, this approach is likely to produce unallowable error because of the inappropriate assumption. The author's final goal is to propose an alternative numerical technique to calculate the velocity vector profile accurately. In this preliminary report, a concept for estimation of the divergence distribution is introduced and tested.

2.   Expected Results/ Conclusion/ Contribution

The tested plane was surrounded by rigid walls as any part of the inlet or outlet was included in the extracted section. Hence, flow in the plane was driven purely by fluid coming in and going out of the plane, which means that divergence of the velocity field in the plane was definitely non-zero. There were some spots near the side walls where the magnitude of divergence was significantly large.

The present method to estimate divergence in the plane was applied, only referring to the u-profile on an 80x40 computational grid. It was shown that the computational result reflected the overall tendency of the divergence profile with a good agreement with the exact profile in terms of locations where peak values appeared. However, peak values of divergence calculated by the present method were too low: approximately 20 – 60 % of the exact quantities. This error could be attributed to the simple linear relationship used for separation of the divergence contribution from that of vorticity. Further work is necessary to enhance the quantitative performance of the present technique.

Keywords: computational fluid dynamics, two-dimensional velocity profile, divergence, Helmholtz's theorem

Feedback Control Method for an Optical Profilometer based on a DVD Pickup Head

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Abstract

The optical profilometer based on a DVD pickup head has advantages of low cost, compact size, and small laser spot size. However, the height measurement is affected by the reflectivity of the sample surface significantly. Therefore, a routine calibration process is necessary before the measurement. Moreover, accurate height measurement on a sample which comprises multiple materials with different reflectivities is not available. In this work, we applied a feedback control method to achieve the quantitative height measurement based on an optical profilometer with a commercial DVD pickup head. The homemade system includes a control system which was programmed to accomplish the feedback control function. The focus error signal from the DVD pickup head was used as the reference signal which was maintained by adjusting the vertical position of the sample during the scanning. Therefore, the scanning trajectory represents the surface profile. The experimental results show that the quantitative height profile of a test grating can be obtained without a calibration process.

Keywords: DVD, pickup head, optical profilometer

A Study of Geometry Parameters of Non-Contact Vortex Grippers

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Abstract

This paper applies the CFD（Computational Fluid Dynamics）method with the Reynolds stress transport turbulence model to predict the lifting force of non-contact vortex grippers and the pressure distribution on the surface of work piece. The goal of this paper is to get the relations between the lifting force and several parameters. After lots of work, we find that the lifting force of arc/circular inner channels gripper is largely improved. Besides, the gripper with two inner channels can give higher lifting force easily by increasing the diameter of inner channels without concerning the possibility of interference. Then, we need to conduct optimization to decide the inner diameter of gripper which gives the best performance. These results can be referenced to design a new type of non-contact vortex gripper.

Keywords: Vortex Gripper, Non-Contact, CFD

ACEAIT-0154
Simulation Model for Strip Warpage of Molding Process

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1.   Background

The trends in electronic products are thin, short and small. Electronic packaging structure must also become smaller and smaller, so that Flip-Chip and Wafer-Level package technology develop. In the domain of packaging technology has a serious problem. In 2016 Chen, Y. L. [1] mentioned that because of the CTE(Coefficient of Thermal Expansion) mismatch of the materials, the package structure is subjected to a great thermal stress in a heating process such as Molding; thus, the package structure (strip) warpages. To make matters worse, warpage results in low yields on the production line.

2.   Contribution

This study successfully simulates the strip warpage for the Flip-Chip Molding process. Fig. 2 illustrates strip warpage of simulation results in side view. Tables 2 list experimental and simulation values of strip warpage. This study finds that the simulation value matches the experimental value very well, which the error is only 6.1%. According to the aforementioned, this simulation method can be used to estimate the strip warpage. Furthermore, and it can help to improve process yield and reduce costs on the production line.

Fig. 2: Strip warpage of simulation result.

Tables 2: Experimental and simulation values of strip warpage

Experimental Results (mm)	Simulation Result (mm)	Error (%)
5.17±0.23	5.49	6.1

Keywords: CTE, Molding, Flip-Chip, Warpage

Structural Adhesives Used to Delay the Shear Failure of FRP-Metal Heterogeneous Joints

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Abstract

In order to reduce the center of gravity of ship and enhance the stealth effectively, more and more super-structures of war ships were manufactured using FRP. Therefore, the heterogeneous joint methods of FRP-metal are needed to be discussed. Expect for the use of bolt, the overlapped fiber-cloth is usually used to assemble the FRP superstructure and metal ship hull. In this study, we used the overlapped method to manufacture the FRP-metal specimens, and discussed the shear strength of FRP-metal heterogeneous joints using experimental method. Several different kinds of structural adhesives were considered to enhance the bonding efficiency. In order to maintain the consistency of test specimens, vacuum assisted resin transfer molding (VARTM) was considered to manufacture the test specimens. According to experimental results, we can find that the shear strength of FRP-metal heterogeneous joints are not dominated by structural adhesive. However, the PU structural adhesive with high failure strain can delay the failure progress and enhance the failure strain energy of heterogeneous joints. In the viewpoint of dynamic response, PU structural adhesive provided better reinforcement efficiency than high-strength epoxy structural adhesive.

Keywords: heterogeneous joints, structural adhesives, failure strain energy, VARTM

Fundamental and Applied Sciences / Geosciences and Petroleum

Engineering

Thursday, March 29, 2018 **14:45-16:15** **Room B**

Session Chair: *Prof. Jaw-Fang Lee*

ACEAIT-0031

An Analytic Model of Unsteady Directional Wave Generation

Cheng-Tsung Chen │ *Yancheng Institute of Technology*

Jaw-Fang Lee │ *National Cheng Kung University*

Pi-Sheng Hu │ *National Cheng Kung University*

ACEAIT-0020

Structural and Ionic Conduction Study of Enhanced Bio-Polymer Electrolytes based Carboxymethyl Cellulose Doped NH$_4$Br

Ahmad Salihin Samsudin │ *Universiti Malaysia Pahang*

ACEAIT-0177

Accumulation of the Fossiliferous Fluvio-Lacustrine Carbonates of the Early Jurassic Nam Phong Formation, Khorat Group, Northeastern Thailand

Rattanaphorn Hanta │ *Suranaree University of Technology*

Anisong Chitnarin │ *Suranaree University of Technology*

Kannatee Fuengaksorn │ *Suranaree University of Technology*

Patteera Ketmuangmoon │ *Suranaree University of Technology*

ACEAIT-0031

An Analytic Model of Unsteady Directional Wave Generation

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Abstract

In this paper, time-domain surface wave generations in a plan wave basin are presented based on an analytic solution obtained in this research. With given motions of the wavemaker aligned on one side of the basin, water waves are generated and propagate away from the wavemaker boundary. The mathematical problem associated with the physical problem is formulated, and an analytic solution is proposed. The solution methodology to the problem is an extension of an analytic solution to the wavemaker problem in a channel. More specifically, the two-dimensional problem is extended to a three-dimensional problem. The spatial horizontal coordinates of a plan are expressed by the Fourier cosine transform, respectively, which incorporates boundary conditions at two sides of the basin. The function of the vertical coordinate is obtained by solving the nonhomogeneous differential equations. As for the time dependent function, the free surface and bottom boundary conditions are applied to form two equations to solve the time-dependent coefficients. Similar to the analytic solution of the wave generation in a channel, inspection of the series solution is required. The bigger dimension of the wave basin the more series terms are required for the convergence. Using the analytic solution obtained in this research unsteady formation of water waves generated in the plan basin are simulated. Given different functions along the wavemaker boundary, the generated surface waves can be long crested waves or directional waves. Bigger dimensions of the wave basin are expected if wave forms are to be observed without interference of reflection waves.

Keywords: Time-domain, directional wave generation, analytic model

Structural and Ionic Conduction Study of Enhanced Bio-Polymer Electrolytes based Carboxymethyl Cellulose Doped NH₄Br

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1.   Background/ Objectives and Goals

The increasing interest in green energy storage materials for electrochemical devices with the development of polymer as electrolytes candidate has attracted great attention recently. It can offer a number of high-value opportunities, provided that lower costs can be obtained besides environmental friendly. Due to this matter, this work presents the discovery on proton conducting bio-polymer electrolyte (BPE) by incorporating various composition of plasticizer namely ethylene carbonate (EC) with biopolymer–salt complexes carboxymethyl cellulose (CMC)–NH₄Br.

2.   Expected Results/ Conclusion/ Contribution

The highest conducting CMC bio-polymer electrolytes (BPE) was achieved at 1.12×10^{-4} S cm^{-1} with addition of 25 wt. % NH₄Br and was enhanced to 3.31×10^{-3} S cm^{-1} when plasticized with 8 wt. % EC. The temperature analysis shows that the ionic conductivity increases when increased with temperature and exhibits Arrhenius behavior where the samples thermally activated as proven by TGA. Rice and Roth transport properties analysis shows that the conductivity of BPE system was found to be dependent on the number of mobile ions and the mobility of the ions. It has been shown that the conducting species in this present work are predominantly due to proton (H$^+$) which was confirmed via FTIR and TNM analysis. The results suggest that BPE system is highly potential to be applied in electrochemical devices, i.e. proton battery and electrical double layer capacitor cell.

Keywords: bio-polymer material, polymer electrolytes, conducting species (H$^+$), ionic conductivity

ACEAIT-0177

Accumulation of the Fossiliferous Fluvio-Lacustrine Carbonates of the Early Jurassic Nam Phong Formation, Khorat Group, Northeastern Thailand

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Abstract

The fossiliferous carbonate rocks of the Nam Phong Formation crop out locally in the Early Jurassic Non Tum dinosaur track site, Nong Bua Daeng district, Chaiyaphum province, northeastern Thailand. The carbonate deposits could decipher the depositional process and the subenvironment of the Early Jurassic Nam Phong Formation. The studied carbonate rocks were observed under the polarizing microscope and analyzed by the X-ray diffraction analysis in order to obtain information on rock textures and mineral compositions. The Non Tum carbonate rocks can be categorized into three facies; the limestone-marlstone alternation, massive mudstone, and bioturbated and laminated mudstone, ascendingly. The limestone-marlstone alternation facies contain over 60% of bivalves and darwinulid ostracods. These evidences suggest that this carbonate rocks were deposited in a low-energy subtidal environments below fair-weather wave base of the shallow seasonal lake or ponds.

Keywords: fluvio-lacustrine carbonates, depositional environment, Early Jurassic, Nam Phong, Formation, Khorat Group, darwinulid ostracods

Material Science and Engineering

Thursday, March 29, 2018   16:30-18:00   Room A

Session Chair: *Prof. Ku-Chin Lin*

ACEAIT-0030

Freeform Lens Design for Illumination of Right Polygonal Shapes

Ku-Chin Lin｜*Kun Shan University*

ACEAIT-0041

Feasibilities to Develop Concrete Floor of Swine Farm in Thailand.

Laddawan Lapcharatsangroj｜*King Mongkut's Institute of Technology Ladkrabang*

Chalida U-Tapao｜*King Mongkut's Institute of Technology Ladkrabang*

ACEAIT-0088

Effects of Hydrophobic Porous Coating and Catalyst on Cycling Performance of Lithium-Oxygen Battery

Jia-Cheng Chang｜*Chang Gung University*

Shingjiang Jessie Lue｜*Chang Gung University*

ACEAIT-0111

Interaction of GO with Various Salts and Solvents

Chia Wen Lin｜*Chang Gung University*

Shingjiang Jessie Lue｜*Chang Gung University*

ACEAIT-0184

Effect of Carbon Fibers on Mechanical Properties of Aluminum Alloys

Aniwat Hasook｜*Rajamangala University of Technology Isan*

Pitinun Vasantasananont｜*Rajamangala University of Technology Isan*

Patcharaporn Somdee｜*Rajamangala University of Technology Isan*

Kanokon Nuilek｜*Rajamangala University of Technology Isan*

Chanon Bunon｜*Rajamangala University of Technology Isan*

Natkrita Prasoetsopha｜*Rajamangala University of Technology Isan*

ACEAIT-0030

Freeform Lens Design for Illumination of Right Polygonal Shapes

Ku Chin Lin

Mechanical Engineering Department, Kun Shan University, Taiwan

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Abstract

In this study, a map is proposed to achieve continuous and smooth freeform surfaces for uniform illumination of right polygons. The proposed map is an integration of a number of primitive maps where a polygon is divided into a number of symmetric quadrilaterals of the same size, and the irradiance energy of source is also divided into the same number of symmetric pie sectors. The transfer of a pie sector of irradiance energy onto a quadrilateral is derived. Procedures to implement the proposed map are given in this study. The adequacy of the proposed map is demonstrated by Monte Carlo ray tracing simulation and experiment as well. The contribution of this study is fundamental and profound in the field of freeform lens design. Advanced studies for uniform illumination of arbitrary polygons are currently taken to expand the applicability of the proposed map.

Keywords: Freeform Len Design, Uniform Illumination, Ray Tracing Simulation, Irradiance Energy Mapping.

Feasibilities to Develop Concrete Floor of Swine Farm in Thailand.

Laddawan Lapcharatsangroj [a], Chalida U-Tapao[b]

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Abstract

Nowadays, 80% of the pig houses inside Thailand are made of conventional concrete. One of the major problems is concrete cracking and spalling around the feeding area. Results of a survey section, it was found that the pig behavior and acid derived from animal feed are 2 main reasons. Thus, the researcher has seen about the chance to develop this concrete area for the pig houses by studying from factors affecting to concrete and analyzing the possibility to improve the concrete floor for the quality pork with disease resistance. This article is presenting about the research reviews in the subject of the abrasion and corrosion resistance of concrete floor in swine farm. As claimed by the Department of Public Works and Town & Country of Thailand (1352-2550), it was found that the quality concrete floor should have the water cement ratio not over 0.45 and the quantity of cement adding up less than 350 kg./cubic meter.

Keywords: swine farm, animal feed, lactic acid, durability

Effects of Hydrophobic Porous Coating and Catalyst on Cycling Performance of Lithium-Oxygen Battery

Jia-Cheng Chang[a], Shingjiang Jessie Lue[b]

Department of Chemical and Materials Engineering, Chang-Gung University, Taiwan

E-mail: darksheepalex666@yahoo.com.tw [a], jessie@mail.cgu.edu.tw[b]

Abstract

Rechargeable lithium-oxygen battery is a secondary battery that provides high specific energy density, with light weight as compared to current lithium ion rechargeable batteries. Therefore, the lithium-oxygen battery has a high potential to be used in mobile devices, especially for electrical vehicle cars and smart phones. In this research, it is attempted to study the design on cathode structure of coin cells.

We have prepared lithium-oxygen batteries with carbon cloth as cathode materials, and found out the cathode needed some time (2~8h) to activate the cell to reach 2.7-V discharge voltage; but the power density was only 1.4 mW/cm^2 after the first charge. After the carbon cloth was coated with a hydrophobic microporous layer, the max power density reaches to 4.0mW/cm^2 with the same test conditions above. When the cathode carbon cloth contained platinum catalyst, 4.76mW/cm^2 of the max power density was observed. When both hydrophobic microporous layer and catalyst were applied onto the cathode (with hydrophobic microporous layer facing outside of the cell), it has the max power density of 3.47mW/cm^2. The electrochemical impedance spectra showed that after adding a hydrophobic microporous layer, the Rb is around 20 ohm, Rct 23 ohm, comparing the only-carbon-cloth, which the Rb is 15ohm, Rct 24 ohm, respectively. This result shows adding a hydrophobic microporous layer won't have significant change on the impedance. Also that the batteries can get longer cycle life time for 20hrs or even more if the hydrophobic microporous layer is added. On the catalyst side, we found that platinum catalyst can extend the cycle life for 100hrs.

Keywords: Lithium-Air Batteries, Lithium-Oxygen Batteries, Cathode, Carbon cloth, Cycle life, hydrophobic porous layer

Interaction of GO with Various Salts and Solvents

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Graphene oxide (GO) is a two-dimensional material to make high-performance membrane for important applications. However, using GO membrane in ion sieving and desalination is limited by its natural tendency to swell. As water is absorbed by GO membrane which form an enlarged interlayer spacing (d-spacing). It is a challenge to achieve smaller d for GO laminates.

In this study, we prepare GO nanosheets using modified Hummer's method and evaluate the GO characteristics dispersed in aqueous salt solutions and organic phase. The GO is dispersed GO in water, $MgSO_4$ and Na_2SO_4 aqueous solutions, and NMP (n-methyl-2-pyrrolidone) solvent under room temperature. Well aligned Go nanosheets is obtained using pressure-assisted filtration method on GO suspension. The GO properties are analyzed using Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS) and X-ray diffraction (XRD), and laser light scattering analyzer.

Permeation rates decrease with decreasing sieve size but water transport is weakly affected. The reaction with water is caused by C-C bond cleavage, formation of vinylogous carboxylic, and the generation of protons. We expected the interlayer spacing changes of GO membrane helping ion separation.

Keywords: Graphene oxide, interlayer spacing, aqueous salt solutions

Effect of Carbon Fibers on Mechanical Properties of Aluminum Alloys

Aniwat Hasook*, Pitinun Vasantasananont, Patcharaporn Somdee, Kanokon Nuilek, Chanon Bunon, Natkrita Prasoetsopha

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Abstract

The purpose of this research is to investigate the mechanical properties of aluminum alloy A356 with varied short carbon fibers content. Short carbon fibers were mixed into a molten aluminum at a temperature of 780 ℃, the ratio between aluminum and carbon fibers were 100:0, 99:1, 98:2, 97:3, 96:4 and 95:5 wt%. After that, molten aluminum composites were poured into the permanent mold at a temperature of 720 ℃ for casting specimen test. Tensile property, impact property, hardness property, microstructure and chemical composition of aluminum composites were investigated. The tensile strength increased up to 17.72 % when 5 wt% of carbon fiber was added. The percent elongation tended to decrease with increasing carbon fibers content. Impact value decreased when carbon fibers increased but hardness increased when carbon fibers increased, up to 377.3 HB at 5 wt% of carbon fiber. Hardness was increased 2.4 times compared to pure aluminum. Microstructure of aluminum composite was investigated. The results showed the dispersed short carbon fibers into dendrite boundary of aluminum affect fine dendrite and short arm dendrite of aluminum composites. Hence, the short carbon fiber can improve the mechanical properties of aluminum alloy. The chemical compositions of all composites were in the range of aluminum alloys standard.

Keywords: Carbon fibers, aluminum A356, composites

Computer and Information Sciences   / Electrical and Electronic

Engineering / Fundamental and Applied Sciences

Wednesday, March 28, 2018   13:00-13:50   Room AV

ACEAIT-0006

High Degree Coefficients of Spherical Harmonics Expansions and Image Reconstruction

An-Wen Deng｜*Chien Hsin University of Science and Technology*

Chih-Ying Gwo｜*Chien Hsin University of Science and Technology*

ACEAIT-0007

Improved High-Order Zernike Moments for Shape Discrimination

Chih-Ying Gwo｜*Chien Hsin University of Science and Technology*

An-Wen Deng｜*Chien Hsin University of Science and Technology*

ACEAIT-0091

Projection of Risk Rate of False Personation by using USB-HID Identifications

Hyo-Joong Suh｜*The Catholic University of Korea*

ACEAIT-0113

A Personalized Approach for Recognizing Music Emotion on Mobile Devices

Chia-Chun Wu｜*Fu Jen Catholic University*

Jia-Lien Hsu｜*Fu Jen Catholic University*

ACEAIT-0153

The Optimal Tourist Traveling Planning - Based on Android Platform

Her-Shing Wang｜*National Taipei University of Technology*

Wei-Yin Tsai｜*National Taipei University of Technology*

ACEAIT-0174

Human Action Recognize using SVM

Zong-Yi Lin｜*Tokushima University*

Stephen Karungaru｜*Tokushima University*

Terada Kenji｜*Tokushima University*

Shin-Pu Fang｜*Southern Taiwan University of Science and Technology*

ACEAIT-0190

Use Aesthetic Measure to Analyze the Consumer Preference Model of Product Forms

Shih-Wen Hsiao｜*National Cheng Kung University*

Zhang-Chen Tian｜*National Cheng Kung University*

ACEAIT-0017

Design of Phasor Estimator Based on Interval Halving Method for Synchronization of Distributed Energy and Power System

Cheng-I Chen｜*National Central University*

Yeong-Chin Chen｜*Asia University*

Chung-Hsien Chen｜*Metal Industries Research and Development Centre*

ACEAIT-0029

Quint-Band Microstrip Bandpass Filter Using Multi-Mode Resonator and Stepped-Impedance Resonators

Tzu-Yang Ting｜*National Central University*

Wen-Hua Tu｜*National Central University*

ACEAIT-0045

Optimal Placement and Sizing of Distributed Generations in Radial Distribution Network by Using Genetic Algorithm

Sovann Ang｜*Suranaree University of Technology*

Uthen Leeton｜*Suranaree University of Technology*

Thanatchai Kulworawanichpong｜*Suranaree University of Technology*

ACEAIT-0050

Efficient Pilot Scheduling Using Ant Colony Optimization for Massive Multiuser MIMO Systems

Jung-Chieh Chen｜*National Kaohsiung Normal University*

Yu-Chieh Chang｜*National Kaohsiung Normal University*

Kai-Hsiang Chen｜*National Kaohsiung Normal University*

Hsuan-Yung Wang｜*National Kaohsiung Normal University*

Yuh-Fung Huang｜*National Kaohsiung Normal University*

ACEAIT-0053

Application and Circuit Design of the Same-Phase Power Supply Scheme in Electrical Power Distribution Systems

Yu-Wen Huang｜*National Taiwan University of Science and Technology*

Tsai-Hsiang Chen｜*National Taiwan University of Science and Technology*

Tai-Jou Chen｜*T.Y.Lin Taiwan Consulting Engineers, Inc.*

ACEAIT-0095

Fabrication of Aluminium Oxide/Silicon MOS Capacitor by Low Temperature Chemical Solution Deposition

Chih-Feng Yen｜*National Kaohsiung Marine University*

Lyu-Wei Liao｜*National Kaohsiung Marine University*

Rui-Jun Hong｜*National Kaohsiung Marine University*

ACEAIT-0104

Optimal Second-Order Kalman Filter for Pulse Radar Tracking Using Acceleration Information

Kenshi Saho｜*Toyama Prefectural University*

ACEAIT-0122

New Estimation Method for Daily Performance Based on Ambient Sensing Technology

Koichi Kurita｜*Kindai University*

ACEAIT-0123

The Health Estimator for LFP Battery Using the Fuzzy Neural Network

Wen-Yeau Chang｜*St. John's University*

ACEAIT-0183

Study the Random Telegraph Noise on P-Channel FinFET Devices

Yu-Lin Chen｜*National University of Kaohsiung*

Chih-Cheng Hsu｜*National University of Kaohsiung*

Chen-Kai Yang｜*National University of Kaohsiung*

Chiao-Feng Chung｜*National University of Kaohsiung*

WenQi Zhang｜*National University of Kaohsiung*

Yi-Lin Yang｜*Nation Kaohsiung Normal University*

Wen-Kuan Yeh｜*National Nano Device Laboratory*

ACEAIT-0046

Optimal Individual and Group Preventive Maintenance Policies for a Two-Device System with a Threshold Value on Age

Kai Jye Chia｜*National Taiwan University of Science and Technology*

Chao Wang｜*Providence University*

Wen Liang Chang｜*Cardinal Tien Junior College of Healthcare and Management*

ACEAIT-0006

High Degree Coefficients of Spherical Harmonics Expansions and Image Reconstruction

An-Wen Deng, Chih-Ying Gwo*

Department of Information Management, Chien Hsin University of Science and Technology, Taoyuan, Taiwan

[*] E-mail: ericgwo@uch.edu.tw

Abstract

In this paper we discuss several different methods explicitly computing coefficients for spherical harmonics expansion. Through the inverse equirectangular projection of the image to the unit sphere, those spherical harmonics expansion coefficients for that image function can be regarded as image features. Our proposed algorithms use a series of recursive formulae computing the normalized associated Legendre polynomials and the indefinite integrations. With the information of those coefficients, one can reconstruct the image. The experimental results show that our idea of expansion coefficients as image features works well and the proposed methods are accurate. By one of our proposed methods, the error rate is 0.002860169 for the image reconstruction for the test image 256×256 'Lena' from expansion coefficients up to degree of 480.

Keywords: Spherical Harmonics, Associated Legendre Polynomials, Recursive Formulae, Image processing

Improved High-Order Zernike Moments for Shape Discrimination

Chih-Ying Gwo *, An-Wen Deng

Department of Information Management, Chien Hsin University of Science and Technology, Taiwan

* E-mail: ericgwo@uch.edu.tw

Abstract

Zernike moments (ZMs) have been successfully used in the fields of image processing and pattern recognition. An innovative method, combining edge blurring with computation of ZMs, was proposed to further enhance image processing. After the augmentation process, the images showed that the reconstruction errors were increased dramatically at augmented pixels, but decreased on other pixels. The experimental results demonstrated that 4-pixel augmentation approach not only provided better performance for reducing reconstruction error on non-augmented pixels but also strengthened shape contour characteristics.

Keywords: Zernike moments; reconstruction error; class separability; shape descriptor

ACEAIT-0091

Projection of Risk Rate of False Personation by using USB-HID Identifications

Hyo-Joong Suh

School of Computer Science and Information Engineering, The Catholic University of Korea, Korea

E-mail: hjsuh@catholic.ac.kr

1.   Background

Each product of USB-HID keyboards has a unique Product ID (PID) and Vendor ID (VID) numbers which grated by the USB forum and the manufacturer. Furthermore, the keyboards exhibit exceptional persistency that across the developments of the computer systems. As an instance, an early stage USB keyboard released in 1996 is still adaptable to the modern operating systems such as Windows 10. Furthermore, the keyboards are primary devices for human interface, thus there are lots of various models by the fulfillment of the diversity of characteristics of persons. Consequently, huge models of the keyboards are in use with the diversity of the time period (S., H.-J., 2017).

It is the key idea of this research that can be used as an identifier of a person. In this paper, I propose a detecting method of false personation by the track of PID and VID history.

2.   Conclusion

The risk rate of the false personation can be developed by the digitalized patterns of the personal circumstances. In this paper, I focus the USB keyboard as a projection factor which shows an exceptional consistency as well as the personal preference. By the combination of VID-PID pairs with the other substantial parameters, the risk rate can be sophisticated to avoid the false personation.

Keywords: Risk rate, False personation, USB-HID keyboard, VID-PID pair

Projection of Risk Rate of False Personation by using USB-HID Identifications

Hyo-Joong Suh

School of Computer Science and Information Engineering, The Catholic University of Korea, Korea

E-mail: hjsuh@catholic.ac.kr

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Keywords: Risk rate, False personation, USB-HID keyboard, VID-PID pair

A Personalized Approach for Recognizing Music Emotion on Mobile Devices

Chia-Chun Wu[a] , Jia-Lien Hsu[b]

[a] Graduate Institute of Applied Science and Engineering, Fu Jen Catholic University, Taiwan

[b] Department of Computer Science and Information Engineering, Fu Jen Catholic University, Taiwan

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1. Objectives and Goals

In this research, we propose an evidence-based approach to recognize music emotion. Several approaches have been proposed for recognizing emotion in music. These approaches employ supervised learning algorithms to categorize the emotional characteristics of music from crowd sourcing tags, but these classifications still deviate from the personalized emotion of each individual user. Meanwhile, electroencephalography (EEG) is a non-invasive and monitoring method to record electrical activity of the brain. The spectral content of EEG can be observed in the frequency domain have been utilized for exploring emotions with respective to certain stimulus (*i.e.*, listening to music, in our research). Therefore, we seek to further personalize music emotion recognition by exploiting physiological assessment of EEG signals.
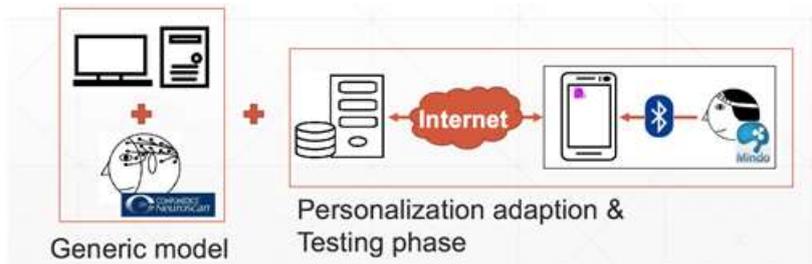

Figure 1: The client-server architecture of personal music emotion recognition.

Figure 2: (a) EEG setup for generic model (left) (b) wearable EEG reading device (right)

2. Conclusion

Experimental results identify the optimal set of music acouscout feastures and EEG channel combinations for music emotion prediction. We implement an evidence-based and personalized emtion recognition method for music objects by explore EEG on mobile device.

Keywords: Electroencephalography (EEG), mobile device, emotion recognition

The Optimal Tourist Traveling Planning - Based on Android Platform

Her-Shing Wang, Wei-Yin Tsai

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Taiwan (R.O.C.)

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Abstract

Science and technology improve every day. It brought people about the convenience of life and information exchanged immediately, and the traditional way of life will be changed in the future is inevitable. In response to the development, people's traveling style and the operation of tourists have not been the same as in the past. Basing on network development and information circulation, the integration and analysis of tourism-related information have gradually become popular and trendy.

This study aims to establish a set of tourist's attractions recommendation and travel planning system, based on Android platform, to help people decide and plan their journey easily and quickly. At the beginning of the system, the user will be asked to login account or register at the first time of the system. After sign in, the user will be asked to give weight to items presented by the recommendation system. The menu is the category of attractions provided by government. The recommendation system will do the analysis based on the weight and attraction's rating presented by Google Map and use the nearest neighbor algorithm to calculate the degree of recommendation. In view of the list of attractions, coupled with the user provide playing time and traffic method, travel planning will be the minimum traffic cost time as the target and calculate by genetic algorithm. The result will give the user the best sequence of attractions. In the end, the sequence will be presented on the Google Map, and compared with the sequence of random sequences to explore the benefit of the planning result.

Keyword: Android platform, travel planning system, nearest neighbor algorithm, genetic algorithm

ACEAIT-0174

Human Action Recognition Using the Kalman Filter

Zong-Yi Lin[a, b], Stephen Karungaru[a], Kenji Terada[a], Shin-Pu Fang [b]

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Abstract

This study explores a computer version system to classify different human actions. The aim of this paper is to classify three similar actions, i.e. walking, jogging, and running for 4 subjects using support vector machine (SVM). The recorded accuracy is 66% for walking, 84% for jogging, and 67% for running.

Keywords: Image processing, Detection, Tracking, Machine learning.

ACEAIT-0190

Use Aesthetic Measure to Analyze the Consumer Preference Model of Product Forms

Shih-Wen Hsiao*, Zhang-Chen Tian

Department of Industrial Design, National Cheng Kung University, Taiwan

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Abstract

As technology development advance rapidly, for customers the essential physical function of a product is no longer the decisive factor the attracts them to buy. Further-more, customers begin to pursue the products in personality. Customers have a fixed preference model for the product form, if which can be analyzed, designers are able to figure out quickly whether the form designs satisfy the target groups or not. In the study, the product form is selected as the major target for investigation of consumer preferences with variety vases. First, screen out the aesthetic principles, composed of symmetry, minimalist, and cohesion, the different values of which, by calculating objective quantization on the evaluation model of aesthetic measures, can serve as different attributes and levels, further combined with consumer preferences for a conjoint analysis to determine the aesthetic values. Based on the two indices in the conjoint analysis, it has been verified the subjects indeed possess an established preference model. Followed by the finding, the concept of market segmentation was utilized to divide the subjects into six groups by the differences in the part-worth utilities perceived. The figure of the form preference models, constructed by the result, can be detected with the reverse engineering in different groups' preference values. The approach can also be applied to design or adjust the form design with the correct direction. Finally, select a vase with an ordinary preference to a group and modify the details in order to cater more a target group in the direction of the aesthetic values preference results.

Keywords: product form, aesthetic measure, consumer preference, preference model, conjoint analysis

Design of Phasor Estimator Based on Interval Halving Method for Synchronization of Distributed Energy and Power System

Cheng-I Chen[a,*], Yeong-Chin Chen[b], Chung-Hsien Chen[c]

[a] Department of Electrical Engineering, National Central University, Taiwan

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[c] Metal Industries Research and Development Centre, Taiwan

* E-mail: hq7296@yahoo.com.tw

Abstract

The estimation of phasor is an important task for the control, monitoring, and protection of power system, especially for the synchronization of distributed energy and power grid. However, the phasor would be a rotational value in the complex plane due to the deviation of power frequency. In this circumstance, the interconnection of power system and distributed energy would be difficult. In this paper, the phasor estimator based on interval halving method is designed for the grid synchronization under the power frequency deviation. With the compliance tests in IEEE Std. C37.118.1-2011 and actual field measurement, the performance of proposed solution procedure can be verified.

Keywords: phasor, synchronization, distributed energy, power frequency deviation, interval halving method

Quint-Band Microstrip Bandpass Filter Using Multi-Mode Resonator and Stepped-Impedance Resonators

Tzu-Yang Ting, Wen-Hua Tu

Department of Electrical Engineering, National Central University, Taiwan

E-mail: whtu@ee.ncu.edu.tw

1.   Background

For the development of modern multi-service wireless communication systems, an increasing number of multi-band BPF research has been published recently. However, to increase the amount of passbands in a least consumption of circuit size and sacrifice of design freedom is the principle design target. To this end, tri-band BPFs using stub-loaded resonator that created multiple resonance modes have been proposed [1]. Such kind of structure reduce their size by using less resonators to generate more passbands. Furthermore, researches of quad-band and quint-band BPF were also reported [2]-[3]. In [2], a quad-band BPF was proposed using a stub-loaded SIR and a quarter-wavelength SIR. In this structure, a stub-loaded SIR is formed by loading a short-circuited stub in the center of SIR and two symmetrical open-circuited stepped-impedance stubs at two sides. In [3], a stub-loaded resonator which resembles the structure in [2] was associated with a quarter-wavelength resonator which produces two passbands, and used this structure to build out a quint-band BPF. In summary, these papers have one feature in common, all of which were constituted of multi-mode resonators. In fact, multi-mode resonator has the advantage of compact size and flexible design freedom. In this paper, a quint-band BPF composed by multi-stub-loaded resonator and half-/quarter-wavelength SIRs is presented to extend previous work [1]. The even-odd mode method is utilized to analyze resonance characteristics of the multi-stub-loaded resonator, and all the passband frequencies can be predicted by EM full-wave simulations. By adjusting the eight resonance modes, the passband frequencies of multi-stub-loaded resonator can be controlled conveniently. At last, the filter is implemented and results are shown.

2.   Results

Fig. 2 shows the simulated and measured S parameters. The overall size is 35.9 mm×21.5 mm, approximately 0.34 λ_g×0.2 λ_g, where λ_g is the guided wavelength at 1.8 GHz. The measurement passband insertion loss are 1.93, 3.35, 2.32, 3.21, and 2.75 dB at the 1st, 2nd, 3rd, 4th, and 5th passbands, respectively. There are five transmission zeros at 1.96, 2.41, 2.62, 3.2, and 3.79 GHz to improve selectivity.
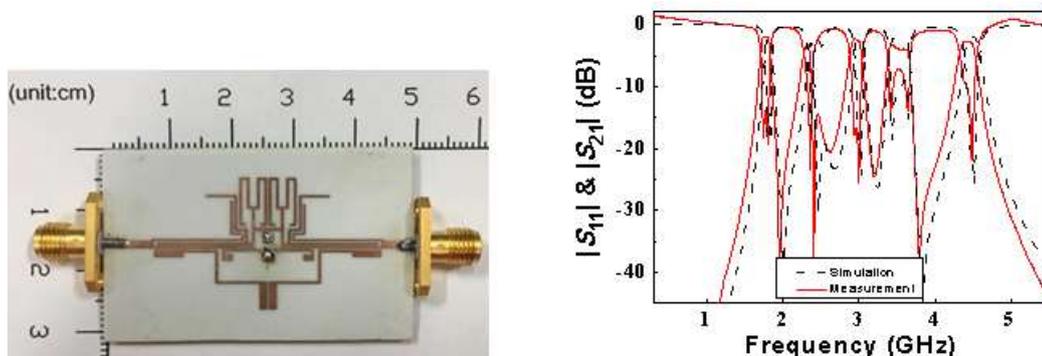

Fig. 2. The final circuit. (left) photograph and (right) simulated and measured results.

Keywords: Quint-band bandpass filter, multi-mode resonators, stepped-impedance resonators.

Optimal Placement and Sizing of Distributed Generations in Radial Distribution Network by Using Genetic Algorithm

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Abstract

Distributed generators (DGs) is widely applied in distribution networks due to its potential solution for loss mitigation and voltage profile improvement. The DGs should be placed in the optimal place and size in the system in order to get high effectiveness and good performance. The aims are to find the optimal location and size of DGs in the radial distribution system. The location of DGs could be identified through Fast Voltage Stability index approach (FVSI) to find the buses in which should be placed in the network, and Newton-Raphson power flow method is utilized to solve the power flow in the system. In this paper, the overall power losses in the system is the objective function. Genetic Algorithm is well-known and widely considered as a potential intelligent search method for solving such a problem. Therefore, the optimal sizing of DGs could be calculated by using Genetic Algorithm (GA). The 13 buses of the radial distribution network are applied with the method. The obtained outcome will show the loss reduction and voltage profile improvement after installing DGs in the system. Moreover, the efficient performance of FVSI and GA algorithm in finding the optimum of loss reduction, size and placement of DGs is conveyed. Single and multiple DG installed in the system are compared in term of losses reduction and voltage profile improvement.

Keywords: distributed generation, optimization techniques, genetic algorithm, distribution network.

Efficient Pilot Scheduling Using Ant Colony Optimization for Massive Multiuser MIMO Systems

Jung-Chieh Chen[*]**, Yu-Chieh Chang, Kai-Hsiang Chen,**
Hsuan-Yung Wang, Yuh-Fung Huang

Department of Optoelectronics and Communication Engineering, National Kaohsiung Normal University,
Kaohsiung, Taiwan
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1.   Background/ Objectives and Goals

The massive or large-scale multiuser multiple-input–multiple-output (MIMO) system is a promising candidate technology for meeting 5G requirements because of its capacity to provide several significant advantages, such as spectral efficiency, link reliability, and coverage, in comparison with conventional small-scale MIMO systems [1]. However, this system suffers from a fundamental bottleneck, i.e., the pilot contamination effect, where the channel estimation in a given cell is contaminated by the reuse of the same pilot group in adjacent cells. Several approaches have been proposed to address this issue [1]–[5]. Among these methods, resource allocation strategies for pilot decontamination are highly attractive because of their good performance [1][3]–[5]. These strategies are motivated by the heavy dependence of pilot contamination on pilot assignment and aim to intelligently schedule the limited number of orthogonal pilots to different user terminals (UTs) and hence capitalize on UT locations and large-scale fading coefficients to alleviate the effect of pilot contamination. Finding optimal pilot scheduling patterns that minimize the effect of this issue mathematically in multiuser multicell massive MIMO systems can be formulated as a permutation-based optimization problem. However, determining the optimal solution requires an exhaustive search algorithm (ESA), which is computationally prohibitive even when the number of cells or UTs per cell is small. For reducing search complexity and the pilot contamination effect, we propose the application of ant colony optimization (ACO) [6].

2.   Results

Our simulation setup is identical to that in [5], where the numbers of cells (L) and UTs per cell (K) are 3 and 6, respectively. In addition, the performance measure considered in this study is the average achievable rate. For comparisons, the random allocation scheme [1] and the optimal ESA are applied, which require 1 and $(K!)^{L-1}$ trials, respectively. Fig. 1(a) shows the cumulative distribution function (CDF) curves of the achievable rate per UT of the various test algorithms, averaged over 10,000 Monte Carlo realizations, for $M = \infty$ and $M = 128$, in which M is the number of base station antenna. The proposed ACO is run with $S = 36$, $\rho = 0.11$, $\alpha = 32$, and $\beta = 8$. Simulation results demonstrate that the algorithm significantly outperforms the classical random pilot assignment scheme. In addition, the performance of ACO coincides with that of ESA for both $M = \infty$ and $M = 128$. Fig. 1(b) depicts the achievable rate per UT of the ACO algorithm at each iteration and shows the performance of ESA for ease of comparison. The average achievable rates per UT obtained by the proposed ACO-based pilot scheduling method are within 99.99% of the optimal result implemented by the ESA when ACO is run for approximately 124 iterations. In this case, ACO requires $36 \times 124 = 4,464$ trails to obtain the desired solution. However, $(K!)^{L-1} = 518,400$ trials are required for ESA. Therefore, the proposed ACO-based pilot scheduling method requires approximately only 0.86% of the search complexity of ESA. Notably, the proposed ACO algorithm is even better than the recent result in [5], which needs approximately 1.39% of the computational complexity of ESA to converge to within 99.99% of the true optimum obtained by ESA.

Keywords: Ant colony optimization, interference, massive MIMO, pilot contamination, pilot scheduling.

Application and Circuit Design of the Same-Phase Power Supply Scheme in Electrical Power Distribution Systems

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Abstract

The same-phase power supply (SPPS) scheme is applicable to multiphase AC power distribution systems equipped with a neutral line. Technically, it uses a zero-sequence circuit to deliver power. To date, some academic papers have demonstrated and confirmed its feasibility and possible applications through computer simulation. This paper proposes some practical applications and circuit designs to apply the SPPS scheme to electrical power distribution systems. To apply the SPPS scheme, a simple changeover switch (COS) and a few optional auxiliary devices are adopted to momentarily separate a great number of large loads from the system to suspend their power supply. Hence, this scheme enables the reserved power to supply small essential loads throughout the system. In other words, the reserved power can be supplied to a large number of widely distributed small essential loads for basic quality-of-life maintenance when the power supply of the public power system is inadequate. The approaches and devices proposed in this paper can be useful for engineers in the planning and design of electrical power distribution systems to enhance their reliability and security and to reduce the impacts and damage caused by power failures or a considerable power imbalance.

Keywords: same-phase power supply scheme, phase selector, changeover switch, smart building, microgrid

Fabrication of Aluminium Oxide/Silicon MOS Capacitor by Low Temperature Chemical Solution Deposition

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1. Background

Many high dielectric constant (high-k) materials are now used to replace the traditional silicon dioxide (SiO_2). Among these materials, aluminum oxide (Al_2O_3) is a very good candidate because it allows us to reduce the size of the metal-oxide- semiconductor field effect transistor (MOSFET) device. Al_2O_3 has many superior characteristics (i.e., a high bandgap of 9 eV, a high breakdown electric field up to 5–10 MV/cm, a high-k value of 8.6–10, and remains amorphous with typical process) that can apply on silicon metal-oxide-semiconductor (MOS) as dielectric oxide. The MOS capacitor with Al_2O_3 dielectric oxide was prepared by low temperature chemical solution deposition (LTCSD) in this study which has many advantages such as simple process, low temperature, non-vacuum equipment, good selective and high uniformity.

2. Conclusion

In this study, an amorphous Al_2O_3 film was directly deposited on silicon with a low temperature deposition process. To further improve the electrical characteristics of Al_2O_3/Si MOS structure, samples were annealed with various temperatures 500-900 ^{o}C. The experimental results show that the optimal condition happened at 700 ^{o}C. The lowest leakage currents can reach 1.42×10^{-7} A/cm^2 at 5V. The dielectric constant is 11.91 and effective oxide charge is 4.2×10^{11} C/cm^2. The density of interface state was derived from conductance method and the lowest value is 6.39×10^{11} cm^{-2}eV^{-1}. Those results indicate it has potential to fabricate a MOSFET with LTCSD-Al_2O_3 as dielectric oxide in the near future.

Keywords: LTCSD, Al_2O_3, silicon substrate, MOS capacitor.

Optimal Second-Order Kalman Filter for Pulse Radar Tracking Using Acceleration Information

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Abstract

In this paper, an optimal moving object tracking method using second-order Kalman filter for pulse radars is proposed. The proposed method determines optimal covariance matrices of the process noises in a Kalman filter tracking based on minimization of steady-state prediction errors. The optimal matrix of the process noises is adaptively determined using target's acceleration information, and the empirical setting of the process noise is thus unnecessary. Numerical simulations verify that the proposed method achieves smaller tracking error than the conventional Kalman filter trackers using fixed process noises.

Keywords: moving object tracker, Kalman filter, pulse radar, process noise, acceleration

New Estimation Method for Daily Performance Based on Ambient Sensing Technology

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1.   Background

If it becomes possible to develop technology that makes it easy to extract personal characteristics from daily activities, it will be possible to apply to various fields such as elderly support. Then, by accumulating temporal changes in feature values of the daily living behavior of the elderly, life support of elderly people will be possible. However, there are some difficulties when measuring the behavior of everyday life by the conventional method. For example, when image measurement using one camera is performed, ingenuity to reduce the blind spot of the camera is required. Also, when monitoring with a camera, it is necessary to pay attention to the subject's privacy. As a method of measuring a human body motion, there is a method based on motion capture using a multi camera system (M. Windolf, et. al. 2008), for example. In this method, it is possible to detect motion such as walking motion by detecting the movement of the marker attached to the human body in the calibrated space with a multi camera system. However, detection is possible only in a limited space, and the device is also expensive, so it is not easy to use it in general household. Meanwhile, a method for detecting daily performance by attaching an electromyograph, a strain gauge, and an accelerometer to the body is used. However, since the subjects are always wearing sensors such as accelerometers, the subject's life becomes troublesome. Therefore, in the conventional method, it was difficult to acquire natural daily performance in a completely non-contact condition without attaching instruments to subjects. The change in the electric potential of the human body that is caused by the daily performance induces an electrostatic induction current in the electrode placed at a distance of a few meters from the human body (K. Kurita 2009). Using this technology, I have developed an effective non-contact technique for the detection of human daily performance by detecting the change in this human-generated body charge.

2.   Results

The author attempted to detect daily motions in a non-contact condition by detecting electrostatic induction current induced by human body potential fluctuation occurring in daily performance. Seated on a chair after walking exercise and stopped for 5 s, then retreated from the chair and walked was selected as an example of daily performance. As a result, it was clarified that a series of these motions can be detected non-contact by the method of detecting the electrostatic induction current proposed in this research. Furthermore, from the results of the scalogram obtained by the wavelet analysis, a characteristic pattern was detected in the signal in the frequency range between 3 Hz and 0.7 Hz. Furthermore, it was found that characteristic patterns unique to the individual existed in walking exercise, sitting on a chair and retirement from a chair.

Keywords: Electrostatic induction, Non-contact detection, Walking motion, Daily performance

The Health Estimator for LFP Battery Using the Fuzzy Neural Network

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Abstract

The paper proposes a fuzzy neural network based health estimator using for the $LiFePO_4$ (LFP) batteries. The proposed battery health estimator contains the hardware's: voltage detecting circuit, current detecting circuit, impedance detecting circuit and the software's: state of charge (SOC) estimating program, health estimating program. With a micro-processor integrated, the proposed health estimator is capable of digital control to improve the system reliability.

The proposed health estimator is based on the fuzzy neural network. The architectures of fuzzy neural network used in this paper contain an input layer, an output layer. The input layer contains of four nodes which are current, voltage, impedance, SOC and output layer has one neuron which is the value of the state of health.

To verify the performances of the proposed health estimator, a prototype health estimator has been tested on several kinds of practical LFP batteries. The test results show that the proposed estimator is efficient and reliable.

Keywords: Health estimator, LFP batteries, Fuzzy neural network, Micro-processor

Study the Random Telegraph Noise on P-Channel FinFET Devices

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Abstract

In the FinFET, the presence of defects in the oxide layer or the high- κ layer is found by the measurement and analysis of the Random Telegraph Noise (RTN), based on the calculated Capture time (τc) and Emission time (τe) The dependency of the bias is used to calculate the defect position accurately. In this paper, we will research the RTN of High-k / Metal Gate pFinFET, compare the change of RTN with different gate bias and discuss the defect location corresponding to RTN under different bias voltages, and expect the future to improve the impact of these defects on FinFET.

Keywords: FinFET, Random Telegraph Noise, Capture time, Emission time

Optimal Individual and Group Preventive Maintenance Policies for a Two-Device System with a Threshold Value on Age

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Abstract

Consider that a two-device system is sold with a free-repair warranty period. For a two-device system, when the device's age or usage increases, it may fail more frequently. Therefore, performing a preventive maintenance (PM) action for the device may be suitable for reducing the number of failures. In this paper, some maintenance policies for two devices are considered as follows. Within the warranty period, any failure of either device is rectified by minimal repairs and incurs a fixed repair cost. In addition, when the age of either device reaches a specified value (called as a threshold value), a PM action is performed for the device and incurs a PM cost. When the PM cost is high, it might be worthwhile performing PM actions for two devices at the same time (called group PM policy; GPM) instead of performing PM actions for them separately (called individual PM policy; IPM). Under IPM and GPM policies, two expected total cost models of two devices within the warranty period are constructed and further, the optimal IPM and GPM policies are obtained which minimizes the expected total cost. Finally, the impacts of PM cost for the IPM and GPM policy are illustrated through numerical examples.

Keywords: Two-device system, threshold value, individual preventive maintenance, group preventive maintenance

Life Science

Wednesday, March 28, 2018　　　　14:00-14:50　　　Room AV

APLSBE-0003

Development of DNA Marker Detection of Rumen Fluke Larvae (Paramphistomatidae) in Natural Freshwater by Using Real Time PCR

Arin Ngamniyom｜*Srinakharinwirot University*

Thayat Sriyapai｜*Srinakharinwirot University*

APLSBE-0004

Effect of Retrotransposons Express on Spermatogenesis in Azoospermia Patients

Chung-Hao Lu｜*Mackay Memorial Hospital*

APLSBE-0006

Anti-MRSA (Methicillin-Resistant *Staphylococcus Aureus*) Peptides from Protein Hydrolysate of Vegetables

Nuanchawee Wetprasit｜*Ramkhamhaeng University*

Janthima Jaresitthikunchai｜*National Science and Technology Development Agency*

Narumon Phaonakrop｜*National Science and Technology Development Agency*

Sittiruk Roytrakul｜*National Science and Technology Development Agency*

APLSBE-0007

Dengue Virus Nonstructural Protein 1 Induces Platelet Activation

Trai Ming Yeh｜*National Cheng Kung University*

APLSBE-0008

Id1 and Sonic Hedgehog Mediate Cell Cycle Reentry and Apoptosis Induced by Amyloid Beta-Peptide in Primary Cortical Neurons

Ding-I Yang｜*National Yang-Ming University*

Chien-Hui Chen｜*National Yang-Ming University*

Shih-Hsin Chang｜*National Yang-Ming University*

Chao-Tzu Huang｜*National Yang-Ming University*

APLSBE-0010

CD133/RalA/PAR6/The Exocyst Complex Upregulates Tumor Exosome Integrins to Determine Organotropic Metastasis

Yi-Wen Chang｜*National Tsing Hua University*

Wei-Hsin Lin｜*National Taiwan University Hospital Hsin-Chu Branch*

Jia-Lin Lee｜*National Tsing Hua University*

APLSBE-0017

Role of Sfp1 in *Candida Albicans* Resistance to Fluconazole

Ting-Ling Ke｜*National Tsing Hua University*

Chung-Yu Lan｜*National Tsing Hua University*

APLSBE-0021

Protein Hydrolysate Production and Amino Acid Composition from Seed Kernel of Sacha Inchi

Apasiri Sophotong｜*Phranakhon Si Ayutthaya Rajabhat University*

Chanthakan Nuchsuk｜*Phranakhon Si Ayutthaya Rajabhat University*

APLSBE-0041

GM Maize Detection Using Multiplex PCR

Maliwan Nakkuntod｜*Naresuan University*

Nilawan Duaysan｜*Naresuan University*

Surapa Nutthapornnitchakul｜*Naresuan University*

APLSBE-0048

Mitogenic Effect of Endothelin-1 on 3T3-L1 Preadipocytes Depends on the ERK, c-Jun, and STAT-3 Pathways

An-Ci Siao｜*National Central University*

Hui-Chen Ku｜*Academia Sinica*

Yi-Wei Tsuei｜*Taoyuan Armed Forces General Hospital*

Yao-Ming Huang｜*Taoyuan Armed Forces General Hospital*

Yow-Chii Kuo｜*Landseed General Hospital*

Yung-Hsi Kao｜*National Central University*

APLSBE-0049

Examination of Applicability of Southern Chinese Reference Data Set of Dental Age Assessment in Thailand

Hai Ming Wong｜*The University of Hong Kong*

APLSBE-0051

The Role of Exosomes in the Pathology of High Fat Diet Induced Increase in Susceptibility of Cerebral Ischemia

Shin-Wei Huang｜*Taipei Medical University*

Chih-Hao Yang｜*Taipei Medical University*

APLSBE-0052

Anti-Inflammatory Property of a New Polysaccharide from *Cordyceps* Mycelia Extract on LPS-Activated Primary Peritoneal Macrophages

Chien-Hung Hung｜*Taipei Medical University*

Chi-Li Chung｜*Taipei Medical University*

APLSBE-0055

The Role of Adult Neurogenesis in the Etiology of Changes in Eating Behaviors in a Rodent Model of Schizophrenia

Yu Ning Wang｜*Taipei Medical University*

Chih-Hao Yang｜*Taipei Medical University*

APLSBE-0056

Redox Modulation of Protein Phosphatases by Protein Carbonylation/De-Carbonylation Process in Vascular Smooth Muscle Cells

Chieh-Min Chen｜*Taipei Medical University*

Cheng-Ying Hsieh｜*Taipei Medical University*

APLSBE-0057

Platonin, a Cyanine Photosensitizing Dye, Exhibits Anti-Inflammatory Property in ox-LDL-Stimulated Mouse Vascular Smooth Muscle Cells

Chih-Wei Chiu｜*Taipei Medical University*

Cheng-Ying Hsieh｜*Taipei Medical University*

APLSBE-0060

Cinchonidine Exerts Cell-Protective Property on Uremic Toxin-Treated Human Umbilical Vein Endothelial Cells via the Inhibition of OAT-3 Transporter

Ruei-Dun Teng｜*Taipei Medical University*

Yu-Chen Hsu｜*Taipei Medical University*

Cheng-Ying Hsieh｜*Taipei Medical University*

APLSBE-0062

Investigating the Properties of Bacteria is Singaporean Water Sources for Environmental Bio-Remediation

Arjun Vyas ｜ *Newcastle University*

APLSBE-0027

Generation of Recombinant Infectious Bursal Disease Virus and Purification with Immobilized Metal Ion Affinity Chromatography

Su-Yuan　Lai ｜ *Central Taiwan University of Science and Technology*

Min-Ying Wang ｜ *National Chung Hsing University*

Sheng-Tse Liu ｜ *National Chung Hsing University*

Kuan-Yin　Cho ｜ *National Chung Hsing University*

Development of DNA Marker Detection of Rumen Fluke Larvae (Paramphistomatidae) in Natural Freshwater by Using Real Time PCR

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1. Background/ Objectives and Goals

Paramphistomatidae is a typical digenean parasite that is widely distributed throughout tropical and subtropical regions of worldwide. This trematode family has been recognized almost fifteen genera (Sanabria and Romero, 2008). The adult flukes of Paramphistomatidae are the important cause of paramphistomiasis that are a disease in the digestive tracts of livestock animals such as cattle, goat and sheep (Panyarachun et al., 2009). This disease leads to productivity loss in adult ruminant animals and acute parasitic gastroenteritis in young stocks (Noble, 1982). The freshwater snails are a main intermediate host, and encysts attach on plants (Horak, 1971). In general, The infection has been diagnosed by using an observation of parasitic eggs in feces, immunoassay, molecular analysis and strip test of blood serum or feces of animals (Anuracpreeda et al., 2016). However, the detection of cercarial, miracidial, egg or encysted flukes has not been studied in a natural environment. Therefore, this study aimed to development the molecular tools for detecting the larvae of Paramphistomatidae in the environments by using real-time polymerase chain reaction (PCR) analysis.

2. Expected Results/ Conclusion/ Contribution

The molecular signals of real-time PCR analysis were specific to positive DNA of three adult rumen flukes and were undetectable to negative controls by using the ITS2 primers. However, there was weak in signals for some sample of *Fasciola* sp. by using the paired primers of 18S rDNA. Therefore, ITS2 primers were used as DNA marker in this study. The lowest concentration of detection limited at 0.1 ng/l for adult genomic DNA. For genetic detections of larvae from environments, the signal amplifications with ITS2 primers were found in nine samples, in which corresponded to the observation of three larval species under a light microscope that found in the same samples. In contrast, eleven samples were not found those larvae, but molecular reactions revealed the signal detections from one samples without cercarial, miracidial, egg or encysted *Paramphistomum* spp., *Cotylophoron* spp. or *Calicophoron* spp. by a light microscopic observation. These results suggest that real-time PCR using the ITS2 primers may be an alternative tool for detection of rumen fluke larvae in freshwater environments. However, the precision, accuracy, sensitivity of detection is remained to test with the various species of rumen fluke and relative species including the minimum amount of DNA concentration.

Keywords: larvae, ruminants, gastrointestinal fluke, molecular tools, environment

Effect of Retrotransposons Express on Spermatogenesis in Azoospermia Patients

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Azoospermia is the medical condition of a male not having any sperm in their semen. It is associated with very low levels of fertility, and azoospermia cases are idiopathic, since the molecular mechanisms underlying the defects remain unknown. Azoospermia has two forms: obstructive azoospermia (OA), where sperm are created, but cannot be mixed with the rest of the ejaculatory fluid due to a physical obstruction, and non-obstructive azoospermia (NOA), where there is a problem with spermatogenesis, this failure may occur at any stage in sperm production for a number of reasons. This situation may be caused by genetic abnormalities.

Piwi is the germ line-specific subclass of Argonaute proteins. The PIWI proteins family members have been demonstrated to have essential roles in spermatogenesis in mice. Piwi gene null mice demonstrate loss of germ cell phenotype and these phenotypes may be linked to high expression of retrotransposons. In this study, we would like to investigate the expression of retrotransposons in human spermtogenesis by collection of discarded azoospermia testes tissue from patient after IVF (in vitro fertilization) treatment.

We analyzed the expression level of retrotransposon (Alu element) in the NOA testis compare with OA testis by real time PCR. Testes tissue from NOA group expressed significantly ($P < 0.0001$) higher retrotransposon levels than those from OA group. Based on these data, we suggest that *PIWI* genes may involves spermatogenesis in human testis.

Keywords: Retrotransposon, Azoospermia, PIWI, Testis

Anti-MRSA (Methicillin-Resistant *Staphylococcus Aureus*) Peptides from Protein Hydrolysate of Vegetables

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1.   Background

Antibiotics resistance of bacteria is still the problem in treatment especially Methicillin-Resistant *Staphylococcus aureus* (MRSA) which causes a variety of infections and serious diseases (1). Therefore, the protein hydrolysates containing antibacterial activity becomes an interesting approach to develop for new medicines (2). In this study, *Lycopersicon esculentum* Mill., *Capsicum frutescens* Linn*., Allium cepa* var. *aggregatum*, *Ocimum sanctum* Linn. and *Cymbopogon citratus* (DC.) Stapf were used to prepare protein hydrolysates. Total proteins were extracted, pepsin digested and analyzed for antibacterial activity against *Staphylococcus aureus* ATCC 25923 and twenty clinical isolates of MRSA by broth microdilution assay. The results showed that protein hydrolysates from *Capsicum frutescens* Linn. revealed 25-68% growth inhibition of all MRSA isolates at 4 h. Then, bioactive peptides from hydrolysate should be further purified and determined for their amino acid sequences.

2.   Expected Results

Antibacterial activity of hydrolysates

The protein hydrolysates of *Capsicum frutescens* Linn. had the ability to inhibit growth of all MRSA isolates after 2 h and reached the maximum at 4 h. The growth inhibition of protein hydrolysates against MRSA isolates and *S. aureus* ATCC 25923 were 25-68% and 32%, respectively. This might be due to the difference in their cell wall structures and cell surface charges during the growth phase. Then the potent peptides of protein hydrolysates should be further analyzed for their amino acid sequences and physico-chemical characteristic.

Keywords: Peptide, Methicillin-Resistant *Staphylococcus aureus* (MRSA), Protein hydrolysate

APLSBE-0007

Dengue Virus Nonstructural Protein 1 Induces Platelet Activation

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1. Background/ Objectives and Goals

Dengue virus (DENV), a mosquito-borne flavivirus, is responsible for ~390 million infections annually, and leads to dengue fever or potentially lethal dengue hemorrhagic fever (DHF) or shock syndrome(DSS). DHF/DSS patients often show severe symptoms such as vascular leakage and thrombocytopenia. During dengue infection, DENV nonstructural protein 1 (NS1) can be secreted into blood and causes vascular leakage. However, whether NS1 is involved in the pathogenesis of thrombocytopenia remains unclear. In this study, we hypothesized that NS1 may play a critical role of DENV-induced thrombocytopenia.

2. Methods

To verify this hypothesis, freshly isolated platelets from healthy donors were treated with DENV type 1 recombinant NS1 from drosophila and were evaluated for markers of activation, cytokine secretion and aggregation.

3. Results/ Conclusion

We found that NS1 could bind to toll-like receptor 4 of platelets. Furthermore, P-selectin expression and macrophage migration inhibitory factor secretion were increased in NS1-stimulated platelets. Last, platelets aggregation with suboptimal dose of ADP was enhanced after NS1 stimulation. Taken together, our results demonstrate that NS1 could directly bind to platelet and induce platelet activation. These results suggest that NS1 may contribute to the pathogenesis of thrombocytopenia during dengue infection.

Keywords: Autophagy, Sepsis, Cytokine

Id1 and Sonic Hedgehog Mediate Cell Cycle Reentry and Apoptosis Induced by Amyloid Beta-Peptide in Primary Cortical Neurons

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1.   Background and Objectives

The main pathological hallmark of Alzheimer's disease (AD) is accumulation of senile plaques containing the neurotoxic peptides amyloid beta-peptide (Aβ). One of the neurotoxic actions exerted by Aβ is to trigger cell cycle reentry in the fully differentiated neurons followed by apoptosis due to failed completion of mitosis. However, the molecular mechanisms underlying Aβ-dependent reactivation of cell cycle in the quiescent post-mitotic neurons remain to be fully delineated. Recently, we have reported that Aβ may stimulate the expression of inhibitor of differentiation-1 (Id1) to induce sonic hedgehog (SHH) (Hung et al., 2016, Mol. Neurobiol., 53:793-809), two mitogens capable of triggering cell cycle progression. We therefore tested the hypothesis that Aβ-induced Id1 and SHH contribute to cell cycle reentry leading to apoptosis in the post-mitotic neurons.

2.   Results

We found that Id1 knockdown suppressed Aβ-induced expression of cyclin D1 and phosphorylation of retinoblastoma protein (pRb), two G1 phase markers, as well as expression of proliferating cell nuclear antigen (PCNA) and incorporation of BrdU, two S-phase markers. All these marker proteins for G1 and S phases were expressed in the mature cortical neurons positively stained for MAP-2 or NeuN. Id1 knockdown attenuated Aβ-mediated cleavage of caspase-3. In addition, the neutralization antibody against SHH (SHH-Ab) also blocked Aβ-induced expression of PCNA and caspase-3 cleavage.

3.   Conclusion

Taken together, our results revealed the critical roles of Id1 and SHH mediating Aβ-dependent cell cycle reentry and subsequent caspase-dependent apoptosis in the fully differentiated neurons, at least *in vitro*.

Keywords: Alzheimer's disease, caspase-3, cyclin, post-mitotic neurons

CD133/RalA/PAR6/The Exocyst Complex Upregulates Tumor Exosome Integrins to Determine Organotropic Metastasis

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Abstract

CD133 is widely used as a surface marker to isolate cancer stem cells (CSCs). In our previous study, we have demonstrated that CD133 promotes -catenin-mediated transcriptional activity and maintenance of cancer stem cell (CSC) properties depend on cancer-specific integrin/extracellular matrix (ECM) signaling. Here we show that in CSCs CD133/RalA promotes an exocyst–Par6 interaction to upregulate tumor exosome integrins and thus determine organotropic metastasis. Cell migration triggered by wounding CD133^{+} cells cultured on ECM-coated dishes can induce polarity and lipid raft coalescence, enhancing CD133/integrin/RalA signaling. In response to directional cues, integrins, RalA, PAR6 and the exocyst complex were enriched in lipid rafts, and the assembly and activation of an integrated CD133-integrin signaling complex was followed by RalA/PAR6/the exocyst signaling. The subsequent increase may be a regulatory switch to increase exosome secretion and exosome integrin expression. Furthermore, CD133-elicited tumor exosome integrins determined organotropic metastasis *in vivo*. Collectively, these findings 1) indicate that a polarized cell migration-induced CD133/RalA/PAR6/the exocyst axis is required for determination of organotropic metastasis, 2) establish a function for CD133/integrin and 3) support the rationale for targeting CD133/integrin in cancer treatment.

Keywords: CD133, cancer stem cell, exosome, organotropic metastasis

Role of Sfp1 in *Candida Albicans* Resistance to Fluconazole

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1.   Background/ Goals

Candida albicans is an opportunistic human pathogen that can cause invasive and life-threatening infections particularly in immunocompromised patients. Moreover, *C. albicans* resistance to antifungals such as fluconazole has emerged as a serious problem in clinical settings. The upregulation of efflux pump genes is one of the important mechanisms for fluconazole-resistant *C. albicans* clinical isolates. In our study, the main goal is to investigate a possible connection between the transcription factor Sfp1, fluconazole resistance and regulation of efflux pumps.

2.   Results/ Conclusion/ Contribution

(1)   Sfp1 is associated with fluconazole resistance in *C. albicans*

We used spot assay and measured MIC_{90} to demonstrate that Sfp1 is involved in fluconazole resistance. The *sfp1Δ/Δ* mutants were more resistant to fluconazole than the wild type（SC5314） and *SFP1*-reintergrated strains. In contrast, the *SFP1*-overexpression strains were more sensitive to fluconazole than other strains.

(2)   Sfp1 regulates efflux pump genes expression

We use qPCR to determine the expression level of efflux pump genes. Our results indicated that the gene expression of *CDR2* was higher in the *sfp1Δ/Δ* mutants than that in the wild type and *SFP1*-reintergrated strains. However, the gene expression of *CDR1* and *MDR1* was lower in the *sfp1Δ/Δ* mutants than that in the wild type and *SFP1*-reintergrated strains. These results indicated that Sfp1 regulates efflux pump genes expression.

(3)   Sfp1 has an effect on efflux pumps activity

Nile red accumulation assay was applied to determine the efflux pump activity in different strains. The results showed that the efflux pump activity in the *sfp1Δ/Δ* mutants were higher than that in the wild type and *SFP1*-reintergrated strains. In contrast, the efflux pump activity of the *SFP1*-overexpression strains was lower compared to the others.

In conclusion, we found that Sfp1 regulates efflux pump gene expression and influence efflux pump activity which contributes to resistance to fluconazole in *C. albicans*. The mechanism how Sfp1 regulates the efflux pumps will be further studied, and the results of this study is anticipated to provide new insights into regulation of drug resistance in *C. albicans*.

Keywords: *Candida albicans*, fluconazole, efflux pump, Sfp1

Protein Hydrolysate Production and Amino Acid Composition from Seed Kernel of Sacha Inchi

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Abstract

The aim of this study was to produce protein hydrolysate from the seed kernel of sacha inchi (*Plukenetia volubilis*) using acidic (4M HCl) and alkaline (4M NaOH) hydrolysis for 60 minutes at 100°C. The acidic hydrolysis showed the degree of the hydrolysis value of 25.82±0.68% while the alkaline hydrolysis had 56.19±2.14%. The amino acids were derivatized by o-phthalaldehyde-2-mercaptoethanol (OPA-2 MCE) and were analyzed by the reverse phase-HPLC. The ten amino acids were released after the acidic hydrolysis while nine amino acids were released from the alkaline hydrolysis. The antioxidant activity was investigated using the DPPH radical scavenging activity method. Protein hydrolysate from the alkaline hydrolysis showed a higher activity than that from the acidic hydrolysis. The antioxidant activity of the protein hydrolysate from both chemicals hydrolysis was concentration-dependent.

Keywords: Protein hydrolysate, Degree of hydrolysis, Amino acid composition, *Sacha inchi*, Antioxidant activity

GM Maize Detection Using Multiplex PCR

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Abstract

Nowadays, food and beverage are produced from genetically modified maize (GMM) such as popcorn, cereal beverage. In Thailand, GM food labeling is required. Hence, the techniques which are reliable save time and decrease costs are used to detect GM contamination. This study proposed to develop the multiplex PCR method to test GMM contamination from field and market samples for rapid detection. The results showed that modified CTAB method is suiTable for DNA extraction from all maize samples not only seed but also processed products although there was a little quantity. For simplex PCR amplification, CaMV 35S promoter, *nos*-terminator, EPSPS and *Cry* genes could be detected in 20, 12, 3 and 7 samples, respectively. For duplex PCR, 2 combinations of invertase and zein genes as well as zein and cry genes were developed under optimum components and annealing temperature. Therefore, multiplex PCR for GMM detection was successful.

Keywords: GMO, GMM, maize, multiplex PCR

Mitogenic Effect of Endothelin-1 on 3T3-L1 Preadipocytes Depends on the ERK, c-Jun, and STAT-3 Pathways

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1.   Background/ Objectives and Goals

Endothelin (ET)-1 has been reported to regulate adipogenesis and endocrine activity of fat cells. However, relative little is known about the signaling pathway of ET-1 on preadipocyte growth. Using 3T3-L1 preadipocytes, we investigated the pathways involved in ET-1 modulation of preadipocyte proliferation.

2.   Expected Results/ Conclusion/ Contribution

We found that ET-1 dose- and time-dependently stimulated preadipocyte proliferation as indicated by an increased number of cells and greater incorporation of BrdU. ET-1 also time-dependently stimulated phosphorylation of signal transducer and activator of transcription (STAT)-3, c-Jun, and mitogen-activated protein kinase (MAPK) pathway proteins, ERK, but not JNK and p38. Treatment with an inhibitor of the ET type-A receptor, such as BQ610, but not with the ET type-B receptor antagonist BQ788, blocked ET-1-increased levels of cell proliferation and phosphorylated levels of ERK. Also, the BQ610 prevented ET-1-increased levels of total and phosphorylated c-Jun. Moreover, pretreatment with specific inhibitors of either Janus kinase 2 (JAK2)/STAT-3 (AG490), ERK1/2 (PD98059 and U0126), and JNK (SP600125), prevented ET-1-increased levels of cell proliferation and reduced the ET-1-stimulated phosphorylation of STAT-3, ERK1/2, and c-Jun, respectively. However, the p38 MAPK antagonist SB203580 did not alter the effect of ET-1. We can conclude that ET type-A receptor, JAK2, ERK1/2, and c-Jun, but not ET type-B receptor or p38 MAPK, are necessary for the ET-1 stimulation of preadipocyte proliferation.

Keywords: Endothelin-1, Preadipocyte, Mitogenesis, Kinase

APLSBE-0049
Examination of Applicability of Southern Chinese Reference Data Set of Dental Age Assessment in Thailand

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1.   Background/ Objectives and Goals

Dental age estimation can assist in the identification of victims in a variety of forensic situations, such as mass disasters or human rights violations, as well as help solve birth date disputes in criminal investigations and asylum requests. Dental age is often estimated using population-specific reference standards, but it is unclear whether these represent an improvement over non-population-specific methods. Cross-population applicability of dental age estimation techniques are thus important, not only to understand whether these are reliable beyond the population in which they were developed, but also because they can provide insights into potential population differences in dental development and inform about the usefulness of different methods. If different populations are shown not to differ significantly in dental development, standards developed in one population may be crucial for application in another population where population-specific age estimation methods are not or may not be available. Considering the number of natural disasters in Thailand, there is a great need to conduct age assessment studies in this country. Thailand has also recorded highest number of natural disasters. Between the year 1980 and 2000, around 64 million people were affected by various forms of natural disasters including earthquake, landslide and flood. [1] In 2004, a powerful earthquake struck the northern Sumatra region triggering a Tsunami that killed more than 4000 people and left another 4000 people missing. Dental records were reported to be highly useful for identification of victims following the Tsunami in Thailand.[2] Age assessment based on the stage of dental development has been widely reported in the literature which has been established as a reliable method for estimating the age of people with unknown birth records.[3-4] Demirjian and co-workers derived dental maturity scores by evaluating dental development of a French-Canadian population. A classification system was also developed based on the stage of development of the crown and the root.[5,6] It is indicated in the literature that there is a need for a population specific dataset. An accurate estimation of age would seem to be possible only when it is derived from datasets representative of the corresponding ethnic population.[7] Our research team has successfully constructed a reference dataset based on a cohort of southern Chinese subjects aged between 2 and 24 years.[8] However, there is no population-specific method of age estimation available for Thailand. Due to a common population history,[9] one may presume that the Chinese standards may be applicable to Thai people, but the extent to which population differences in dental development are genetic or due to shared common ancestry has yet to be proven, as other sources of variation have not been systematically explored. The goal of this study is to test the reliability of a southern Chinese dental reference dataset when applied to estimate the age of a Thai population.

2.   Results/ Conclusion/ Contribution

All six methods seem to overestimate age in the Thai samples, with age differences ranging from 0.05 (1/se-tds) to 0.15 years (se-tds) for males and 0.27 (1/sd-tds and 1/se-tds) to 0.35 years (sd-tds and se-tds) for females. In this sample, statistically significant differences ($p<0.05$) were only observed in the female sample. Whereas in males neither of the six methods showed statistically significant differences. Root mean square deviation (RMSD) of 0.941 and 1.287 years was observed for the sd-tds and 1/sd-tds methods for males and females respectively. Difference between DA and CA plotted against chronological age showed increasing variation with age. Results from this study indicate the dental age estimation method based on a Chinese sample has a diverse performance across the different samples tested. While the age of males seems to be accurately estimated by the method, in the females it is overestimated. The shared population history between the populations in the East Asian region may be perceived as suggesting a similar pattern of dental maturation, but in fact results can be quite disparate and equally supporting the notion that a shared population history is unlikely to support assertions of population similarity in dental maturity. Based on the outcomes of this study, the southern Chinese reference dataset can be recommended for use on Thai males. The work described in this abstract was fully supported by a grant from the Research Grants Council of the Hong Kong Special Administrative Region, China (Project No. 17126115).

Keywords: dental age assessment, southern Chinese, Thailand

APLSBE-0051

The Role of Exosomes in the Pathology of High Fat Diet Induced Increase in Susceptibility of Cerebral Ischemia

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Objective

Stroke as the fourth leading cause of death that accounts for 6.8% of deaths annually world-wide. Hyperlipidemia and Obesity have long been identified as critical risk factors for the occurrence of ischemic stroke which might be linked to the vascular remodeling or blood vessel constriction in the brain. However, exosome as mediators of intercellular communication may play some roles in trafficking of proteins and RNAs between cells. And recent studies found evidence showing the dysregulation of exosomal properties in lipid disorders. We aim to study the changes in exosome kinetics and the transfer of its neuro-inflammatory cargos in dictating the early onset of hypoxic susceptibility in hyperlipidemics.

Methods

Male C57BL/6 mice were fed for high fat diet start from three weeks after birth, and their susceptibility to hypoxic challenge in the brain were studied at different stages (6, 9, and 12 weeks) after feeding. The transient middle cerebral artery occlusion (tMCAo) was adapted to induce regional brain damage and evaluate cytotoxic events after hypoxic challenge. Multiple indexes including morphological infarct area, neurological scores, and biochemical indicators of neuro-inflammatory events were analyzed to reflect hypoxic susceptibility after high fat diet feeding.

Results

We found a trend increase in hypoxic susceptibility (increase in infarct size, impairment of neurological coordination) which correlated to the duration of high fat. Interestingly, a significant increase in MCAo susceptibility starts from as early as six weeks after high fat diet feeding which there were no obvious changes of vascular remodeling or blood vessel constriction in the brain. Also we found the releasing of exosomes in hyperlipidemic animals may contribute to the observed hypoxic changes.

Conclusion

These results indicate that high fat feeding significantly increase in susceptibility of brain injury after hypoxic insults and targeting of exosome trafficking or its neuro-inflammatory cargos may a promising therapeutic direction for the prevention of hypoxic induced brain damage in hyperlipidemic individuals.

APLSBE-0052

Anti-Inflammatory Property of a New Polysaccharide from *Cordyceps* Mycelia Extract on LPS-Activated Primary Peritoneal Macrophages

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Chronic obstructive pulmonary disease (COPD) is characterized by uncontrolled pulmonary inflammation that persists after smoking cessation. The pathology of COPD is heterogeneous but the major inflammatory cells involved are macrophages, T cells and neutrophils. Developing novel anti-inflammatory treatments is thus critical for improving COPD therapy. In the present study, our findings demonstrate that a novel polysaccharide purified from *Cordyceps sinensis* mycelia named CME significantly reduced iNOS expression in primary peritoneal macrophages treated by lipopolysaccharide (LPS) via the upregulation of the ceramide signalling pathway and anti-oxidative property. We determined the inhibitory effects of CME in LPS-activated primary peritoneal macrophages. CME (100 g/ml) significantly reduced NO production and iNOS expression in primary peritoneal macrophages treated by LPS (1 g/ml). LPS-stimulated irregular morphology with pseudopodia formation of peritoneal macrophages was abolished by the treatment of CME (100 g/ml). Furthermore, the addition of 3-OMe-SM, a specific inhibitor of ceramide formation, apparently reversed CME-inhibited NO production, iNOS expression, morphological change, and the phosphorylation of ERK and Akt in peritoneal macrophages stimulated by LPS. On the other hand, CME (100 g/ml) also revealed potent anti-oxidative property against LPS-induced formation of reactive oxygen species in primary peritoneal macrophages. Collectively, CME-1 may be a potential therapeutic agent for the treatment or prevention of inflammatory diseases such as COPD.

The Role of Adult Neurogenesis in the Etiology of Changes in Eating Behaviors in a Rodent Model of Schizophrenia

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Objective

Schizophrenia is a mental disorder that characterized by abnormal social behavior, psychological hallucinations, and deregulated emotionality. Recent analyses indicated that obesity is twice as prevalent in schizophrenics compared to the general populations which cover more than half of the schizophrenics. Evidence indicated that excessive body weight gain might result from their psychological changes in "eating behaviors" and prefer to intake foods with higher glucose and saturated fats. However, the neuropsychological mechanisms governing such phenomenon still remain largely unknown.

Methods

Maternal intravenous injection of 5mg/kg polyI:C (pregnant C57BL6 mice at gestation day 17) was used to established a rodent model that display schizophrenia-like symptoms in their offspring. Numerous behavioral analyses related to the symptoms of schizophrenia and also the eating preference behaviors were tested at 6, 9, and 12 weeks after birth. Meanwhile, a retroviral based labeling approach for monitoring of neuronal maturation process was used to correlate with behavioral changes.

Results

We found a significant increase in schizophrenia-like behaviors in polyI:C group of mice which recapitulates various core psychological symptoms of schizophrenia in clinic, including hyper-locomotion, social defeat and cognitive impairments. More interestingly, the schizophrenic mice display abnormal preference to high fat diet feeding and increase in body weight gain compared to saline treated groups. Meanwhile, we found aberrant development of neuronal trees and protrusions in schizophrenic brain which correlated to the onset of changes in eating behaviors.

Conclusion

Our data strongly indicated that aberrant neuronal maturation process is a critical determinant controlling the psychological problems of eating behaviors in schizophrenics. Our results point out directions through pharmacological treatments that adjust these abnormalities should provide potential therapeutic benefits toward bulimia nervosa linked to schizophrenia.

Redox Modulation of Protein Phosphatases by Protein Carbonylation/De-Carbonylation Process in Vascular Smooth Muscle Cells

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Reactive oxygen species (ROS) had been traditionally considered to nonspecifically and indiscriminately react with most constituents of cells. In the past decade, numerous studies indicated that ROS influence many signaling events through oxidative modification of proteins. Therefore, the oxidation of protein phosphatases including protein tyrosine phosphatases (PTPs) and Ser/Thr protein phosphatases (PPases) is particularly important in redox signaling, because the inactivation of protein phosphatases can induce a broad range of signaling pathways. Recently, an oxidative modification- protein carbonylation attracted people's attention. This metal-catalyzed carbonylation was considered to be an irreversible and non-enzymatic modification of proteins. Nevertheless, a pioneer study found that carbonylated proteins can be decreased subsequent to the peak of carbonylation within short term, and this de-carbonylation process is proteasome-independent. Protein carbonylation/de-carbonylation may be another important mechanism to be involved in redox signaling. In the present study, we have known the protein phosphatase activities of Ser/Thr PPases and PTPs were both down-regulated in H_2O_2-stimulated vascular smooth muscle cells (VSMCs). PP2A and SHP-1 were carbonylated in H_2O_2-treated VSMCs. In addition, the proteasomal degradation-independent carbonylation/de-carbonylation process was observed in H_2O_2 or PDGF-BB-stimulated VSMCs. However, phenomenon of de-carbonylation was not occurred in 4-hydroxynonenal -treated VSMCs. These data indicate that protein carbonylation/de-carbonylation only occurred in primary carbonylation but not 4-hydroxynonenal -induced secondary carbonylation, and this carbonylation/de-carbonylation process is proteasome-independent and reversible. Collectively, we speculate a novel redox signaling pathway- the carbonylation/de-carbonylation of protein phosphatases in activated VSMCs and VSMC proliferation-associated diseases.

APLSBE-0057

Platonin, a Cyanine Photosensitizing Dye, Exhibits Anti-Inflammatory Property in ox-LDL-Stimulated Mouse Vascular Smooth Muscle Cells

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Abstract

Atherosclerosis is a chronic inflammatory arterial disease driven by both innate and adaptive immune responses to modified lipoproteins and components of the injured vascular wall. The pathology of atherosclerosis is a complicated and long-term inflammation process which involves multiple factors such as immune cells, the releasing cytokines, and activated vascular smooth muscle cells (VSMCs). Platonin, a cyanine photosensitizing dye, has been used as an immunomodulator to treat rheumatoid arthritis. Previous studies indicated that the administration of platonin inhibits the expression of several inflammatory mediators including interleukin family, tumor necrosis factor-α, and inducible nitric oxide synthase (iNOS) in endotoxin-activated macrophages. In the present study, we determined the anti-inflammatory effect of platonin in LPS/interferon γ (IFN-γ) or ox-LDL-treated VSMCs. The expression of several inflammatory factors which involve in the progression of atherosclerosis including MCP-1, interleukin-1β (IL-1β), and iNOS were evaluated in this study. The treatment of platonin (5 or 10 μM) significantly attenuated LPS/IFN-γ induced expression of iNOS, mature form of IL-1β, and MCP-1 in mouse VSMCs. On the other hand, ox-LDL-upregulated MCP-1 expression was substantially suppressed in platonin (5 or 10 μM)-treated mouse VSMCs. The results collectively indicate that platonin revealed potent anti-inflammatory property in both LPS/IFN-γ and ox-LDL-activated VSMCs. Platonin may be a potential medication for treating vascular inflammatory diseases including atherosclerosis.

Cinchonidine Exerts Cell-Protective Property on Uremic Toxin-Treated Human Umbilical Vein Endothelial Cells via the Inhibition of OAT-3 Transporter

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Previous clinical studies have indicated that the mortality of cardiovascular disease (CVD) in dialysis patients was five times higher than the general population, and this event is correlated with the blood level of protein-bound uremic toxins. Indoxyl sulfate (IS) is a dietary tryptophan-derived uremic toxin that is markedly accumulated in the plasma of CKD patients. Numerous studies have indicated a potential role of IS in the progression of vascular and hemostatic dysfunctions. IS was known to exacerbate atherosclerosis, a major cause of CVDs, by inducing endothelial cell dysfunction. In the present study, we screened 131 natural compounds to discover potential cell-protective agents on IS-treated human umbilical vein endothelial cells (HUVECs). IS-induced endothelial dysfunction was reported to associate with excessive reactive oxygen species (ROS) production and subsequent oxidative damage. However, we found that the cell-protective property of these natural compounds on HUVECs-treated by IS is independent of their anti-oxidative property. By using MTT assay, 61 natural compounds were found to reduce IS-induced cell death in 10 μM. Cinchonidine, piperine and nalidixic acid are the top three cell-protective agents on IS-treated HUVECs. The treatment of cinchonidine (1, 5, 10, 20, 50 μM) apparently reduced IS-induced cell death by 41%, 44%, 36%, 35%, and 36%, respectively. In addition, cinchonidine (5 μM) significantly recovered the impairment of tube-formation over 40% and reversed IS-induced cell senescence about 80% in HUVECs. The previous studies have indicated a role of organic anion transporters (OATs) in the uptake of IS in basolateral membrane of proximal tubular cells. We found that the activity of OAT3 was apparently suppressed by the treatment of 50 μM cinchonidine. Furthermore, the cell-protective property of these natural compounds on IS-treated HUVECs is positively correlated with their anti-OAT3 activity. Collectively, these results indicated that cinchonidine may attenuate IS-induced endothelial dysfunction by inhibiting the uptake of IS by OAT3, an anti-oxidative-independent pathway.

APLSBE-0062

Investigating the Properties of Bacteria is Singaporean Water Sources for Environmental Bio-remediation

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A bacteria called C. Necator has the potential for environmental bioremediation. An unknown type of bacteria found in Singaporean water sources is thought to have the same properties. The water source is a sulphur hot spring, and therefore a sulphate reducing bacteria is expected. This bacterium was then investigated to find out what it is, and whether it may be used to have the same effect on the environment as C. Necator.

This investigation had several steps to figure out what bacteria was used, and to find out whether the bacteria could actually be used for environmental bioremediation. The first method was plating the bacteria and growing it with different metals. The bacteria were grown in regular LB Agar, and were grown in plates that had Copper, Lead, and Silver. The uptake of Copper and Lead are known properties of C. Necator, and may be useful for environmental bioremediation. Another technique conducted was extracting the DNA from grown bacteria. This was followed by doing a RAPD. This primer series used was 5' – GAG GGT GGC GGT TCT – 3'. A 16s rRNA PCR was also conducted. Other methods included running gels for gel electrophoresis, purifying and sequencing DNA, and Gram Staining the bacteria.

Just from viewing the plates, it was clear the bacteria could grow on Copper and Lead. Isolate 2 seemed as if different bacteria was growing on the plate with Copper, and therefore was tested again by growing the different looking bacteria on a different plate. From electrophoresis, it was apparent that Isolate 1 and Isolate 3 were the same or were closely related, as the bands formed for the both of them were very similar. Both were quite different from C. Necator or the Mutant, implying that these definitely are not the same bacteria as those, however do share the same property. Finally, the bacteria were gram stained and examined under a microscope to view whether the bacteria were gram positive or negative, and whether the bacteria looked at all similar to one another. C. Necator control did show a gram negative result as expected, along with having the expected shape. This further reinforces that there are multiple bacteria found, both possessing the same desired property.

In conclusion, further investigation will be required for the bacteria to identify what it is exactly, such as possibly sequencing the purified DNA samples obtained. However, based on the results from the experiments done, the bacteria indeed do have the same properties as C. Necator, which is what was desired.

Generation of Recombinant Infectious Bursal Disease Virus and Purification with Immobilized Metal Ion Affinity Chromatography

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Abstract

Infectious bursal disease virus (IBDV) is a member of the genus *Avibirnavirus* of the *Birnaviridae* family. It causes severe immunosuppression in 3~6 week-old young chickens by infecting B cells present in the bursa of Fabricius, a characterization of the infectious bursal disease (IBD). The chicks with IBD are easily infected with other disease agents, resulting in various secondary infections and leading to death. The capsid protein VP2 of IBDV contains conformation-dependent, neutralizing epitopes of IBDV and plays an important role in virulence, cell tropism, as well as antigenic variation. Recently, we concluded that VP2's His253, a site not significant for the overall immunogenicity induced by VP2-formed subviral particles (SVP), is crucial for the binding affinity of SVP to Ni-NTA and the attachment of an IBDV host cell line. This is the first report to decipher the role of His253, a residue on the DE loop of the VP2 protrusion domain (P_{DE}), played in receptor interaction and immunogenicity. In order to develop a method for the purification of IBDV using Immobilized Metal-ion Affinity Chromatography (IMAC), the wild-type of recombinant D78 (rD78) IBDV and six rD78 IBDV mutants with site-directed mutagenesis at P domain (residue 206-350) of VP2 by reverse genetics were generated and characterized. Our goal not only aims to establish an efficient process for IBDV vaccine production and purification to prevent IBD, but also to establish a novel strategy for the production and purification of other viruses or virus-like particles.

Keywords: Infectious bursal disease virus (IBDV), subviral particles (SVP), site-directed mutagenesis, vaccine, Immobilized Metal-ion Affinity Chromatography (IMAC)

Mechanical Engineering

Wednesday, March 28, 2018   15:00-15:50   Room AV

ACEAIT-0024

Vibration Analysis of Multi-Span Beams under a Moving Force Using SEM

Usik Lee｜*Inha University*

Taehyun Kim｜*Inha University*

ACEAIT-0069

Multi-Physics Computation of Solid Melting with External Wall Boiling

Hyuk-Jin Song｜*Dongguk University*

Jong Woon Park｜*Dongguk University*

Sunmi Kwon｜*Dongguk University*

ACEAIT-0076

Turbulent Heat Transfer and Flow Characteristics of Hot Flow behind the Backstep with Wall Mass Injection

Yue-Tzu Yang｜*National Cheng Kung University*

Kuo-Teng Tsai｜*National Cheng Kung University*

ACEAIT-0077

Numerical Study of Natural Convection Heat Transfer for Annular Elliptical Finned Tube Heat Exchangers in a Chimney

Han-Taw Chen｜*National Cheng Kung University*

Ping-Chou Chen｜*National Cheng Kung University*

Jui-Sheng Tsao｜*National Cheng Kung University*

Yi-Lun Hsieh｜*National Cheng Kung University*

ACEAIT-0101

Analytical Solutions of Differential Approximation for Radiative Heat Transfer in a Planar Refractive Medium with Fresnel Boundaries

Chih-Yang Wu｜*National Cheng Kung University*

Dao-Chi Hong｜*National Cheng Kung University*

ACEAIT-0108

Wave Propagation in the Periodic Tetrachiral Honeycomb Structure with Locally Resonator

Pei-Lun Wang｜*National Cheng Kung University*

Pei-Ju Guo｜*National Cheng Kung University*

Wei-Lun Lin｜*National Cheng Kung University*

Lien-Wen Chen｜*National Cheng Kung University*

ACEAIT-0160

Exact solution Deflection of Beams With Nonlinear Boundary conditions by the Adomian Decomposition Method

Sen-Yung Lee｜*National Cheng Kung University*

Li-Kuo Chou｜*National Cheng Kung University*

Chao-Kuang Chen｜*National Cheng Kung University*

ACEAIT-0133

Dispersion of Elastic Wave Propagation in Tunable Auxetic Star-Shaped Honeycombs

Ting-Yang Lee｜*National Cheng Kung University*

Wei-Di Chou｜*National Cheng Kung University*

Lien-Wen Chen｜*National Cheng Kung University*

ACEAIT-0141

Optimized Design of a New Spanner

Y.S. Jhang｜*National Kaohsiung University of Applied Sciences*

Ming-Che Lin｜*National Kaohsiung University of Applied Sciences*

ACEAIT-0155

Experiment and Analysis of Abrasive Removal Depth of Silicon Wafer Using Cross-Groove Pattern Polishing Pad for Chemical Mechanical Polishing with Different Volume Concentrations

Zone-Ching Lin｜*National Taiwan University of Science and Technology*

Po-Yen Chen｜*National Taiwan University of Science and Technology*

Xin-Ren Fang｜*National Taiwan University of Science and Technology*

ACEAIT-0156

Using Taguchi Method to Determine the Optimal Parameters for Rail Drilling Process

Chun-Lang Chang｜*National Formosa University*

Ruei-Hong Liao｜*National Formosa University*

ACEAIT-0165

Optimal Design of Insert Geometry Considering Cutting Forces

Ruo-Ning Lee｜*National Cheng Kung University*

Jiunn-Jyh Wang｜*National Cheng Kung University*

ACEAIT-0166

Living Tissue One-Dimensional Nonlinear Heat Transfer Problems

Cha`o-Kuang Chen｜*National Cheng Kung University*

Jun-Yi Liu｜*National Cheng Kung University*

Kuei-Hao Chang｜*National Cheng Kung University*

ACEAIT-0179

Development of Novel 2-D.o.F Electromagnetic Actuator for 6-Legged Mobile Robot

Buhyun Shin｜*Hanbat National University*

Hyunho Shim｜*Hanbat National Univercity*

YoungShik Kim｜*Hanbat National University*

Vibration Analysis of Multi-Span Beams under a Moving Force Using SEM

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1.   Background and Objectives

A structure subjected to moving loads may experience severe vibrations to cause structural failures. Thus, it is important to predict vibration characteristics of such structures accurately. FEM is known as a powerful solution technique to deal with most complex structural dynamics problems. However, in general, it requires very fine meshes to improve solution accuracy. Thus, as an alternative to FEM, a spectral element method (SEM) is developed in this study for the vibration analysis of a multi-span beam subjected to a moving point force.

2.   Results and Conclusion

Through the numerical study, the following conclusions are obtained: (1) The high accuracy and computational efficiency of the proposed SEM were verified by comparing the results with those by other well-known solution methods such as the exact theory, finite element method, and modal analysis method. (2) It was found that the time histories and deformed shapes of single-span or multi-span beams were highly dependent on the boundary conditions, interim supports, and the speed of a moving point force. (3) When a series of point forces is moving simultaneously on a single-span or multi-span beam, the time interval between neighboring forces is a crucial factor for the resonance vibration of the beam.

Keywords: Vibration, multi-span beam, spectral element method (SEM), FEM

ACEAIT-0069
Multi-Physics Computation of Solid Melting with External Wall Boiling

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1.   Background and Objective

Melting of solid driven by natural convection with external wall boiling is associated with applications such as metal processing, environmental engineering, thermal energy storage, nuclear reactor core safety, etc. More specifically, knowledge of nuclear reactor vessel melting significance with concentrated heat load from inside and the external cooling after a severe accident like in the Fukushima nuclear power plants is required for an improved accident management. Existing methods are limited in that they have used lumped-parameter cell method without considering realistic physics of solid convection melting to account for the thermally-driven liquid metal flow with moving solid-liquid interface (melt front) where latent heat is absorbed and accompanying external wall boiling to explain two-phase flow and heat transfer. Present authors' previous computational method showed the concentrated heat flux to the nuclear reactor vessel inside wall hardly penetrates the vessel when sufficiently cooled outside. The heat is absorbed by the latent heat during the melting process and the remaining heat is spread out. However, the limitation of the previous work is that the exterior vessel wall was assumed at constant temperatures to represent nucleate or film boiling.

2.   Results and Conclusion

Typical computational result with respect to volumetric fractions at several instances are shown in Fig. 1. The left half is the carbon steel and the right half is water channel. In the molten part of the solid region (blue color), natural convection occurs due to buoyancy force and the melting is propagating toward the upper right direction. At the same time, subcooled liquid enters the bottom of the right half and steam volume fraction is increasing according to length. At the higher temperature region, vapor film covers the surface and prevents most of the heat from being removed from the wall, which expedites melting process in the solid region from about 1600 sec. The precise estimations of each boiling transition times are underway and will be presented in the full paper.
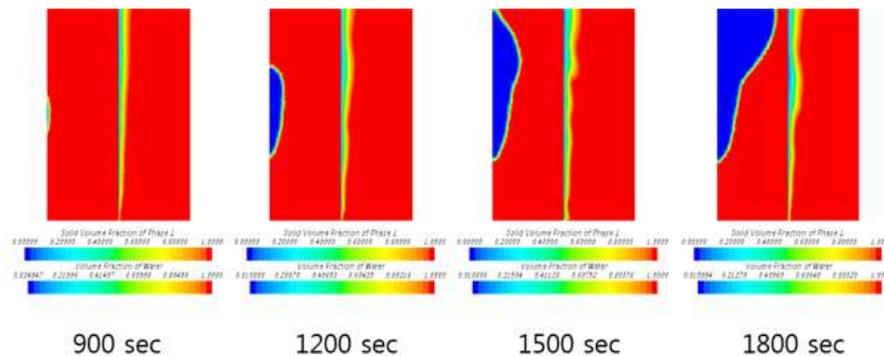

Fig. 1: Volumetric fraction distribution of the solid and water channel

This physical trend shows that the present multi-physics of solid melting coupled with liquid boiling processes is properly modelled. For sensitivities, effects of the liquid channel width and the inlet flow velocity are also analyzed. Variations of the significance of the melting propagation according to these parameters are under computations. All these results would provide parametric insight on the effect of geometrical and boundary conditions generally for the solid melting coupled with external cooling conditions. Further, the present method and the result would provide accurate estimation of a nuclear reactor vessel melting significance when cooled outside after a severe accident like in Fukushima.

Keywords: convection melting, natural convection, external wall boiling, finite-volume method.

Turbulent Heat Transfer and Flow Characteristics of Hot Flow behind the Backstep with Wall Mass Injection

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Abstract

This study presents numerical simulations of a transient mixing process of the high temperature turbulent flow behind the backstep with a low temperature wall mass injection, and compares with the experimental results in the literature. The turbulent governing equations are solved using a control-volume-based finite-difference method with a power-law scheme. The well-known $k-\varepsilon$ turbulence model and its associate wall functions are used to describe the turbulent structure. The parameters studied include inlet velocity ($U_0 = 10$ m/s, 20 m/s and 30 m/s), inlet temperature ($T_0 = 150℃$, $200℃$ and $300℃$), and the wall injection rate ($Q = 0.15$ m³/min, 0.25 m³/min and 0.35 m³/min). The numerical calculations on the flow field indicate that the reattachment length Xr becomes shorter as the wall injection rate increases. The error of the reattachment length is about 7%-10% comparing with the experimental results. In the recirculation zone, the horizontal velocity is decreased whereas the vertical velocity is increased with a uniform wall injection. It shows that the base mass injection suppresses the horizontal velocity and turbulence intensity. With these high temperature heat transfer characteristics, the corresponding Nusselt number and Stanton number reached its maximum value near the reattachment point while that was relatively low near the step corner.

Keywords: turbulent flow, mass injection, numerical simulation

Numerical Study of Natural Convection Heat Transfer for Annular Elliptical Finned Tube Heat Exchangers in a Chimney

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Abstract

This study uses three-dimensional computational fluid dynamics (CFD) commercial package along with the experimental data to investigate the natural convection heat transfer and fluid flow characteristics of the vertical annular elliptical finned tube heat exchangers in a small chimney. FLUENT along with various flow models and inverse results is used to determine the air temperature and velocity profiles, the fin surface temperature and the heat transfer coefficient on the fins. More accurate results with the appropriate flow model are obtained when the resulting heat transfer coefficient and fin temperature are as close as possible to the inverse results and the experimental temperature measurements, respectively. The results show that the choice of the appropriate flow model may vary with the physical geometry of the problem under investigation. The more grid points may not be able to obtain more accurate results. Therefore, the grid independence assumption may not be appropriate. To the best of our knowledge, a few researchers use commercial software to determine the heat transfer and fluid flow characteristics of this problem**.**

Keywords: CFD, natural convection, annular elliptical finned tube, experimental data

I

Analytical Solutions of Differential Approximation for Radiative Heat Transfer in a Planar Refractive Medium with Fresnel Boundaries

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Abstract

The closed-form solution of differential approximation (DA) is derived for for radiative transfer in a planar, scattering, refractive medium with Fresnel boundaries. The analysis method is an extension of the method proposed for radiative transfer in a planar refractive medium in radiative equilibrium with diffusely reflecting boundary. The accuracy of the DA solution is examined and the angular dependence of radiative transfer in the cases with Fresnel boundaries is investigated. Besides, radiative equilibrium in a medium with diffuse boundaries and heat generation is also considered. Multiplying the radiative transfer equation by the zeroth- and first-order directional cosines and integrating each of the equations over all solid angles, we obtain DA for radiative transfer in a planar, scattering, refractive medium. The boundary conditions can be treated similarly. When the DA can be integrated analytically for some distributions of refractive index, we obtain a closed-form solution of the incident radiation. The dimensionless incident radiation and radiative flux are obtained for slabs with various optical thicknesses, scattering albedos and distributions of refractive index. The accuracy of the DA solution is examined by comparing the solution of the DA with that obtained by the Monte Carlo Method (MCM). To investigate the influence of Fresnel boundaries, the angular dependence of radiative transfer in the case with Fresnel boundaries and that in the case with diffuse boundaries are compared. Effects of these parameters on the present solutions are examined. The following may be observed from the results obtained: (i) The accuracy of the DA solution for radiative transfer in a planar refractive medium increases as the optical thickness increases or the gradient of the refractive index decreases. Besides, the boundary reflection also increases the accuracy of the DA solution. (ii) The discrepancy between the DA solutions and the MCM solutions decreases, when the optical thickness increases or the gradient of the refractive index decreases in the medium with diffuse boundaries and heat generation.

Keywords: Radiative transfer, Varying refractive index, Differential approximation, Fresnel boundaries, Heat generation

Wave Propagation in the Periodic Tetrachiral Honeycomb Structure with Locally Resonator

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1. Background

Phoninic crystals is an artificial periodic composite material. The existence of the complete frequency band gap has large potential applications, such as waveguides, filters and isolation device. In order to isolate the vibration in low-frequency region, local resonance mechanisms have been proposed. We can find local resonances bandgap in a design of periodic tetrachiral lattices with center rings which are composed of hard core coated with a soft material in the ring. The proposed metamaterials with local resonator can be applied to design subwavelength acoustic devices.

2. Results

First, the periodic tetrachiral lattices with curve ligaments of quadratic shape are studied. We calculated the dispersion relations by using finite element method and periodic boundary conditions. The dispersion diagram are shown in Fig. 1. By comparing with honeycomb structures with straight beam ligament, honeycomb structures with curve beam ligament is easier to have band-gaps. Then, the tetrachiral structure with center rings are also investigated. The rings are composed of hard core coated with a soft material in our design. The soft material acts as a spring and the rings are considered as a spring-mass locally resonator. We found that a new band gap at the lower frequency region appears in the dispersion diagram due to the presence of the locally resonator in the phononic crystal (Fig. 2). The negative mass effect appears at the frequencies near the resonant frequency of the locally resonator. The proposed metamaterials with locally resonator can be applied to design subwavelength acoustic devices such as acoustic filter and vibration insulators in lower frequency region.

Fig. 1 Dispersion relations of honeycomb structures with (a) curve beam ligament. (b) straight beam ligament.
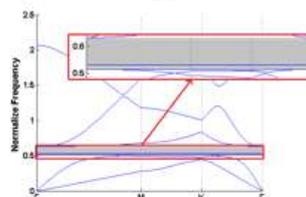

Fig. 2 Dispersion relations of honeycomb structures with center rings.

Keywords: tetrachiral honeycomb, locally resonator, negative mass, metamaterial

Exact solution Deflection of Beams With Nonlinear Boundary conditions by the Adomian Decomposition Method

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Abstract

The analytic static deflection solutions of beams with nonlinear boundary condition are developed by the modified Adomian method. If the applied force function is an analytic function, then the deflection function can be derived and expressed in Maclaurin series. A recurrence relation for the coefficients of the Maclaurin series is derived. It is shown that the proposed solution method is accurate and efficient. The solution method can be successfully applied to the problem with strong nonlinearity.

Keyword: large deflection of beam, Adomian decomposition method, nonlinear boundary condition

Dispersion of Elastic Wave Propagation in Tunable Auxetic Star-Shaped Honeycombs

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1. Background

Phononic band gap can be applied in filters, acoustic guides and high-precision instruments vibration isolated. However, the range of phononic band gap is usually a fixed interval, if we want to change   the phononic band gap, we must add some tunable elastic material, or through a special design modulation, some scholars are dedicated to this research, such as Wilm[1] used piezoelectric materials to construct one and two-dimensional square lattice phononic crystal elements.

2. Results

The periodic star-shaped honeycombs with piezoelectric material patched ligaments are studied and to be necessary to solve the two dimensional elastic problem. As shown in Figure 1, It is not be greatly affected the equivalent Poisson's ratio for the periodic star-shaped honeycomb structures after the piezoelectric material is added. Furthermore, the comparison between the results obtained by FE model and analytical expressions for star-shaped honeycombs is investigated. The wave propagations of periodic star-shaped honeycombs with piezoelectric materials patched ligaments are studied. The piezoelectric materials are connected to a separate negative capacitance circuit. Applying the elastic current, the effective Young's modulus and Poisson's ratio of the star-shaped structures can be tuned. Then, we can manipulate the elastic wave propagations in the periodic structures. By changing the capacitance ratio of the electric circuit. The FEM COMSOL soft wave is used to solve the wave propagation in the periodic structure problems. By using tunable star-shaped honeycomb structures, we can design the beam splitter, reflector and other acoustic devices. The finite element simulation is presented in Fig. 2. We can see the negative refraction by varying the effective mechanical properties of the slanted region of the periodic structure.
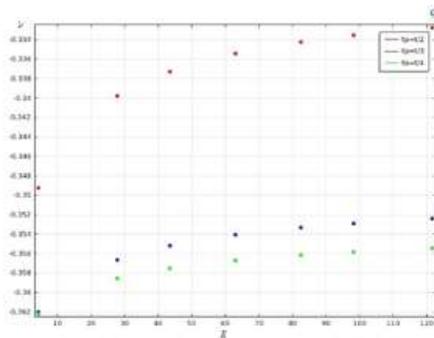
Fig 1. Relation of the equivalent negative Poisson's ratio and the young's modulus of the piezoelectric materials patched ligaments
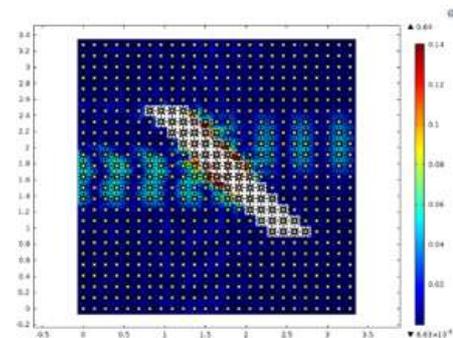
Fig 2. Full wave simulation of star-shaped honeycomb structures with piezoelectric materials patched ligaments

Keywords: star-shaped honeycombs, piezoelectric material, negative capacitance circuit, band gap

ACEAIT-0141

Optimized Design of a New Spanner

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Abstract

This paper presents an optimization method for the design of a spanner using computer-aided engineering. The response surface method and genetic algorithms to explore optimal relationships in the maximum stress and stress concentration factor for the inner diameter and bend radius of the handle. We finally find the population crossover rate and mutation rate to combine optimal parameters in the genetic algorithms. Simulation analysis quickly and efficiently determined the minimal stress under the designed conditions, with validation errors of less than 2%.

Keywords**:** Optimization, Response Surface Method, Spanner

Experiment and Analysis of Abrasive Removal Depth of Silicon Wafer Using Cross-Groove Pattern Polishing Pad for Chemical Mechanical Polishing with Different Volume Concentrations

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Abstract

The study explores the effect of different volume concentration of slurry on the abrasive removal depth of silicon wafer for chemical mechanical polishing using cross-groove pattern polishing pad. Through experimental results of chemical mechanical polishing, with cross-groove pattern polishing pad, a regression equation for the average abrasive removal depth and volume concentration of slurry is obtained. From the experimental results and regression analysis, it is found that the increasing volume concentrations of slurry, the average abrasive removal depth and is increased. Besides, AFM machine is used to measure the roughness on the surface of silicon wafer after CMP experiment. The study also finds that the greater volume concentration of slurry has the larger roughness values on the surface of silicon wafer. The surface morphology on silicon wafer is affected by the cross-groove pattern polishing pad.

Keywords: chemical mechanical polishing, silicon wafer, abrasive removal depth, volume concentration.

Using Taguchi Method to Determine the Optimal Parameters for Rail Drilling Process

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Abstract

In response to the increasingly mature production technology for linear slide rails, competition in the market is also intensifying. Therefore, how to effectively control and reduce processing costs in production is a top issue that companies have to tackle successfully in order to ensure their profitability and the competitiveness of their products in a red ocean market. In the face of advanced high speed cutting technologies for processing production, processing costs with cutters and the requirements for cutter lifespans are becoming increasingly important.

In this research, testing and analyses were run on the seven key control factors. The Latin square L_{18} $(2^1 \times 3^7)$ was used for determining the configuration of each testing condition. The testing results underwent an ANOVA for optimization calculation. The optimal combination of parameters (A1, B2, C1, D2, E2, F1 and G2) was thus established for verification in the confirmation experiment.

The verification results showed the combination of process parameters with the optimal level identified with Taguchi methods could effectively increase the cutter lifespan by over 24%.

Keywords: Linear Slide Rail, High Speed Cutting, Cutter Lifespan, Taguchi Method, Process Parameter

ACEAIT-0165
Optimal Design of Insert Geometry Considering Cutting Forces

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1.   Background

In milling processes, a negative cutter rake angles yield stronger cutting edge strength, better stability at higher feed rate, and being more economical because of double-sided cutting blades. But the resulting large cutting force and higher temperature decrease cutting capacity and tool life. To mitigate these shortcoming, an optimal design of the insert geometry is required in reducing the cutting forces. As the cutting force coefficients are important indicators for the quality of the edge geometry, they are chosen as the target of edge design optimization in this study. Taguchi method is first applied to analyze the contribution to cutting coefficient of each geometric parameter. Response surface methodology is then used to establish a model for cutting coefficient as function of cutting depth, feed rate, and edge geometry. The result of this study shows that feed rate has the greatest contribution to cutting coefficient, and cutting edge with larger land angle and blade width is more effective. The results were verified by finite element simulation and cutting experiments.
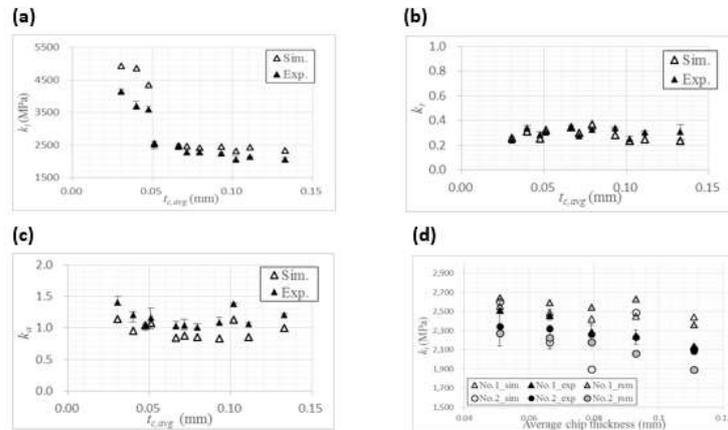
2.   Results

The experimental verification adopts two types of insert geometry: insert 1 with edge geometry available on the market and insert 2 fabricated using the optimal design obtained in the last section. Tests first use insert 2 with f_z= 0.3 ~ 1.0 mm and a_p= 0.3 ~ 0.7 mm to cut stainless steel 316 with other cutting conditions being the same. Figs. 2(a)~(c) verify that the three cutting coefficients, k_t, k_r, k_a, from simulation and experiments with different average chip thickness are very close to each other, where k_r, k_a are the ratios of the radial and axial forces to the tangential force, respectively. Moreover, the experimental results shows that the value of k_a to be 1 or higher, indicating that this negative insert exerts larger axial force than the tangential force, thus requiring special attention in the spindle's thrust bearing design. Furthermore, a comparison of tangential cutting coefficient experiment for the two types of cutter insert are shown in Fig. 2(d) to demonstrate that the optimally designed insert 2 yields lower cutting coefficients than insert 1 acquired from the tool supplier. This study thus not only design and validates the optimal insert geometry, but provides a design methodology for the optimal design of other types of cutter such as turning inserts and drill points.

Keywords: milling, edge geometry, cutting coefficient, Taguchi method
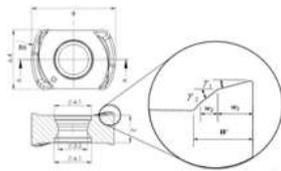
W: groove width, w1: blade width,
w2: 2nd blade width, γ_1: land angle,
γ_2: 2nd land angle

Figure 1. The key geometry of double-sided milling insert.

Figure 2 Comparison of (a) k_t, (b) k_r, and (c) k_a, from results of simulations and experiments, (d) Comparison of k_t for two types of edge geometry

Living Tissue One-Dimensional Nonlinear Heat Transfer Problems

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Abstract

In the study, DPL Model is used to simulate the one-dimensional heat conduction of biological tissue with the laser heat source. The temperature distribution and the thermal damage in the living tissue both can be obtained by using the differential transformation method. The conclusions are summarized as follows (1) Based on the Dual-Phase-Lag Heat Transfer Model under different boundary conditions, the results show that the temperature distributions are consistent with the previous literature results. (2) The living tissue of the one-dimensional heat transfer is analyzed by nonlinear Dual-Phase-Lag model with the various laser heating source. The results show that the Dual-Phase-Lag not only can effectively reduce the intense thermal shock in TW model but also can greatly reduce the thermal damage.

Keywords: Dula-Phase-Lag bio-heat transfer model, Nonlinear of The Perfusion Rate of Blood, differential transformation method

Development of Novel 2-D.o.F Electromagnetic Actuator for 6-Legged Mobile Robot

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1.   Background/ Objectives and Goals

Recently many researchers have developed the small mobile robots. There are mobile legged robots using various actuators. RC servo motors, PZT actuators, SMA actuators and pneumatic actuators are widely used used in these robots. Many of these legged robots six legs to provide improved stability. Six-legged robots have thus been commonly used commercial and military applications.

The electromagnetic actuator has a very simple structure and provides moderate torque and response, which is suitable for mass production due to low cost. In this research we developed the novel 2-Degree of Freedom (D.o.F) electromagnetic actuator and applied the actuator to 6-legged robot.

2.   Expected Results/ Conclusion/ Contribution

We developed the novel 2-D.o.F electromagnetic actuator and 6-legged robot. 2-D.o.F has 30Hz bandwidth. The 6-legged mobile robot can move forward and backward and turn right and left. The moving distance per one step will approximately be 3 mm

Material Science and Engineering / Biological Engineering / Chemical

Engineering

Wednesday, March 28, 2018   16:00-16:50   Room AV

ACEAIT-0036

Enhance Functionality of Titanium Dioxide Nanotube Arrays for Photocatalytic Degradation of Methylene Blue under Visible Light with Deposited Gold Nanoparticles

Areeya Aeimbhu │ *Srinakharinwirot University*

Atipol Sawang-Arom │ *Srinakharinwirot University*

ACEAIT-0064

Property and Methylene Blue Release Profiles of Multilayer Films Prepared from Gelatin and Chitosan

Ansaya Thonpho │ *Mahasarakham University*

Yaowalak Srisuwan │ *Mahasarakham University*

Prasong Srihanam │ *Mahasarakham University*

ACEAIT-0066

Interfacial Reactions between Lead-Free Solders and Cu-xZn Alloys

William Yu │ *National Taiwan University of Science and Technology*

Chih-Hung Lin │ *National Taiwan University of Science and Technology*

Yu-Chun Li │ *National Taiwan University of Science and Technology*

Pei-Yu Chen │ *National Taiwan University of Science and Technology*

Guan-Da Chen │ *National Taiwan University of Science and Technology*

Yee-Wen Yen │ *National Taiwan University of Science and Technology*

ACEAIT-0074

Studies on the Physical Properties of Gold-Doped Titanium Dioxide Fibers Prepared by Electrospinning Technique

Onnapa Klaocheed │ *Srinakharinwirot University*

Panitarn Wanakamol │ *Srinakharinwirot University*

Areeya Aeimbhu │ *Srinakharinwirot University*

ACEAIT-0085

Mechanical and Oxidation Property of Fe-2 wt%Ni Alloys

Dong Bok Lee ｜ *SungKyunKwan University*

Soon Yong Park ｜ *PIMKOREA*

ACEAIT-0093

Impact Deformation Behaviour of AZ80 Magnesium Alloy over a Wide Range of Temperatures

Woei-Shyan Lee ｜ *National Cheng Kung University*

Cheng-Wen Chou ｜ *National Cheng Kung University*

ACEAIT-0112

2-Methacryeoyloyloxyethyl Phosphorylcholine Modified Strainless Steel for Antibacterial Implants

Hsin-Hsin Yu ｜ *Chang Gung University*

Shingjiang Jessie Lue ｜ *Chang Gung University*

ACEAIT-0146

Enhancing Oxygen Iron Conductivity of 8YSZ Electrolytes in SOFC by Doping with Fe_2O_3

Hsin-Yi Lai ｜ *National Cheng Kung University*

Yen-Hsin Chan ｜ *National Cheng Kung University*

ACEAIT-0158

Material Property Analysis of Amorphous Metallic Thin Films as Copper Diffusion Barrier via Molecular Dynamics

Po-Hsien Sung ｜ *National Cheng Kung University*

Tei-Chen Chen ｜ *National Cheng Kung University*

ACEAIT-0150

Developing Automatic Denim Design Engraving and Grinding Machine

Chi-Wai Kan ｜ *The Hong Kong Polytechnic University*

ACEAIT-0044

Effect of Temperature on Enzyme Activity in Mixed Culture *Koji*

Yuji Moriguchi ｜ *The University Kitakyushu*

Hiroshi Morita ｜ *The University of Kitakyushu*

ACEAIT-0060

Effect of Ultrasound Assisted Extraction on the Physicochemical Properties of the Seed Hull Mucilage of *Citrus Grandis* Osbeck

Lih-Shiuh Lai｜*National Chung Hsing University*

Jin-Feng Hsu｜*National Chung Hsing University*

ACEAIT-0126

Effect of Genipin on Silk Fibroin/Chitosan Film Properties

Nuanchai Kotsaeng｜*Kalasin University*

Prasong Srihanam｜*Mahasarakham University*

Yaowalak Srisuwan｜*Mahasarakham University*

APLSBE-0009

A Study of the Probabilistic Error Bound of Trapezoidal Rule for Engineering and Science

Bum Il Hong｜*Kyung Hee University*

Gon Khang｜*Kyung Hee University*

Intae Ryoo｜*Kyung Hee University*

Sun-Jin Hwang｜*Kyung Hee University*

APLSBE-0013

Biomechanical Investigation of the Fractured Patella Fixed with Various Cannulated Screws and Wire

Chih-Hsien Chen｜*National Cheng Kung University*

Chih-Wei Chang｜*National Cheng Kung University*

Yen-Nien Chen｜*National Cheng Kung University*

Chih-Han Chang｜*National Cheng Kung University*

Yao-Te Peng｜*National Cheng Kung University*

APLSBE-0043

Biomechanical Investigation of the Screw Configuration of Tibial Tubercle Osteotomy in Revision Total Knee Arthroplasty

Chih-Hsien Chen｜*National Cheng Kung University*

Chih-Wei Chang｜*National Cheng Kung University*

Yen-Nien Chen｜*National Cheng Kung University*

Chih-Han Chang｜*National Cheng Kung University*

Chi-Rung Chung｜*Chi-Mei Medical Center*

Guan-Heng Jhong｜*National Cheng Kung University*

APLSBE-0053

The Study of the Composite 3D Hydrogel with Electrical Stimulation Used in the Differentiation of Mesenchymal Stem Cells into Cardiomyocytes

Yung-Gi Chen｜*I-Shou University*

Pei-Leun Kang｜*Kaohsiung Veterans General Hospital*

Yu-Hsin Lin｜*Kaohsiung Veterans General Hospital*

Xiu-Wei Zhou｜*Kaohsiung Veterans General Hospital*

Shwu-Jen Chang｜*I-Shou University*

APLSBE-0058

Potential Therapeutic Targets of Reactive Dicarbonyl Species-Associated Diabetes Exacerbating Pulmonary Fibrosis

Jie Heng Tsai｜*Taipei Medical University*

Chi-Li Chung｜*Taipei Medical University*

APLSBE-0028

Polysaccharides Production Using a Semi-Continuous System

Ping-Ting Lin｜*National Chung Hsing University*

Su-Yuan　Lai｜*Central Taiwan University of Science and Technology*

Min-Ying Wang｜*National Chung Hsing University*

ACEAIT-0023

Synthesis and Properties of Smart Hydrogels Prepared from Dendritic Monomers Derived from Cystamine

Yu-Jung Chou｜*Tatung University*

Wang-Xin Wu｜*Tatung University*

Wen-Fu Lee｜*Tatung University*

ACEAIT-0162

Electrochemical Property of Composites Prepared from Ni-Containing Metal-Organic Framework for Capacitor Electrodes

Seok Kim｜*Pusan National University*

Jeonghyun Kim｜*Pusan National University*

Jin Ho Bae｜*Pusan National University*

ACEAIT-0180

Investigation of Sterol and Antioxidant Activity of Wild Grape Seed Fractionated Extracts

Wilaiwan Simchuer │ *Mahasarakham University*

Prasong Srihanam │ *Mahasarakham University*

ACEAIT-0098

Applications of Magnetic Resonance Imaging Technique to Agricultural Researches

Myoung Ho Kima │ *Chonbuk National University*

Seong Min Kima │ *Chonbuk National University*

Enhance Functionality of Titanium Dioxide Nanotube Arrays for Photocatalytic Degradation of Methylene Blue under Visible Light with Deposited Gold Nanoparticles

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Abstract

Highly ordered and vertically aligned titanium dioxide nanotubes were productively prepared by in situ grew on titanium sheet by anodised titanium, processing a high surface-to-volume ratio with controllable dimensions. Gold nanoparticles (Au NPs) were subsequently deposited on the titanium dioxide nanotube arrays (TNAs) by electroplating technique. The microstructures of Au NPs/TNAs including surface chemical composition and surface area were studied with Field emission electron microscopy (FE-SEM), Energy Dispersion X-ray Spectroscope (EDS), X-ray Phototelectron Spectroscopy (XPS), N_2 adsorption-desorption isotherm analysis (BET). The photocatalytic degradation of methylene blue over the visible light region of Au NPs/TNAs has been investigated and compared with the titanium sheet and TNAs. Photodegradation results demonstrated that photocatalytic activity of Au NPs/TNAs exhibited better photocatalytic performance under visible light irradiation compared to titanium sheet and TNAs in terms of percentage degradation of methylene blue. Between the photocatalysis kinetics model with first-order and second-order model; the second-order kinetic model was found to well present the experiment data of all catalysts. These results suggested that noble metal modification is a promising way to improve photocatalysts with both high activity and visible light sensitivity.

Keywords: photocatalytic, titanium dioxide nanotube arrays, gold nanoparticles, methylene blue

Property and Methylene Blue Release Profiles of Multilayer Films Prepared from Gelatin and Chitosan

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Abstract

This work aimed to compare the properties and drug release profiles of multilayer films that were prepared using two materials: gelatin and chitosan (as an outer layer). All of the films contained methylene blue for the drug release study. Each layer was immersed in methanol before pouring another solution to build the film layer. The obtained films were characterized by scanning electron microscope (SEM), Fourier transformed infrared (FTIR) spectroscopy and thermogravimetric analyzer (TGA) for their morphology, secondary structure and thermal properties, respectively. The results indicated that the prepared films have smooth surfaces without phase separation. The secondary structure and thermal properties of the films were changed by hydrogen bond formation and varied according to the material. Blending chitosan with gelatin resulted in higher thermal degradation, methylene blue release and percentage dissolution than with the native chitosan film. Therefore, the material type and bond formation are important factors on the properties and drug control release of the multilayer films. These data might be used as basic information to design drug carriers with controlled release for drug delivery applications.

Keywords: Biomaterial, Chitosan, Gelatin, Films, Drug delivery

Interfacial Reactions between Lead-Free Solders and Cu-*x*Zn Alloys

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1.   Background

In past 60 years, Sn-Pd alloys played an important role as interconnecting materials in the electronic packaging industry with superior good processing properties and reliability. However, due to the toxicity of Pb, the Sn-Pb solders have been restricted in accordance with WEEE and RoHS regulations. Sn, Sn-3.0 wt.% Ag-0.5 wt.% Cu (SAC), and Sn-9.0 wt.% Zn (SZ) are high potential lead-free solder candidates and commonly used to replace the Sn-Pb alloys.   Numerous studies have reported on the interfacial reactions between Pb-free solders and the Cu substrate. Several studies had indicated that the Cu-Zn alloys are a highly recommended candidate for interconnecting materials with its outstanding mechanical properties and reliability. Therefore, the solid/liquid reaction couple technique interfacial was applied to investigate the interfacial reactions between the Cu-*x*Zn ($x = 0, 5, 15, 30, 40$ wt.%) alloys and Sn, SAC, and SZ. The IMC formation, surface morphology, and reaction mechanism in interface reaction can be well understood.

2.   Results

The $(Cu,Zn)_6Sn_5$ and $(Cu,Zn)_3Sn$ phases were formed in the Sn/Cu-*x*Zn (x=5, 15, 30 wt.%) couples. When the reaction temperatures and time were increased, the $(Cu,Sn)Zn$ phase replacing the $(Cu,Zn)_3Sn$ phase was formed in the Sn/Cu-*x*Zn couple. The metastable T phase and $(Cu,Sn)Zn$ phase were formed in the Sn/Cu-40Zn reaction couple aged at 300 ℃. The $(Cu,Zn)_6Sn_5$ and $(Cu,Zn)_3Sn$ phases were formed in the SAC/Cu-*x*Zn (x=5, 15 wt.%) couples. The $(Cu,Zn)_6Sn_5$ and $(Cu,Zn)Sn$ were observed when the SAC solders were reacted with Cu-30Zn and Cu-40Zn substrates. The T and $(Cu,Sn)Zn$ phases were formed in the SAC/Cu-40Zn reaction couple aged at 300 ℃ for 100 h. The $(Cu,Sn)Zn_5$ and $(Cu,Sn)_5Zn_8$ phases were formed in the SZ/Cu-Zn couples aged at 240 ℃. When the reaction times and temperatures were increased, only the $(Cu,Sn)_5Zn_8$ phases can be observed at the SZ/Cu-Zn interface. The results revealed that the IMC formation was sensitive to the reaction temperature and Zn content in the Cu-Zn alloy.

Keywords: solid/liquid reaction couple technique, interfacial reaction, Cu-*x*Zn alloys, lead-free solders, metastable T phase

Studies on the Physical Properties of Gold-Doped Titanium Dioxide Fibers Prepared by Electrospinning Technique

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1. Background/ Objectives and Goals

Titanium dioxide fibers (TFs) have attracted much attention for uses as catalysts in water treatment. The intrinsic semiconductor properties of titanium dioxide could be well utilized since the nanofibers yield large surface-to-volume ratio. The major drawback of the TFs is its ability to absorb only ultraviolet light, which covers approximately 5% of the total amount of the solar spectrum. The ability to absorb visible region (approximately 47%) of solar energy would increase solar catalytic efficiency and could be done by various techniques such as doping of the TFs with non-metal, noble metals and transition metal ions. These doping procedures can alter physical and chemical properties of the TFs. Noble metals such as Pt, Ag, Pd and Au doped into the TFs offer broadened light absorption that includes visible region. The aim of this research is to fabricate gold-doped titanium dioxide fibers via electrospinning technique. The morphology, microstructure and crystal structure of the TFs were characterized by scanning electron microscope (SEM), energy dispersive x-ray spectroscopy (EDX), x-ray diffraction (XRD), and transmission electron microscopy (TEM). The optical properties were studied by UV-visible diffuse reflectance spectroscopy(UV-Vis spectroscopy).

2. Expected Results/ Conclusion/ Contribution

The electrospun TFs were successfully fabricated into long continuous fibers with some macroscopic beads as observed in low-magnification SEM micrographs. The beads were absent for 0g-Au-TFs sample. After heat treatment, some TFs samples became more brittle, as slight fiber fractures were evident in SEM. The fiber diameter averages after heat treatment were 115 nm,   94 nm, 152 nm, 130 nm, 114 nm, and 103 nm for 0 g, 0.010 g, 0.015 g, 0.020 g, 0.025 g, and 0.030 g gold doping conditions, respectively. These diameter sizes were smaller than the conditions before heat treatment, since the organic content was removed by heat treatment.   EDX confirmed the existence of Au in Au-TFs specimens. From XRD analysis, as-spun TFs were in amorphous phase. After heat treatment, the TFs transformed to anatase (JCPDS No.78-2486) and Au pattern (JCPDS No. 04-0784) was also detected. TEM observation showed scattered Au nanoparticles in all Au-TFs. From method of Kubelka-Monk, the band gaps of the Au-TFs were lower than that of the neat TFs.

The current study has illustrated a successful fabrication route of Au-TFs. The fiber diameter in the range of 90-150 nm would yield large surface-to-volume ratio and enhance catalytic properties. The decrease in band gap by gold doping would allow the absorption further into the visible spectral region.

Keywords: Titanium dioxide fibers, Electrospinning, Gold-doped titanium dioxide, UV-Visible spectroscopy, Microstructure

Mechanical and Oxidation Property of Fe-2 wt%Ni Alloys

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1.   Objectives

Fe-2 wt%Ni alloys were fabricated using Fe and Ni powders by the metal injection molding (MIM) process. They are used as gear actuator of automobile transmission. Their main advantages are cost-effectiveness, easy fabrication, aqueous corrosion resistance, wear resistance, and good magnetic properties. MIM is a metalworking process in which finely-powdered metal is mixed with binder material to create a "feedstock" that is then shaped and solidified using injection molding. This study was performed to investigate the mechanical and oxidation property of Fe-2 wt%Ni alloys, which was not yet adequately studied.

2.   Conclusion

The effect of Ni content of Fe-Ni alloys on the microstructure and on the oxidation characteristics was investigated in detail. The obtained microstructure was a ferrite (α) phase with body centered cubic (BCC) structure. With the addition of the Ni content, mechanical property and oxidation resistance was improved.

Keywords: metal injection molding, gear actuator, tensile test, wear test, oxidation

Impact Deformation Behaviour of AZ80 Magnesium Alloy over a Wide Range of Temperatures

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Abstract

The high strain rate deformation behaviour and dislocation substructure of AZ80 magnesium alloy are investigated at strain rates of 8×10^2 s^{-1}, 1.5×10^3 s^{-1} and 2.2×10^3 s^{-1} and temperatures of -100℃, 25℃ and 300℃ using a compressive split-Hopkinson pressure bar system. The flow stress, work hardening coefficient, strain rate sensitivity and temperature sensitivity all increase with increasing strain rate or decreasing temperature. Moreover, the dynamic deformation behaviour is well described by the Zerilli-Armstrong hcp constitutive equation. Transmission electron microscopy observations show that the dislocation density increases with a higher strain rate or a lower temperature. Finally, the flow stress varies linearly with the square root of the dislocation density in accordance with the Bailey-Hirsch model.

Keywords: AZ80 magnesium alloy; flow behaviour; dynamic deformation; strain rate effect; dislocation density

2-Methacryeoyloyloxyethyl Phosphorylcholine Modified Strainless Steel for Antibacterial Implants

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Abstract

The purpose of this study is to modify 316L stainless steel surface with 2-methacryloyloxyethyl phosphorylcholine (MPC) using photoinduced polymerization grafting. Benzophenone (BP) was used as a precursor to be grafted on the stainless steel for subsequent MPC attachment and poly (lactic-co-glycolic acid) (PLGA) microspheres were mixed with MPC as an adhesive carrier of glycopeptide antibiotic vancomycin. The chemical composition and bonding composition of the films deposited on the surface of 316L stainless steel substrate were measured by using X-ray photoelectron spectroscopy; The nitrogen content was increased by 5% and the phosphorus by 3% after MPC modification; The surface also become hydrophilic as he water contact angle was decreased to $36°$ from $80°$. Both XPS and contact angle data confirmed successful grafting of MPC on the stainless steel surface. The samples were co-cultured with Staphylococcus aureus for antibacterial activity determination. The vancomycin permeation through the PLGA was measured as function of time to elucidate controlled drug release behavior.

Keywords: 2-methacryloyloxyethyl phosphorylcholine (MPC), stainless steel, biomaterials, poly (lactic-co-glycolic acid) (PLGA), Vancomucin

Enhancing Oxygen Iron Conductivity of 8YSZ Electrolytes in SOFC by Doping with Fe_2O_3

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1.   Background/ Objectives and Goals

Fe_2O_3 is a sintering material that can help Yttria-stabilized zirconia (YSZ) to decreasing the sintering temperature, and avoid the microstructure of YSZ be damaged in sintering process. However, rarely of research use the simulation method to investigate the electrolyte Oxygen Ion Conductivity (OIC) which using Fe_2O_3 to be a dopant. Also, the influence of OIC when doping Fe_2O_3 into YSZ is still not clear enough. Therefore, in this study, the Molecular Dynamic (MD) simulation will be used as a tool to estimate the electrolyte's OIC, which using Fe_2O_3 to be a dopant and dope into 8YSZ. In order to find out the crucial factor that enhance the electrolyte OIC, this study will investigate the change of electrolyte's OIC in different doping proportion (1%-5%) and working temperature (773 K-973 K).

2.   Conclusion

In this study, the oxygen ion conductivity enhancement for SOFC electrolytes doped with Fe_2O_3 is investigated. Based upon the results of MD modeling, the effect of 8YSZ doped with Fe_2O_3 is characterized and enhanced to improve the electrolyte oxygen ion transport ability in SOFC. Several concluding remarks are given as follows:

(i)   The results of MD simulation presented in this study indicate that Fe_2O_3 as an economic dopant for 8YSZ electrolytes can indeed improve the oxygen ion transport ability in the middle working temperature range from 773 K to 973 K.

(ii)   The simulation results also indicate that as the concentration of oxygen vacancy of the electrolyte is higher enough, the oxygen ion mobility will be then decreased. This is why the activation energy was found decreased as the proportion of the Fe_2O_3 dopant is increased only up to approximately 4%. This clearly leads to an optimistic OIC characteristics for Fe_2O_3 as doped with 8YSZ electrolytes. As such, the possible efficiency enhancement for a cost-effective SOFC working in middle temperature range can be characterized to allow sufficient improvement being further exerted for subsequent process applications.

Keywords: Solid Oxide Fuel Cell, Molecular Dynamic, Oxygen Ion Conductivity, Yttria-stabilized zirconia

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Material Property Analysis of Amorphous Metallic Thin Films as Copper Diffusion Barrier via Molecular Dynamics

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Abstract

During the development of electronic devices over the last decades, the microelectronic devices dimensions have been reduced drastically. In the current semiconductor device industry, flip chip assembly package with microbump (solder bump) has widely been used for high-end niche applications. However, copper and tin could react to form Cu–Sn intermetallics at temperature as low as $200℃$ and result in premature failure of electronic devices. In the current, Ni as an barrier layer has been widely studied and industrially accepted. However, Ni barrier layer suffers from its polycrystalline grain structure where grain boundaries can potentially act as a diffusion path for the Cu/Sn interaction to take place and could react to form Cu–Sn intermetallics. In this study, a thin film metallic glass (TFMG) as a diffusion barrier between tin and copper layers is introduced to block the Cu/Sn interaction. CuAg TFMG with different atomic percentage and amorphous ratio were employed in the current study via molecular dynamics simulation. To simplify the modeling, only Cu and barrier layer interface has been discussed. Among all compositions, $Cu_{40}Ag_{60}$ is found to have the best glass forming ability, that is to say $Cu_{40}Ag_{60}$ can effectively stop diffusion between copper and tin than other compositions.

Keywords: thin film metallic glass, barrier layer, intermetallic, molecular dynamics

Developing Automatic Denim Design Engraving and Grinding Machine

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Background and Objectives

In the recent year, fashion and apparel trend focus on faded and torn look which is a way of expressing poverty to catch the eye. Thus, garment manufacturers started fading and tearing the textile products, with an example of faded blue jeans which looked strikingly poor and particularly those with torn legs and bare knees became very popular in a short time amongst young customers. They are even sold at a higher price in certain areas than bright blue jeans which looked brand new. With such a higher profit advantages, fabric manufacturers are changing the appearance of fabrics by applying certain designs to the texture and surface of textiles in response to customer demand, thus increasing their added value. Therefore, companies have been trying in recent years to develop various techniques to improve the visual aspect of fabrics especially the faded and torn looks.

In the industry, the conventional technologies involve creating designs by fading the colour in certain areas of denim fabric using the processes includes:
(i) Mechanical method such as sanding, sand blasting, brushing;
(ii) Chemical method such as pre-washing, rinsing, stone washing, sand washing, snow washing, stone washing with enzymes, bleaching, dyeing, printing and finishing;
(iii) Combined methods (i) and (ii).

No matter the methods (i), (ii) or (iii) conduct, in order to produce repeatable and reproducible design in the denim, a design mould is required for assisting the production of pattern in the denim. Recently, the mould is engraved by experienced workers manually.

Although desired design can be engraved, the following problems were encountered:
(i) time consuming due to problem in manual engraving
(ii) inability to create standard and reproducible designs
(iii) inability to produce identical designs
(iv) insufficient visual effects due to only simple designs is applicable
(v) low quality of designs if complicated design is used
(vi) inability to apply the original writings and designs onto the product

In order to cope with these problems, a suitable automatic engraving system that does not have the drawbacks involved in the conventional technologies should be adapted for producing the design mould for denim. Conventionally, the design mould is used for manual grinding so as to produce desired design in the denim product.

The manual grinding may introduce human errors which may affect the final product quality. Although the manual grinding process can be now replaced by laser treatment, the laser machine cost is high which may not be afforded by SMEs. Therefore, a single grinding machine with simple operation is required for suiting individual need. With the use of the proposed engraving machine, we may change the engraving spindle to grinding spindle in order to achieve similar grinding effect as manual grinding. With the help of the grinding function of the equipment, it can:
(i) reduce the human error in manual grinding;
(ii) grind design with large area;
(iii) produce good repeatable and reproducible design;
(iv) reduce the production cost when compared with laser grinding process.

In this work, an automatic engraving and grinding equipment for the denim design will be developed. With the help of the equipment, textural effect imparted by conventional mechanical finishing could be achieved uniformly.

Keywords: Denim, design, engraving, grinding

Effect of Temperature on Enzyme Activity in Mixed Culture *Koji*

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1. Background/ Objectives and Goals

For *sake* making in Japan, rice *koji* which brewed *Aspergillus oryzae* in *sake* rice is used, and four kinds of enzymes produced by this *koji* mold are important. The α - amylase and glucoamylase which is one kind of saccharification enzyme, acidic protease which is one kind of proteolytic enzymes, acidic carboxy protease, the balance of these enzyme activities greatly influence the flavor of *sake*. It has been reported that differences in enzyme activity were observed when culturing in a state where the temperature of *koji* is kept constant in the *koji* making process. In addition, it has been reported that the enzymatic activity increased by mixed culture of *Aspergillus* strains and *Rhizopus* strains in a previous study. Therefore, in this study, research was conducted for the purpose of investigating the enzyme activity productivity based on the culture temperature of mixed culture *koji*.

2. Expected Results/ Conclusion/ Contribution

As a result of the *koji* test, an increase in enzyme activity was confirmed as the incubation time increased. As a result of conducting the *koji* test with the culture temperature set at 33 ℃, 35 ℃ and 37 ℃, the α-amylase activity reached a maximum of 302.7 U/g at 37 ℃. As a result, the glucoamylase activity reached a maximum of 50.4 U/g at 33 ℃. The acid protease activity reached a maximum of 66.1 U/g at 35 ℃. As for the acidic carboxypeptidase activity, the maximum was 1705.4 U/g at 33 ℃. As a result of this experiment, α-amylase activity, glucoamylase activity and activity value of acidic carboxypeptidase were high values in the *koji* test at 33 ℃. Therefore, it is considered that cultivation at 33 ℃ is optimal for mixed culture *koji*. In addition, enzymes other than acidic protease had no increase in activity at the time of culturing for 48 hours. Therefore, it is considered that the optimum incubation time is 48 hours. As a result of pure cultivation of *Aspergillus oryzae* at 33 ℃ for comparison, the pure culture of *Aspergillus oryzae* showed higher activity than the mixed culture. However, since acidic protease activity showed equivalent or higher results, the possibility of improving enzyme productivity by mixing culture was obtained. In the future, we will aim to improve enzyme production by optimizing culture conditions such as water content.

Keywords: mixed culture, *sake*, glucoamylase, α-amylase

Effect of Ultrasound Assisted Extraction on the Physicochemical Properties of the Seed Hull Mucilage of *Citrus Grandis* Osbeck

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1. Background/ Objectives and Goals

Refinery of biomass with more eco and environmental-friendly methods to recover the labile value-added components from the side-streams of agricultural industries to important food ingredients is getting more attention recently, for examples, by using ultrasound-assisted extraction. The seed of *Citrus grandis* Osbeck, a kind of agricultural wastes from the processing of *Citrus grandis* Osbeck, contains significant amount of mucilaginous substances that would form slimy coating around the seed when the seed was soaked in water, and may have a potential as a novel thickener. Therefore, in this study, the effect of ultrasonic extraction factor (including temperature, amplitude and time) on the yield of *Citrus grandis* Osbeck seed hull mucilage was investigated by using response surface methodology. The physicochemical properties of the seed mucilage extracted under optimum conditions were characterized as well, and compared with those extracted with water without the assistance of ultrasound.

2. Expected Results/ Conclusion/ Contribution

Single factor experiment revealed the extraction yield of the seed hull mucilage of *Citrus grandis* Osbeck increased to a maximum then decreased with increasing ultrasonic temperature and amplitude, but increased with increasing ultrasonic extraction time to a certain extent then levelled off. The optimum conditions for maximum seed hull mucilage extraction yield were found to be under an extraction temperature of 53°C, ultrasonic amplitude of 84% and ultrasonic extraction time of 40 min. Verification test performed under the optimum extraction condition indicated that the seed hull mucilage extraction yield (4.86±0.22%) agreed very well with the predicted yield (4.86%). However, the physicochemical properties of seed hull mucilage have also been modified significantly by ultrasonic treatment, particularly for lower molecular weight, intrinsic viscosity and dynamic rheological properties. Monosaccharide composition analysis revealed that the molar percentage of GalA and Gal decreased pronouncedly accompanied with a significant increase in the molar percentage of neutral sugar, particularly Glc. Electron microscopy observation revealed that the outer hull of *Citrus grandis* Osbeck seed was apparently corroded by the ultrasonic treatment. These results implied that ultrasonic treatment may corrode the cell wall structure and enhance the release and possible degradation of hemicellulose/cellulose polysaccharide, resulting in higher yield of mucilaginous matter with lower molecular weight and higher neutral sugar fractions, and may be considered as a potential novel thickener.

Keywords: ultrasound, mucilage, physicochemical properties, optimization

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Effect of Genipin on Silk Fibroin/Chitosan Film Properties

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Abstract

The objective of this work was to study the effect of genipin cross-linked agent on silk fibroin/chitosan property. The different solution ratios of silk fibroin and chitosan mixed with genipin cross-linked agent were prepared for construction of the blend films. The morphology, secondary structure and thermal properties of films were characterized by scanning electron microscope (SEM), Fourier transform infrared (FTIR) spectrophotometer and thermogravimetric analysis (TGA), respectively. In addition, film dissolution was tested by immersing in buffer solution for 7 days. The results indicated that the blended films have slight rough on their surface comparison to the native silk fibroin film. The secondary structure of the blend films varied with different ratios and co-existed by random coil, α-helix and β-pleated sheet structures. This resulted to lower thermal stability than the native silk fibroin films since they composed of high α-helix and β-pleated sheet structures. All of films dissolved slightly in buffer after 7 days immersion. The obtained results indicated that genipin helped to increase bonding formation between silk fibroin and chitosan which increased stability of the films.

Keywords: Bonding formation, Chitosan, Silk fibroin, Property, Dissolution

A Study of the Probabilistic Error Bound of Trapezoidal Rule for Engineering and Science

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1. Background/ Objectives and Goals

Many numerical computations in engineering and science can only be solved approximately since the available information is partial. For an integration, there are many numerical integration schemes. One of them is Trapezoidal rule that is widely used in life science and biological engineering. Whenever we use this scheme, we must have the error between the true and the approximate values. The error between the true and the approximate values could be reduced by acquiring more information. However, this increases the cost. Hence there is a trade-off between the error and the cost. To reduce the cost, we propose a new way of computing an error by using probability measure.

2. Expected Results/ Conclusion/ Contribution

There are many advantages of the probabilistic setting. But we list two of them.

(1) Reduction of complexity: The worst case setting cannot solve some problems. That is, no numerical scheme that uses a finite number of function values can approximate the integral with the worst case error less than any given positive real number. However, the probabilistic setting can solve this problem. That means the reduction of complexity.

(2) Bayesian statistics: Because we assume that the space of functions is equipped with a probability measure, the probabilistic setting is related to the Bayesian approach and this corresponds to a priori probability measure on the space of function parameters.

Therefore, the probabilistic setting can be used in a variety of fields for better results. There are a number of applications to the area such as Image Processing, Analysis on the Neuroimaging Data, Biomedical Ultrasonics, Electric Power Distribution and so on.

Keywords: Numerical integration, Trapezoidal rule, Probabilistic setting

APLSBE-0013

Biomechanical Investigation of the Fractured Patella Fixed with Various Cannulated Screws and Wire

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1.   Background/ Objectives and Goals

Patellar fractures account for 1% of skeleton traumas in adults. Displaced patellar fractures often require surgical fixation to restore the congruent patellar articulation, particularly in young or high-performing patients. Cannulated screw with anterior wire in a figure of eight, developed based on the tension band technique, could convert patellar front tension forces into compression at articular surface to promote healing, hence this method is becoming popular. However, the wire migration and rupture is not uncommon while the loading on the wire is rear investigated. Full thread cannulated screw can increase the failure load of the fractured patella with screw and wire in previous studies, but the loading on the wire and the stability of the fractured patella with various screws is still unknown. Therefore, the objective of this study is to compare the stability and wire loading of the fractured patella fixed with various cannulated screws, including partial and full thread, and combined with tension band wire in a figure of eight by using finite element method.

2.   Expected Results/ Conclusion/ Contribution

Full thread screw reduced the wire loading and increased the stability of the fractured patella by reducing the gap opening and fragment displacement compared with partial thread screw. The screws 5 mm placement yielded higher stability, lower wire loads than the 10 mm placement. Full thread cannulated screw placed 5 mm away from the leading edge of the patella with anterior wire is suggested for the fixation of transverse patellar fracture.

Keywords: Patellar fracture, cannulated screw, stability, wire loading, finite element method

Biomechanical Investigation of the Screw Configuration of Tibial Tubercle Osteotomy in Revision Total Knee Arthroplasty

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1.   Background/ Objectives and Goals

Tibia tubercle osteotomy (TTO) is a surgical technique used in revision total knee arthroplasty (RTKR), reduction and fixation of severe fractures of distal femur and proximal tibia and management of patellofemoral incongruence. The reasons to TTO widely used are its larger exposure and space for operation, negligible soft tissue violation during the operation. The application of TTO in RTKR is different from the other surgery because the metallic tibial stem of the artificial joint affects the insertion of the screw. Therefore the surgeon must adjust the trajectory of the screw to avoid interference. However the effect screw trajectory on the TTO stability is rear investigated in literature. Hence the aim of the present study aims to compare the TTO stability with various screw trajectory in the revision total knee arthroplasty by using finite element methods.

2.   Expected Results/ Conclusion/ Contribution

The results indicated that the difference of maximum fragment displacement between the screw configurations was 0.05 mm and 0.04 mm, respectively, with the bevel and step cut of the fragment. The bevel cut with the upper screw toward laterally and the lower screw toward medially yielded the highest stability with least fragment displacement.

Keywords: Patellar fracture, cannulated screw, stability, wire loading, finite element method

The Study of the Composite 3D Hydrogel with Electrical Stimulation Used in the Differentiation of Mesenchymal Stem Cells into Cardiomyocytes

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1. Background/ Objectives and Goals

Myocardial tissue has limited self-repair ability due to its loss of differentiation characteristic for most mature cardiomyocytes, which causes the injury on myocardial is difficult to cure even the current treatment methods also have their limitations. Some clinical studies have tried to transplant immature myocardial cells directly to the defect and hope to cure the lesion, but the drawbacks and difficulties including limited of source, proliferation capability and maintaining physiological functions of myocardial cells while culture in vitro all impeded this idea. The main purpose of this project was to develop a functional scaffold which not only be able to provide a 3-D environment for stem cells culturing, but also able to allow transmission of electrical stimulation to the cultured stem cells, and hope to promote and increase the differentiation of stem cells into myocardial cells. In this study, we utilized screen imprinting techniques with using the PLGA membranes as printing substrates to fabricate a new electrode that covered with alginate/carbon nanotube hydrogels. This unique and integrated micro-circuitry could serve as a 3-D culture environment for mesenchymal stem cells; also act a platform for electrical stimulation. This project was focusd on the preparation of the electrical stimulation system with carbon/CaCl2 electrodes covered with carbon nanotube-hydrogel, the effects of the related factors from electrical stimulation on the differentiation of stem cell into cardiomyocytes.

2. Expected Results/ Conclusion/ Contribution

The electrochemical properties data showed no significant difference among PLGA and PC substrates. The CV results demonstrated that 7.5% calcium chloride modified-carbon electrode combined with 2% alginate had the best gel rate and electron conductivity. The cell culture tests indicated that the calcium chloride modified-carbon electrode showed the good biocompatibility. MSCs treated with electrical stimulation increased the expressions of cardiac protein to cTnI and α-actin compared with MSC groups without electrical stimulation. The results showed that three-dimensional hydrogel composed of alginate and PLGA with electrical stimulation system is the promising for inducing mesenchymal stem cells into cardiomyocytes.

Keywords: Alginate, Mesenchymal Stem Cells, Poly(lactic-co-glycolic acid), Single-Walled Carbon Nanotubes, Myocardial Tissue Engineering

Potential Therapeutic Targets of Reactive Dicarbonyl Species-Associated Diabetes Exacerbating Pulmonary Fibrosis

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Diabetes mellitus is an independent risk factor for the exacerbation of pulmonary fibrosis. In the present study, we have found that bleomycin-induced pulmonary fibrosis was exacerbated in STZ diabetic mice. However, the advanced glycation end products (AGE)/receptor of AGE (RAGE)-pathway, a major pathogenic mechanism in hyperglycemia, was found to have anti-fibrotic and anti-epithelial to mesenchymal transition properties in pulmonary fibrosis. Reactive dicarbonyls including methylglyoxal (MG), glyoxal and 3-deoxyglucosone (3-DG) were known to be involved in the pathology of diabetic complications by direct modification of proteins, nucleotides or phospholipids. In addition to proteins, reactive dicarbonyls can react with nucleotides to form nucleotide-AGEs. Recently, MG was reported to regulate gene expression by altering DNA demethylation and miRNA expression. MiRNAs are implicated in the pathogenesis of diabetes and its complications, and have become an intriguing target for therapeutic intervention. We performed the RNA seq assay of miRNA in MG-treated or un-treated pulmonary epithelial cells and lung fibroblasts. In MG-treated pulmonary epithelial cells, 17 miRNAs were up-regulated and 12 miRNAs were down-regulated more than 50 %. The treatment of MG also increased the expression of 9 miRNAs and suppressed 20 miRNAs expression in lung fibroblasts. Among these identified miRNAs, MIR566, 564, 221, 614, 34AHG, 205HG, and 25 of HBECs and MIR1248, 762, 210HG, and 221 of lung fibroblasts were reported to be involved in the pathology of fibrotic diseases. These miRNAs may consider as potential therapeutic targets in reactive dicarbonyls-excerbating pulmonary fibrosis. The expression and function of identified miRNAs should be further examined in the future.

Polysaccharides Production Using a Semi-Continuous System

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Abstract

Diatoms are one of the most important sources of biomass in the ocean, accounting for about 40% of marine primary production. Diatoms also contribute up to 20% of global CO_2 fixation in the biosphere. The food storage polysaccharide in diatoms is a $\beta(1,3)$ glucan, also named chrysolaminarin because it resembles the $\beta(1,3)$ glucan found in chrysophyte algae. Chrysolaminarin is currently marketed for its ability to stimulate macrophages leading to immuno-stimulatory, anti-tumor and wound-healing activities. Here, we described the characterization of a diatom, *Halamphora* sp. NCHU MYW AQ4, collected from marine waters at Kenting, Taiwan and the culture method for a bench-scale polysaccharide production. The morphology of *Halamphora* sp. NCHU MYW AQ4 displayed patterns consistent with the generic characteristics of the genus Halamphora. The size (about 20 µm), the dorsiventrality of the cells in valve view, the protracted, rostate valve ends and the seemingly central helictoglossa sitting on a raphe ledge placed NCHU MYW AQ4 among the Halamphora clade. The 18S rDNA molecular analysis was also consistent with our morphological analysis. Using NJ, MP and ML evolutionary tree constructs, our strain was found to be in the same branch with *Halamphora* sp. with bootstrap support; thus, we assign *Halamphora* sp. NCHU MYW AQ4 to this strain. Currently, AQ4 (*Halamphora* sp.) was subjected to an 8 L spinner flask for a long-term semi-continuous culture. Our goal is to increase the biomass of diatoms and to develop the optimal condition of their polysaccharide production.

Keywords: Diatom, *Halamphora* sp., semi-continuous culture, chrysolaminarin, polysaccharide

Synthesis and Properties of Smart Hydrogels Prepared from Dendritic Monomers Derived from Cystamine

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1.   Background/ Objectives and Goals

Traditionally, the thermosensitive hydrogels were prepared with N, N, methylene –bis-acrylamide (NMBA) and which were non-degradable hydrogels. To improve their degradability, a series of novel thermosensitive and degradable hydrogels were developed via the redox reaction of disulfide bonds in this study. The properties of these novel hydrogels such as swelling ratio and mechanical properties can be controlled by the degree of degradation, and the changes are expected to improve the applications and recyclability of the hydrogel.

2.   Results and Conclusions

In this study, we have successfully synthesized three dendritic monomers as crosslinker and prepared three series novel hydrogels (Tx, Ox, and Bx) containing dendritic monomers with disulfide structure. Results show that the swelling ratios and mechanical properties of the hydrogels are varied with the structure and content of the crosslinker. Tx series hydrogels showed greatest swelling ratio and Bx series hydrogels had better mechanical properties. These hydrogels also showed obvious thermal-sensitive behavior, their CGTTs of the Bx, Tx, and Ox hydrogel are 32 ^{o}C, 38 ^{o}C, 38 ^{o}C, respectively. At the same time, all hydrogels also showed thermoreversible and swelling-deswelling behavior. The mechanical properties showed that the gel strength is dependent with crosslinker's structure of the hydrogel. In our system, the gel strength of the series hydrogels show the order of Bx > Ox > Tx. This result follows their tendency of crosslinking density. In degradability, these series hydrogels can be degraded in the cysteine solution. The swelling ratios of the hydrogels increased significantly after degradation and increased with an increase of cysteine concentration and degradation time. But, the mechanical properties showed an adverse trend after degradation, and decreased with the increase of cysteine concentration and degradation time. Moreover, hydrogen peroxide can be used to converted thiol group into sulfonate group in the hydrogel structure. The sulfonate group can greatly enhance the swelling ratio of the hydrogels after degradation. In these systems, the Bx series hydrogels can be completely degradation and dissolved in water solution, but the Tx and Ox series hydrogels cannot be completely degradation due to their vinyl group number in the dendritic monomers over two.

Keywords: Dendritic crosslinker, Cystamine, Disulfide, Redox, Thermosensitive hydrogels

Electrochemical Property of Composites Prepared from Ni-Containing Metal-Organic Framework for Capacitor Electrodes

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1. Background

A Ni-BTC MOFs was successfully synthesized by hydrothermal method and thermal treated at various temperature. The electrochemical performance of the composites was investigated using cyclic voltammetry (CV), galvanostatic charge-discharge, and electrochemical impedance spectroscopy (EIS). Among the prepared composites, the samples annealed at 250 ℃ showed the highest capacitance, low resistance, and high cycle stability. It is estimated that during the process of raising the temperature to 250 ℃, it was possible to obtain low electrical resistance and high electric conductivity of the electrode by removing moisture and solvent molecules.

2. Results

Metal organic frameworks (MOFs) are porous coordination compounds constructed by organic ligands and metal ions or clusters and have been an attractive research area due to their high specific surface area and various porous and controllable structures. However, MOFs have low electrical conductivity due to the coordination bond between metal ions and ligands. In this study, cycle performance and specific capacity has been improved through preparation of composites with graphene which has superior conductivity and high surface area. Field Emission Scanning Electron Microscopy (FE-SEM) and Fourier Transform Infra-Red (FT-IR) spectroscopy were conducted for morphology. Electrochemical characterizations were carried out using 3 electrodes test in voltage range of -0.1 – 0.4 V. The materials which was 250℃ heat treated Ni-BTC MOF shows the highest specific capacitances.

Keywords: metal- organic framework, supercapacitor, electrode, electrochemical property

ACEAIT-0180

Investigation of Sterol and Antioxidant Activity of Wild Grape Seed Fractionated Extracts

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Abstract

This work aimed to fractionate crude extracts of different growth stages of wild grape seed namely immature (IMSE), mature (MSE) and ripe (RSE) by silica column and used hexane and ethyl acetate (9:1 v/v) as elution solvent. The fractionated extracts were investigated sterol content and antioxidant activity using spectroscopic method. The quantification and type of sterol were also analyzed using high performance liquid chromatography. The highest content of total triterpenoid (TTC) found in IMSE-SF2 while the total sterol content found the highest in RSE-SF3. Moreover, the RSE-SF3 showed the highest value of total antioxidant capacity (TAC). HPLC analysis indicated that β-sitosterol and stigmasterol are two main sterols in the fractionated extracts and both found the highest contents in RS. The fractionated extracts were tested for antibacterial activity using agar well diffusion method. The results found that the MS could be moderately inhibited of *B. cereus* ATCC11778, *S. aureus* DMST12933 and *S. aureus MRSA* DMST20651. This work concluded that the fractionated seed extract of wild grape fruits might be new sources of phytosterol which could be further developed as health supplement product or pharmaceutical applications.

Keywords: Fractionation, Fruit, Silica, Sterol, Wild grape

Applications of Magnetic Resonance Imaging Technique to Agricultural Researches

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Introduction

Consumers need fresh and high quality agricultural products such as fruits, vegetables, and meat. Quality related factors related to internal tissue structure like internal bruise and tissue breakdown are very important attributes for storing and further processing of the products. Even a same product shows different internal structure due to environmental growing conditions, maturity states and defects caused by various biological and physical sources. Magnetic resonance imaging (MRI) technique is widely used in medical areas recently to diagnose health conditions of human beings. Agricultural products, which have high moisture content, are consisted of biomaterials and are good samples for utilizing an MRI technique.

The objectives in this study are to monitor the internal structure changes of kiwi fruits due to external impact and storing periods, to examine the internal structure changes of cherry tomato fruits with different growth stages, and to investigate the internal tissue structure of various intact agricultural products.

Methods

We used an industrial grade MRI system installed at Chonbuk National University in Republic of Korea to acquire magnetic resonance (MR) image data sets of various intact agricultural products nondestructively. The sample size varied from a small cherry tomato to a big grape fruit. Three different varieties of cherry tomatoes with different growth stages, three different kiwi fruits with different varieties and origin, and various agricultural products such as garlics, figs, oranges, meat etc. In MRI, a 'Gradient Echo' pulse sequence was used to acquire 3D data sets with three different imaging directions, axial, coronal and sagittal directions. To examine the signal changes from the samples, MR image acquisition parameters such as repetition time (TR), echo time (TE), and flip angle (FA) of the sequence were changed in the experiments appropriately.

Results and Conclusion

In the cherry tomato experiments, tomato samples with six different growth stages from green to red were imaged and the data sets acquired were analyzed. The internal structure changes with varying growth stages were monitored. Especially, the signal change from the pericarp area observed clearly.

In the kiwi experiments, kiwi fruits were stored at 17℃ with 50% RH condition for 20 days and monitored the internal structure changes with an MRI system. Internal tissue breakdowns were observed with an increasing storing period.

Various internal structures and defects of agricultural products such as garlics, figs, oranges, meat etc. were analyzed effectively.

This study showed that MRI technique is a very powerful tool to examine the internal structure of most of agricultural products nondestructively. The technique could be applied to all agricultural products to monitor the internal physical changes due to defects, growth stage change, and storing period.

Civil Engineering / Environmental Science

Wednesday, March 28, 2018   17:00-17:50   Room AV

ACEAIT-0057

Numerical Study of Saltwater Intrusion by Opening of Drainage Gate at Isahaya Polder

Yumi Mikami｜*Iwate University Graduate School*

Kunihiko Hamagami｜*Iwate University*

Kozue Yuge｜*Saga University*

ACEAIT-0079

Manual of Ground Subsidence Risk Rating(GSR) for Practitioners during Pre-Excavation

Eugene Jang｜*Daejeon University*

Myeong Hyeok Ihm｜*Daejeon University*

ACEAIT-0080

Proposal of Ground Subsidence Risk Rating(GSR) to Predict Ground Subsidence during Pre-Excavation

Myeong Hyeok Ihm｜*Daejeon University*

ACEAIT-0086

Preliminary Findings of In-Situ Construction Conditions on the Properties of Road Base Soils Stabilized by Slag Cement

Deng-Fong Lin｜*I-Shou University*

Tie-Shyong P. Lin｜*I-Shou University*

Huan-Lin Luo｜*I-Shou University*

Qi-Jun Lin｜*I-Shou University*

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ACEAIT-0118

Displacement Analyses of a Sliding Case Along Mountain Road

Sung-Chi Hsu｜*Chaoyang University of Technology*

Ya Suan Huang｜*Chaoyang University of Technology*

Tai Seong Quah｜*Chaoyang University of Technology*

ACEAIT-0198

A Study of Thailand's Natural Sand Which Properties Similar to Ottawa Sand

Thitinun Pongnam｜*North Eastern University*

ACEAIT-0199

Cost Estimation of Residential Buildings by Using 3D Sketchup Program Compared with Detailed Cost Estimating Techniques

Chaichan Yuwanasiri｜*North Eastern University*

ACEAIT-0201

A Study of Waterproofing Method by Using Natural Rubber Coating

Worawit Phojan｜*North Eastern University*

ACEAIT-0202

Water Resources Management for Agriculture

Worawit Phojan｜*North Eastern University*

Pattaraphon Na Nongkhai｜*North Eastern University*

ACEAIT-0016

Typhoon Long-Distance Total Rainfall Forecast Considering ENSO Effects in the Subtropical Zone

Chih-Chiang Wei｜*National Taiwan Ocean University*

ACEAIT-0027

Solar Photocatalysis of 4-Chlorophenol Wastewater using Partial Shell-Core Ag/P3HT@TiO$_2$ Nanocatalysts

Wen-Shiuh Kuo｜*National United University*

Pei-Shan Chiu｜*National United University*

ACEAIT-0040

Utilization of Humidity-Conditioning Mesoporous Molecular Sieve Synthesized from Thin-Film-Transistor Liquid-Crystal-Display Waste Glass

Kae-Long Lin｜*National I-Lan University*

Kang-Wei Lo｜*National Taipei University of Technology*

Yan-Yu Lin｜*National I-Lan University*

Chiao-Ying Chen｜*National I-Lan University*

Ta-Wui Cheng｜*National Taipei University of Technology*

ACEAIT-0070

Eulerian Two-Phase Flow Model for Particle Removal in Ventuti Scrubbers

Ji-Su Kim｜*Dongguk University*

Jong Woon Park｜*Dongguk university*

Minkyung Kim｜*Dongguk University*

ACEAIT-0205

Bidirectional Gate Driver Circuit with High Driving Capability for High-resolution Liquid-Crystal Displays

Po-Cheng Lai｜*National Cheng Kung University*

Ming-Xun Wang｜*National Cheng Kung University*

Chih-Lung Lin｜*National Cheng Kung University*

ACEAIT-0057
Numerical Study of Saltwater Intrusion by Opening of Drainage Gate at Isahaya Polder

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1.   Background

Recently the deterioration of water quality in the Ariake Sea has become a problem, and it is thought that one of the causes is that the tidal embankment in Isahaya Bay may have influenced the ocean current and the water level variation in the Ariake Sea. Therefore, whether the drainage gate of the tide-receiving embankment is open is questioned, but when the drain gate is opened, the salt concentration and the water level in the adjustment pond increases, so there is concern that groundwater with high salinity penetrates the reclaimed land and salt water will go over the embankment and enter the drainage channel. When salt water intrudes into the drainage path, saltwater may come up, and invades farmland which can then cause damage to the farmland from excessive salt. Therefore, we aimed at grasping the behavior of saltwater jumping that can cause salt damage in a simulation. First of all, in order to grasp the present drainage conditions, the outflow volume of each branch drainage route and the change in the water level of the trunk drainage route were checked during a certain rain event, and the result is used to estimate the size of the saltwater wedge.

2.   Results

When comparing the calculated flow rate with the measured flow rate from the outflow volume calculation, the outflow calculation result can be said to be able to roughly reproduce the actual flow rate. Using the results of each branch line drainage outflow volume, the trunk drain water level calculation was done. Reviewing the results of the estimation of the water level of the trunk drainage canal and the reservoir, the water level is almost constant at the beginning of the calculation, at which point there was no rain during the previous stage, and when the rain began the water level rose with rain, when the reservoir pond pump was operated and drainage was carried out, it was possible to reproduce how the water level of the flood basin and trunk drainage channel decreased. Next, we compared the measured water level with the calculated water level. The calculated value was lower than the actual measured value as a whole and there was a difference of about 0.7 m at the maximum, but since it can be said that the state of the water level fluctuation can be reproduced using the water level calculation result obtained by the calculation, a prediction of saltwater uphill was made. Looking at the result of the saltwater wedge shape, it was found that the upstream distance greatly changed in a short time. Then, the temporal change of the saltwater upstream distance, flow rate, and downstream water level over time were compared. When the flow rate increases and becomes maximum, the saltwater upstream distance is minimum.   On the other hand, when the flow rate decreased and the downstream water level reached the maximum, the upstream distance became large and it was confirmed that it became the maximum. From these result, it was found that the saltwater upstream distance varies with the downstream water level, but the upstream distance can be suppressed to some extent as the flow rate increases.

Keywords: Saltwater intrusion, double-layer density flow, outflow analysis

Manual of Ground Subsidence Risk Rating(GSR) for Practitioners during Pre-Excavation

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Abstract

In the field of excavation, it is important to recognize and analyze the factors that cause the ground subsidence in order to predict and cope with the ground subsidence. However, it is difficult for field engineers to predict ground subsidence due to insufficient knowledge of ground subsidence influence factors. Although there are many cases and studies related to the ground subsidence, there is no manual to help practitioners. In this study, we present the criteria for describing and quantifying the influential factors to help the practitioners understand the existing ground subsidence cases and classification of the ground subsidence factors revealed through the research. This study aims to improve the understanding of the factors affecting the ground subsidence and to provide a manual for the ground subsidence risk assessment which can be applied quickly in the field.

Keywords: Ground subsidence risk, Influence factors, Manual, Excavation

Proposal of Ground Subsidence Risk Rating(GSR) to Predict Ground Subsidence during Pre-Excavation

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Abstract

Throughout studying geotechnical field related to the ground subsidence through case study and literature analysis. As a result this study selected as 6 categories and 18 factors for the ground subsidence risk rating(GSR). The factors of the ground subsidence determined in the study were classified into 6 categories: Existence of the cavity, soil and rock, soil, rock, hydrogeology, and external influence during pre-construction. The 18 most important factors affecting the ground subsidence are listed in order of importance. The most important order is groundwater level fluctuation, kind of soil, type of rock, distance between main channel , soil depth and thickness, soil shear strength, RQD, liquid limit, relative density, permeability coefficient, water content, existence of artificial facilities, rainfall intensity, orientation and depth of soil and rock interface, and dry unit weight of soil. In this study, GSR 1.0, which is applicable in the GSR sheet during pre-excavation stage is presented. Each factor affecting ground subsidence was graded as a score(S) between 0 and 100 on the basis of the statistical basis, and the weight(x_i) of each factor was multiplied by the factor grade score. The ground condition corresponding to GSR 1.0 to be applied at the pre-excavation stage is divided into 8 cases and the weight(y_i) for each category (P1~P8) Respectively. Therefore, the final score for estimating the risk of ground subsidence is expressed as

$$GSR\ 1.0 = \sum \{ [\sum(S_i \cdot x_i)] \cdot y_i \}\ 1 + \sum \{ [\sum(S_i \cdot x_i)] \cdot y_i \}\ 2 + \cdots + \sum \{ [\sum(S_i \cdot x_i)] \cdot y_i \}\ n$$

GSR 1.0 final rating can be graded from very poor ground to very good ground by dividing 0 ~ 100 points into 5 sections.

Keywords: Ground subsidence, Prediction of ground subsidence, Pre-excavation, Risk Rating, GSR 1.0

Preliminary Findings of In-Situ Construction Conditions on the Properties of Road Base Soils Stabilized by Slag Cement

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Abstract

To investigate the influences of the different rolling compaction conditions on the base or subbase soil stabilized by the treatment of slag cement, a test road section located at Siaogang District, Kaohsiung City was selected in this study. The test road was under long-term heavy loadings from container trucks and was damaged badly to allow vehicles using. After excavation of the test road was completed, the back-fill soils were stabilized by the treatment of the slag cement. Following parameters such as rolling compaction pass number, rolling compaction thickness, water content sprinkled on the surface, and amount of slag cement added were considered to study the effects of these parameter on the properties of road base soils treated by the slag cement. The test results show that the more content of slag cement added, the better strength gained for the soils of base or subbase layers. However, when the content of slag cement added to 8%, the crystallizations were formed pushing and expanding with each other leading to the decrease of the strength in soils. The addition of 6% slag cement content to the soils yielded to the best performance on strength, followed by 8 and 4%. Similar results and phenomena were obtained for the water content added to the soils stabilized by the treatment of slag cement. The addition of 10% water content to the soils produced the best performance on strength, followed by 14% and 6%.

Keywords: Slag cement, rolling compaction, road base, soil

ACEAIT-0118
Displacement Analyses of a Sliding Case Along Mountain Road

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1.   Background and Objectives

Many landslides had occurred during the raining season in central Taiwan. The infiltration of heavy rainfall made the slopes to slide from the upper and/or downward slope. This study is focused on the Nantou 89th County Road which is located in Renai Township, Nantou County, Taiwan. The geological condition within this region is very broken and fragile, and the mountain slopes along the road are in serious condition. In recent years, 89th County Road had struck by the earthquake, typhoons and flood disaster. The traffic will be disrupted almost every time when it encounters with heavy rain because of the disasters. The serious disaster mostly occurs after continuous rain or heavy rain. Typhoon Mindulle in 2004 and 0609 flood in 2006 brought the cumulative rainfalls up to 1,215 mm and 1,810 mm, respectively, resulting in severe damage of the road. Therefore, rainfall is one of the main reasons that induced slope disasters along the road. The objective of this research is to study the displacement field and range of the landslide area using particle image velocimetry (PIV) method at Nantou 89th County Road. The research also retrieved the historical data and aerial photos of 32.5K. The areas of failures and failure processes are revealed by comparing the former and after images. Different major sliding zones can be identified based on the aerial photos and failure processes. The major causes of slope instability include the erosion at gullies on down-slope besides the heavy rainfall.

2.   Expected Results/ Conclusion/ Contribution

This study is to use particle image velocimetry (PIV) method on orthophotos at different years to obtain the horizontal displacement field of the collapsed and the surrounding area. The slides at the slope at 32.5K initiated from the downslope of the road, and then developed upward to the road. The displacements between 2009 and 2011 were less than 3.5m. The displacements obtained from PIV analysis between 2008 and 2010 were about 1.0 to 3.5m directed downslope, and three major moving zones were found. For 2010 to Jan. 2012, the displacements occurred at this sliding location were 1.3 to 3.3m, and two major moving zones were observed. According to the aerial photos, a large landslide was noticed to occur during March to September in 2012.

Some conclusions can be drawn based on this study on 32.5K of Nantou 89th Country Road in Nantou County, Taiwan.
1.   The PIV method can be used to obtain the displacement field of landslide movement.
2.   Use of PIV analysis can identify the potential moving zones and value of movement.
3.   Most of the movement between 2009 and Jan. 2012 is less than 3.5m.
4.   Three major moving zones are found.

Keywords: Landslide, PIV, Rainfall, Orthophoto

ACEAIT-0198

A Study of Thailand's Natural Sand Which Properties Similar to Ottawa Sand

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Abstract

Study of natural sand in Thailand which properties similar Ottawa sand for using to Sand Cone Replacement Test for determine the density of compacted soil in the construction field. The researcher observed and studied natural sand in Thailand such as inland, river banks and beach which analysis the physical properties characteristics in laboratory such as Sieve Analysis Absorption Specific Gravity and analysis by microscope. The results showed that the properties of sea sand were similar to Ottawa sand more than inland sand and river banks sand which Cha-am beach sand were most similar the Ottawa sand, especially the percentage difference of Apparent Specific Gravity Buck Specific Gravity Buck Specific Gravity (Sat. Surface dry) were 0.37 % 0.75 % and 0.38 % , respectively. Moreover, the result by the microscope was classified Cha Am Beach Sand as Quartz type similar Ottawa sand.

Keywords: Ottawa sand, Sand Cone Replacement Test, Sieve Analysis, Absorption Specific Gravity and Microscope

ACEAIT-0199

Cost Estimation of Residential Buildings by Using 3D Sketchup Program Compared with Detailed Cost Estimating Techniques

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Abstract

This research aim to study cost of construction materials for residential structures which compare cost of construction materials after construction cost estimation by using detailed cost estimating techniques and 3D Sketch up program for quantities take-offs 10 residential buildings such as concrete, functional area, reinforcing steel, formwork, roof and roof truss. The result shown that the when estimate cost of construction materials for residential structures by detailed cost estimating techniques and 3D Sketch up program both method trend to same direction. Consequently, detailed cost estimating techniques and 3D Sketch up program can use to estimate the cost of construction materials for residential structures with accuracy.

Keywords: Cost of Construction Materials, Cost Estimation, Detailed Cost Estimating Techniques and 3D Sketch up Program

A Study of Waterproofing Method by Using Natural Rubber Coating

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Abstract

Thailand has a rubber plantation area of 12.5 million rai, a yield of 3,032,420 tons, with an export value of 131,617,514 million baht. The country produces para rubber in the world. And exporting raw para rubber is mostly sold abroad. The rest produce domestic products, which generate income with farmers. But the problem of para rubber prices decline since 2014, severely affected the rubber plantation. The government has to help many rubber farmers.

Natural Properties of para rubber (natural rubber) is highly flexible and sticky likewise, natural rubber has its main drawbacks. Fast deterioration under the sun and heat. The use of natural rubber in Thailand is mainly the use of natural rubber mixed with chemicals. To supplement some features that are not in natural rubber and have better performance.

This study on how to pool ponds. In order to be able to retain water for use in the dry season. The method of coating water pool with natural rubber. And the rubber is being improved with calico fabric. By modeling in various types of laboratories. In order to make the process and the appropriate method can be applied in agriculture. It is a way to apply in the work of the pool or pond. Water can be stored. Adding value to natural rubber. To solve the problem of water shortage in areas where there are obstacles or limitations to water retention.

The results showed that the use of rubber latex coated with calico fabric at a certain amount can help prevent permeability in the pond. Natural rubber HAL60 at 700 ml/sq.m can be used to prevent 100% of permeability, and if rubberized cover on clayey layer pond at 10 cm thickness is used will reduce the amount of rubber used. Latex is more effective and has more than 70% waterproofing at the same amount of rubber latex.

Keyword: Natural rubber HAL60, Compound rubber, Clay, Para rubber

Water Resources Management for Agriculture Case Study: Huai Bor Weir, KhonKaen, Thailand

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Abstract

This research aim to study Water Resources Management water management for Agriculture Case Study: Huay Bor Weir, KhonKaen, Thailand which studies monthly water balance before and after building Weir. The research was determine the water budget of Huay-Bor Weir by collect data such as Water Level Flow Rate and Crop Water Requirement by Penman-Monteiht method and prepare the crop calendar for cultivation crops around the Weir.

The result shown that the storage of water in Huay-Bor Weir was highest in August-November of 140,000 cubic meters when compared with amount of Crop Water Requirement for the planting period that promotes planting as appropriate to the area which the amount of water in the weir were sufficient for irrigation throughout the crop.   Moreover, a trend in rice cultivation area has been increased to 33%

Keywords: Water Resources Management, irrigation, Crop Water Requirement, crop calendar and water balance

Typhoon Long-Distance Total Rainfall Forecast Considering ENSO Effects in the Subtropical Zone

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1. Background/ Objectives and Goals

The typhoon rainfall predictions provide critical information, because they can be used for flood control and disaster prevention advanced preparation. Total rainfall nowcasts (i.e., several days ahead) are absent in the studied area, Taiwan, when typhoons are distant. In this paper, we propose a long-distance total rainfall forecast (LTRF) model and present a real-time forecast process using the LTRF model for the formation and possible approach of typhoons in the future.

2. Expected Results/ Conclusion/ Contribution

The typhoon events occurring during 2001–2013 and 2014–2015 (Typhoons Matmo and Fung-Wong in 2014 and Soudelor and Dujuan in 2015) were collected for training and testing, respectively. The Hualien Weather Station, located in Eastern Taiwan, was selected as a study site. The forecasting horizon was 6 hours. This study compared the model simulations, observations, and Central Weather Bureau (Taiwan) nowcasts. The simulation results showed that the proposed LTRF model, considering ENSO effects, can efficiently forecast the total typhoon rainfall when typhoons are far away from Taiwan.

Keywords: Typhoon, Rainfall, Nowcast, ENSO, Taiwan

Solar Photocatalysis of 4-Chlorophenol Wastewater using Partial Shell-Core Ag/P3HT@TiO$_2$ Nanocatalysts

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1.   Background/ Objectives and Goals

Solar photocatalysis using TiO$_2$ as catalyst has been used as an economically viable process and has attracted great interest in the past twenty years. However, due to the intrinsic structure characteristics and broad band gap (3.2 eV for anatase) of TiO$_2$, TiO$_2$ can only be excited by ultraviolet light (<387nm) (which is less than 5% in solar light) to produce photoinduced hole-electron pairs and the inherent recombination of photo-generated electron-hole pairs, resulting in a low utilization of solar energy and photocatalytic activity. To eliminate these drawbacks of TiO$_2$, dye-sensitized photocatalytic materials exhibit high efficiency in degradation of organic pollutants and utilization of visible light has been hybridized with TiO$_2$. Poly(3-hexylthiophene) (P3HT) with a bandgap of 1.9-2.0 eV is an organic semiconductor with the property of dye sensitizer. It has high charge carrier mobility, dissolubility and process ability, long-term stability and a broad and strong absorption in visible region with $\lambda < 650$ nm. Moreover, noble metal such as Ag could be doped onto TiO$_2$ to reduce the recombination of photoinduced hole-electron pairs by means of electron (CB) shift. In this study, a novel prepared technique was developed to prepare a partial shell-core Ag/P3HT@TiO$_2$ nanoparticles to overcome the drawback of TiO$_2$. The enhanced photocatalytic activity of partial shell-core Ag/P3HT@TiO$_2$ was investigated by degrading 4-chlorophenol wastewater under solar irradiation.

2.   Expected Results/ Conclusion/ Contribution

The images of SEM showed the particle size of partial shell-core Ag/P3HT@TiO$_2$ and TiO$_2$ nanoparticles with a similar range of 12 - 20 nm. The analysis of SEM/EDS showed that the presence of Ag and P3HT were partially covered onto the surface of TiO$_2$ and the existence of Ag, S, O, and Ti element with a desired content existed in the partial shell-core Ag/P3HT@TiO$_2$ nanoparticles. Moreover, the results of XRD indicated the crystal pattern of TiO$_2$ still presented mainly anatase form in the partial shell-core Ag/P3HT@TiO$_2$ nanoparticles. The spectrum of UV/VIS DRS illustrated that the partial shell-core Ag/P3HT@TiO$_2$ nanoparticles were much more responsive to visible light than TiO$_2$, indicating that TiO$_2$ even partially doped with Ag and P3HT could extent the photoresponse region of TiO$_2$. Results showed that the degradation efficiency of 4-CP wastewater increased as the dosage of photocatalyst increased. An appropriate presence of Ag (0.05-0.15%) and P3HT (0.5%) content were beneficial to solar photocatalytic process, in which a 99% degradation efficiency of 4-CP compound and a 92% abs@λ_{max} reduction of wastewater could be achieved within a reaction of 120 min with a dosage of 0.5 g/L photocatalyst. In comparisons, a 24% decrease of the abs@λ_{max} reduction efficiency of 4-CP wastewater would be found as pure TiO$_2$ used in the photocatalytic reaction. Moreover, the pseudo-first-order rate constants of abs@λ_{max} reduction were 0.0192 and 0.0093 min^{-1} for using Ag/P3HT@TiO$_2$ and TiO$_2$ as photocatalyst, respectively. Based on the results obtained in this study, it was revealed that the partial shell-core Ag/P3HT@TiO$_2$ photocatalysts could effectively adsorb and employ solar irradiation for the degradation of 4-CP wastewater.

Keywords: Solar photocatalysis, 4-chlorophenol, partial shell-core Ag/P3HT@TiO$_2$

Utilization of Humidity-Conditioning Mesoporous Molecular Sieve Synthesized from Thin-Film-Transistor Liquid-Crystal-Display Waste Glass

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Abstract

This study characterized the humidity conditioning of Al-MCM-41 mesoporous molecular sieves that were recycled from TFT-LCD waste glass synthesized through alkali fusion and hydrothermal processes. The main constituents of TFT-LCD waste glass were discovered to be SiO_2 and Al_2O_3. When the alkali fusion temperature was 120 ℃, the long-range mesoporous structure was deteriorated. Therefore, crystallization temperature is crucial during template organization and silanol condensation. When the liquid: solid ratio was 5:1, hydrothermal temperature from 90 to 120 ℃ the pore diameters estimated from a BET were approximately 5.08, 3.57 and 3.93 nm, respectively. The liquid: solid ratio of 5:1 resulted in alkali fusion temperatures of 90 ℃, 105 ℃, or 120 ℃, and moisture adsorption content of the synthesized mesoporous molecular sieves were 29.88 g/m^2, 114 g/m^2 and 45.76 g/m^2 met JIS A1470 third grade intensity building materials specifications (moisture adsorption content > 29 g/m^2). Similarly as their commercial counterparts, TFT-LCD waste glass synthesized Al-MCM-41 have the potential to be practically used as humidity-conditioning materials, being useful mainly in adsorption and desorption of moisture technologies applicable in environmental protection.

Keywords: TFT-LCD waste glass, Hydrothermal temperature, Moisture adsorption content, Humidity-conditioning material, Mesoporous molecular sieves

ACEAIT-0070
Eulerian Two-Phase Flow Model for Particle Removal in Ventuti Scrubbers

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1.　　　Background and Objective

Removal of fine dust or particles floating in gas steams are mostly interested in environmental and power plant industries. Among the particle removal methods, venturi scrubbers have been extensively used which utilize a mechanism of impaction due to velocity difference between the particle and the droplets atomized from the external water entering the venturi throat through holes. Theoretical works range from semi-empirical or integrated homogeneous one-dimensional fluid equations to multi-dimensional models. The first two methods have limitations in that relative velocities are unrealistically assumed constant along the flow channel. On the other hand, the multi-dimensional models lack experimental data to validate the local conditions. The purpose of this paper is thus to overcome these limitations of the previous methods by formulating Eulerian two-phase gas and water droplet models coupled with the particle impaction mechanism already known. Integrations of the equations are performed from the venturi scrubber throat inlet to the outlet considering velocity and pressure variations along the throat. This method is benchmarked against existing laboratory-scale data and three one-dimensional integrated models and a two-dimensional computation.

2.　　　Results and Conclusion

Firstly, particle removal efficiencies from the present method are compared with Brink and Contant's data according to the particle size for liquid-to-gas flow ratios of 0.00144 and 0.00173 and the gas velocity of 66.5 m/sec. Secondly, we used the Calvert's data according to gas velocity for 1 micron particle with the liquid-to-gas flow ratio used as a parameter. Finally, a comparison is made with two-dimensional computation of Ananthanarayanan and Viswanathan according to gas velocity for the liquid-to-gas flow ratio of 0.0012 and particle diameter of 5 micron. For the Brink and Contant's data for the liquid-to-gas flow ratio of 0.00144 and the gas velocity is 66.5 m/s, present computations show relatively reasonable agreement. For the particle size below 0.6 micron, the present method displays the best agreement with the data but for the particles over the size the present method is rather overestimate but close to the results from the Yung's and Calvert's integrated models. For the liquid-to-gas flow ratio of 0.00173, the present method results in the better agreement than the models of Yung's, Calvert's and Boll's, even better than the two-dimension model. For the Calvert data according to gas velocity for one-micron particle with the liquid-to-gas flow ratio used as a parameter (0.00267, 0.00401 and 0.00669), the present method follows the data trend in much better way than the Yung's model. Also, the computation according to gas velocity for the liquid-to-gas flow ratio of 0.0012 and particle diameter of five micron shows that the particle removal efficiency from the present method is in best agreement with the data compared with the results from Yung's model and the two-dimensional computation. In conclusion, an Eulerian two-phase flow model is established for the prediction of the particle removal efficiency of venturi scrubbers and it is found that the prediction performance of the present method is improved over existing integrated homogeneous one-dimensional equations and a two-dimensional model. We can thus state that the present method is more promising for industrial applications when more extensive validations are performed in the future.

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Bidirectional Gate Driver Circuit with High Driving Capability for High-resolution Liquid-Crystal Displays

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Abstract

This work presents a hydrogenated amorphous silicon (a-Si:H) bidirectional gate driver circuit for high-resolution displays. The proposed circuit increases the gate voltage of the driving TFT to enhance its driving capability, so the rising time and falling time of the output waveform are shortened. According to the simulation results, the gate voltage of the driving TFT are increased to 17 V and 38.88 V before the output node starts to be charged and discharged, and the rising and falling time of the output waveform are 2.91 μs and 1.89 μs, respectively.

Keywords: Hydrogenated amorphous silicon (a-Si:H), gate driver circuit, high-resolution displays, rising time, falling time.