

CONFERENCE PROCEEDINGS



Scientific and Technical Research Association

**ICRST (2018) XIth International Conference on Researches in
Science & Technology, 13-14 July 2018, Bangkok, Thailand**

13-14 July 2018

Conference Venue

KU Home, Kasetsart University, Chatuchak, Bangkok, Thailand

KEYNOTE SPEAKER



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Joseph U. Almazan is currently working as Assistant Professor, Nursing Department, College of Applied Medical Sciences, Saudi Arabia where he teaches nursing courses. He participated in various international research presentations, serves as a reviewer for several journals and publishes in ISI journals. He also a member of several international organizations. His research interests in nursing are in the areas of geriatrics and gerontology nursing, older adults care, clinical health and community health.



Ir. Sri Darwati
GICICRST1808051

Developing Of Performance Testing Scheme For Decentralized Domestic Wastewater Treatment Plant In Indonesia

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Abstract

Most of the urban and rural areas in Indonesia still use individual scale of decentralized on-site domestic waste water treatment such as pit latrines and septic tank. For some building and small community using communal scale of waste water treatment plant such as fabricated biofilter tank, UASB (up flow anaerobic sludge blanket) , Rotating Biological Contactor (RBC) and wetland . Many application of the decentralized waste water treatment plants (WWTP) have low performance and the effluent doesn't meet effluent standard. To ensure the compliance to the regulation, it is necessary to develop the performance testing scheme for decentralized domestic wastewater treatment plant. The objective of the study is to review performance testing scheme in Indonesia, include the legal aspects, existing performance testing procedure for inspection and certification. The target is to develop performance testing schemes consists of testing standard and institutions scheme. The methodology of research are primary and secondary data collection done through field observation and discussion in stakeholder meeting with stakeholder related. The data analysis of this study are comparative study of certification system of decentralized WWTP in Japan and Indonesia, descriptive analysis of performance testing method and the role of stakeholders. In conclusion for implementation of testing scheme for decentralized domestic waste water treatment plant, need the regulation for waste water management regarding testing body, the provision of performance testing standard, competent institutions, equipment and human resources.

Keywords

Performance, testing, scheme, decentralized, waste water, treatment, plant

Bipul Sarma
GICICRST1808054

Some Sequences of Fuzzy Real Numbers under an Orlicz Function

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Abstract

In this article we introduce some I-convergent difference sequence spaces of fuzzy real numbers defined by Orlicz function and study their different properties like completeness, solidity, symmetricity etc. The notion of fuzzy sets was introduced by Zadeh [16]. After that many authors have studied and generalized this notion in many ways An Orlicz function is a function $M: [0, \infty) \rightarrow [0, \infty)$, which is continuous, non-decreasing and convex with $M(0) = 0, M(x) > 0$ for $x > 0$ and $M(x) \rightarrow \infty$ as $x \rightarrow \infty$. Let X be a non-empty set, then a non-void class $\mathcal{I} \subseteq 2^X$ (power set of X) is called an ideal if \mathcal{I} is additive (i.e. $A, B \in \mathcal{I} \Rightarrow A \cup B \in \mathcal{I}$) and hereditary We introduce the following classes of sequences:
 $(cI)F(M, \Delta) =$
 $(,)$


	<p> $(\cdot) : : \varepsilon$, for k some > 0 and (\cdot) k $d \ X \ L$ $X \ k \ M \ r \ L \ R \ I \ I$ r $\text{---} \ D \ \text{---}$ $\text{---} \ ^3 \hat{I} \hat{I}$ --- 0 $(\cdot, 0)$ $(I)F(\cdot, \cdot) : : k \ \varepsilon$, for some > 0 k $d \ X$ $c \ M \ X \ k \ M \ r \ I$ r $\text{---} \ D \ \text{---}$ $D = \text{---} \ ^3 \hat{I}$ --- Also we define $(mI)F(M, \Delta) = (cI)F(M, \Delta) \ \zeta \ F(\cdot, \cdot) \ M \ \forall \ D, 0 \ (I)F \ m \ (M, \Delta)$ $= 0 \ (I)F \ c \ (M, \Delta) \ \zeta$ $F(\cdot, \cdot) \ M \ \forall \ D$. Various properties of the introduced spaces are studied. </p>
<p>Kulajit Pathak GICICRST1808055</p>	<p>Some specific operators and a poset on BE-algebras</p> <p>Kulajit Pathak Department of Mathematics B. H. College, Howly, Assam, India</p> <p>Abstract Since the introduction of the concepts of BCK and BCI algebras by K. more systems of similar type have been introduced and studied by a number of authors in the last two decades. K. H. Kim and Y. H. Yon studied dual BCK algebra and M.V. algebra in 2007. H. S. Kim and Y. H. Kim in 2006 have introduced the concept of BE-algebra as a generalization of dual BCK-algebra. Here we want to introduce some specific operators and their properties and a poset on BE-algebras. Key words: BCK-algebra, BCI-algebra, BE-algebra, M.V. algebra, Operator.</p>
<p>Fitrijani Anggraini GICICRST1808057</p>	<p>Improved Effectiveness Of Community-Based For Waste Water Recycling</p> <p>Fitrijani Anggraini Research Institute For Human Settlement And Housing, Ministry Of Public Works And Housing Indonesia</p> <p>Elis Hastuti Research Institute For Human Settlement And Housing, Ministry Of Public Works And Housing Indonesia</p> <p>Sri Darwati Research Institute For Human Settlement And Housing, Ministry Of Public Works And Housing Indonesia</p> <p>Abstract Development of wastewater treatment facilities recycling has a target of providing wastewater treatment is not only to produce treated water that is safe discharged into water bodies, but also can be used again. In this paper are described aspects that influence the effectiveness of waste water recycling based on community, include health factors, technical factors, guidance for technology selection process waste water recycling, public motivational and perceptions. Data collection (primary and secondary data) and data analysis</p>


	<p>(qualitative and quantitative) research studies conducted through the application of technology Wastewater Treatment Plant (WWTP) based communal recycling, motivation and community acceptance of using the recycled water. Effectiveness of communal based water recycling among others influenced by the performance of water treatment related to aspects of health and the achievement of recycled water quality and public- acceptance. There are some constraints of communal wastewater recycling, includes the understanding the maintenance procedure, public participation and environmental conditions. Achievement of the effectiveness of community based recycling show can meet the needs of non-potable water approximately 50-65% of clean water needs by achieving quality treated water suitable recycling standards BOD <10-30 mg / L, COD 40-80 mg / L, turbidity 2-9 NTU, TSS 30 mg/ L, E Coli 200/100 ml. The sustainability of the system in addition to improving the quality of water bodies can also be used as an alternative source of water to meet the needs of the common household or urban.</p> <p>Keywords: effectiveness, technology, reuse, wastewater and community</p>
<p style="text-align: center;">Triana Yunita GICICRST1808058</p>	<p style="text-align: center;">Effect of Addition Tahongai Leaf Extract (<i>Kleinhovia hospita</i> Linn.) As Organic Inhibitor on 1040 AISI Steel</p> <p style="text-align: center;">Triana Yunita Materials and Metallurgy Study Program, Kalimantan Institute of Technology ITK Karang Joang, Balikpapan 76127, Indonesia</p> <p style="text-align: center;">Sari Eli Novita Materials and Metallurgy Study Program, Kalimantan Institute of Technology ITK Karang Joang, Balikpapan 76127, Indonesia</p> <p style="text-align: center;">Sulistijono Materials and Metallurgy Study Program, Kalimantan Institute of Technology ITK Karang Joang, Balikpapan 76127, Indonesia</p> <p style="text-align: center;">Abstract</p> <p>This research will study about corrosion inhibition by using Tahongai leaf extract (<i>Kleinhovia hospita</i> Linn.) (<i>Kleinhovia hospita</i> Linn.) In a 3.5% NaCl environment. The inhibitor is extracted using maceration process from Tahongai leaf (<i>Kleinhovia hospita</i> Linn.). Testing of antioxidant activity by whitewater (2009) using DPPH method gives result that antioxidant activity of Tahongai leaf extract (<i>Kleinhovia hospita</i> Linn.) Is strong antioxidant (96%) compared to vitamin C (98), functional group test by FTIR method indicates that Contained in Tahongai leaf extract (<i>Kleinhovia hospita</i> Linn.) Is flavonoid shown by O-H bond (3357,41 cm⁻¹), double bond C = C (1643,36 cm⁻¹), C-H bond (2922,24) Cm⁻¹, 1460,69 cm⁻¹, 1375,57 cm⁻¹, Efficiency of inhibition reach 99.9825% for addition of inhibitor with concentration 200 ppm and duration of soaking 20 days. This inhibitory behavior is also supported by polarization measurements where the lowest corrosion rate of 8.3x10⁻⁴ mm / year is obtained at the same concentration and immersion time.</p> <p>Keywords: Antioxidant, Organic Inhibitor, Tahongai Leaf (<i>Kleinhovia hospita</i> Linn.)</p>
<p style="text-align: center;">Lawal Nura GICICRST1808059</p>	<p style="text-align: center;">Effect Of Antioxidant-Rich Nutraceutical On Serum Glucose, Lipid Profile And Oxidative Stress Markers Of Salt-Induced Metabolic Syndrome In Rats</p> <p style="text-align: center;">N.Lawal Department Of Biochemistry & Molecular Biology Federal University Dutsinma, Katsina State, Nigeria</p> <p style="text-align: center;">Ls.Bilbis</p>

	<p>Department Of Biochemistry, Usmanu Danfodiyo University, Sokoto Nigeria</p> <p>Ra.Umar Department Of Biochemistry, Usmanu Danfodiyo University, Sokoto Nigeria</p> <p>Aa.Sabir Department Of Medicine, Usmanu Danfodiyo University Teaching Hospital, Sokoto Nigeria</p> <p>Abstract Metabolic syndrome (MS) a high risk condition involving obesity, dyslipidemia, hypertension and diabetes mellitus is prevalent in Nigeria. The study aim to formulate an antioxidant rich nutraceutical from locally available foodstuff (onion, garlic, ginger, tomato, lemon, palm oil, water melon seeds) and investigate their effects on blood pressure, body weight, serum glucose, lipid profile, insulin and oxidative stress markers in salt-induced rats. The rats were placed on 8% salt diet for 6 weeks and then supplementation and treatment with nutraceutical and nifedipine in the presence of salt diet for additional 4 weeks. Feeding rats with salt diet for 6 weeks increased blood pressure and body weight of the salt-loaded rats relative to control. Significant ($P<0.001$) increase in serum blood glucose and lipid profile, and decrease in high density lipoprotein-cholesterol (HDL-C) was observed in salt-loaded rats as compared with control. Both supplementation and treatment (nifedipine) lowered the blood pressure but only supplementation lowered the body weight. Supplementation with nutraceutical resulted in significant ($P<0.001$) decrease in the serum blood glucose, lipid profile, malonyldialdehyde (MDA), insulin levels, insulin resistance, and increased HDL-C and antioxidant indices. The percentage protection against atherogenesis was $76.5\pm 2.13\%$. There is strong positive correlation between blood pressure, body weight and serum blood glucose, lipid profile, markers of oxidative stress and strong negative correlation with HDL-C and antioxidant status. The results suggest that the nutraceuticals are useful in reversing most of the component of metabolic syndrome and might be beneficial in the treatment of patients with metabolic syndrome. Keywords: Metabolic syndrome, obesity, dyslipidemia, hypertension and nutraceutical.</p>
 <p>Isa Azare Magaji GICICRST1808060</p>	<p>Challenges Associated with Continues Destruction of Urban Public Spaces in Nigeria: A Review</p> <p>Isa Azare Magaji Department of Environmental Science, Federal University, Dutse, Jigawa State, Nigeria.</p> <p>Abstract Urban public spaces constitute a major environmental resource of an urban landscape. They are great public spaces serving as the living room of the city where people inhabit. It is the platform that makes high quality life in the city and its suburb possible by accommodating array of public spaces that range from grand central plazas, squares and other critical infrastructure, to small, local neighborhood parks. Combinations which create beautiful scenario with great and pleasant atmosphere to live and express life of rich tradition or culture and act as a setting for a good landscape. However, urban public spaces in Nigeria are depleting at an alarming rate. The urban public spaces are particularly vulnerable in that they are immobile and infrastructure such as bridges, buildings, roads, monuments which are critical attributes of urban places are becoming liabilities due to local ecosystems that they are based on are unable to adapt to the climate-induced changes. This paper sought to give a broad discussion on environmental challenges due to continues destruction of urban public spaces in Nigeria. The</p>

	<p>paper adapted the systematic review of relevant literature that focuses on or related to urban public spaces destruction elsewhere. Among the major findings of the paper were that the urban public spaces are influenced by the ecological zones and climate conditions of the areas and the challenges uncovered include: rapid urbanization, low resource base of institutions or authorities, lack of priority and will power to urban public spaces, corruption, uncooperative attitudes of the local people and political instability. To address these challenges, joint and committed efforts by general public, governments, city authorities to preserve these spaces are crucial. Urban public spaces should be treated as among the top priorities of the development agenda of urban planning authorities with the allied agencies managing public spaces well-resourced to go about their activities as expected of them.</p>
<p style="text-align: center;">Tsung-Yu Liu GICICRST1808063</p>	<p style="text-align: center;">The effects of educational games and simulation with multimedia flow design model on students' learning motivation</p> <p style="text-align: center;">Tsung-Yu Liu Dept. of Multimedia and Game Science Lunghwa University of Science and Technology, Taoyuan, Taiwan</p> <p style="text-align: center;">Li-Mei Liu Dept. of Interaction Design National Taipei University of Technology Taipei, Taiwan</p> <p style="text-align: center;">Abstract</p> <p>This study investigated the impact of educational games and simulation with multimedia flow design model on students' learning motivation. A Data Structures curriculum was designed for college students majoring in computer science. Participants included a college teacher, an assistant, and 110 students. Two groups of students participated in the learning activities by using gaming and non-gaming methods separately in the course. During the eight-week course, traditional learning, multimedia-assisted learning, a survey, and interviews were conducted with students. The results demonstrated that, compared to non-gaming methods, incorporating gaming methods in learning can enhance students' learning motivation. The findings implied that three factors of multimedia flow model that could help teachers design effective learning games and activities.</p> <p>Keywords: data structure, educational game, multimedia flow, game-based learning, learning motivation</p>
<p style="text-align: center;">Swe Swe Win GICICRST1808064</p>	<p style="text-align: center;">Intelligent Traffic Control System Using Density Based Estimation Algorithms</p> <p style="text-align: center;">Swe Swe Win Mechatronic Engineering Department, Mandalay Technological University, Myanmar</p> <p style="text-align: center;">Wut Yi Win Mechatronic Engineering Department, Mandalay Technological University, Myanmar</p> <p style="text-align: center;">Abstract</p> <p>The traffic congestion is a daily occurrence problem throughout the world. This intelligent traffic control system (ITCS) intends to work more effectively the traffic control for the four-way intersection. This system is a vehicle-actuated signal type control system such that traffic cycle time can be varied and related to the actual demands by traffic. The real traffic video file at a station in Mandalay is utilized for the experimental test and traffic density area on the road is used as the input data for controller of the system. The density areas on both directions of the analyzed road are calculated by using</p>

	<p>contour and area image processing algorithms. Depending on sum of the amount of density area on both directions, three types of traffic cycle times are determined such as 30 sec, 45 sec and 60 secs etc... This research is desired to improve the system by reducing waste of time based on traffic density area. Keywords: Contour, Moment, Area Calculation Algorithm, Traffic Cycle Time, Density Based Traffic Control System</p>
<p style="text-align: center;">Memeko GICICRST1808065</p>	<p style="text-align: center;">Implementation Of Trajectory Tracking Control Of A Differential Drive Wheeled Mobile Robot</p> <p style="text-align: center;">Memeko Mechatronic Engineering Department, Mandalay Technological University, Myanmar</p> <p style="text-align: center;">Kyawthiha Mechatronic Engineering Department, Mandalay Technological University, Myanmar</p> <p style="text-align: center;">Abstract This paper was the implementation of a mobile robot that can be controlled and driven trajectory tracking as the MATLAB Simulation results. The primary task is to design and motion through the sequences of points to get the necessary trajectory with MATLAB Simulink block. According to the movement timing of the robot, moving forward and trajectory tracking consideration is setup based on the difference of current and torque. The performance of robot path travelled is recorded and implemented using time delay for each steps and PWM (pulse width modulation). These values are sent to PIC16F887 microcontroller and reading data are used as input of motor driver. 12V power supply is applied to drive the motor driver. Left and right DC motors encoders are read and run with motor driver. And then, mobile robot tracks the straight line, go to point, circle and ellipse shape trajectory as the MATLAB Simulation data in real world with less error. Fuzzy logic controller is used to certain the trajectory tracking control system. Keywords: Trajectory Tracking, MATLAB Simulation, PWM (Pulse Width Modulation), PIC16F887, DC Motors</p>
<p style="text-align: center;">Swe Swe Win GICICRST1808066</p>	<p style="text-align: center;">Intelligent Traffic Control System Using Density Based Estimation Algorithms</p> <p style="text-align: center;">Swe Swe Win Mechatronic Engineering Department, Mandalay Technological University, Myanmar</p> <p style="text-align: center;">Wut Yi Win Mechatronic Engineering Department, Mandalay Technological University, Myanmar</p> <p style="text-align: center;">Abstract The traffic congestion is a daily occurrence problem throughout the world. This intelligent traffic control system (ITCS) intends to work more effectively the traffic control for the four-way intersection. This system is a vehicle-actuated signal type control system such that traffic cycle time can be varied and related to the actual demands by traffic. The real traffic video file at a station in Mandalay is utilized for the experimental test and traffic density area on the road is used as the input data for controller of the system. The density areas on both directions of the analyzed road are calculated by using contour and area image processing algorithms. Depending on sum of the amount of density area on both directions, three types of traffic cycle times are determined such as 30 sec, 45 sec and 60 secs etc... This research is desired to improve the system by reducing waste of time based on traffic density area.</p>

	<p>Keywords: Contour, Moment, Area Calculation Algorithm, Traffic Cycle Time, Density Based Traffic Control System</p>
<p>Ma. Kathrina M. Pobre GICICRST1808067</p>	<p style="text-align: center;">Identification Of Actin And Beta-Tubulin Housekeeping Genes In The Moringa Oleifera Lam. Leaves</p> <p style="text-align: center;">Jessica G. Asuncion Graduate School, Ateneo De Manila University, School Of Science And Engineering, Department Of Biology, Loyola Schools, Quezon City 1108, Philippines</p> <p style="text-align: center;">Ma. Kathrina M. Pobre Graduate School, Ateneo De Manila University, School Of Science And Engineering, Department Of Biology, Loyola Schools, Quezon City 1108, Philippines</p> <p style="text-align: center;">Vivian A. Panes, Ph.D Assistant Professor, Research Group Head, Ateneo De Manila University, School Of Science And Engineering, Department Of Biology, Loyola Schools, Quezon City 1108, Philippines</p> <p style="text-align: center;">Abstract</p> <p>Moringa oleifera is a high valued plant. Its multi - purpose uses and numerous health benefits have attracted the attention of farmers and researchers since time immemorial. However, there are limited studies and information about its genome. Thus, the study was conducted to extract, amplify and sequence the actin and beta - tubulin housekeeping genes from M. oleifera leaf. DNA was extracted using the DNAzol plant DNA extraction kit. Then, DNA quantity and quality was checked using spectrophotometry. The housekeeping genes were amplified using PCR. PCR products were run in agarose gel electrophoresis. Results revealed that beta-tubulin gene size is 275bp while actin is 79bp. The consensus sequence and phylogenetic analysis using Chromas and Bioedit, and NCBI BLAST and MEGA respectively showed that beta tubulin housekeeping gene from M. oleifera is closely related to the same housekeeping gene from Cucumis sativus and Cucurbita maxima having a bootstrap value of 56. Based on their taxonomic details, M. oleifera, C. sativus and C. maxima are species all belonging to the same subclass Dileniidae. The sequence analysis has proven that the housekeeping gene isolated from M. oleifera is indeed a beta tubulin gene. Our results will provide a valuable reference for future studies on extraction, amplification and sequence analysis of important functional genes.</p> <p>Keywords: Moringa oleifera, housekeeping genes, beta-tubulin, actin</p>
 <p style="text-align: center;">Rose Dewi GICICRST1808068</p>	<p style="text-align: center;">Tropic Status Assesment in Segara Anakan Lagoon, Indonesia : Experience in Applying the Trophic Index Trix</p> <p style="text-align: center;">Rose Dewi Doctoral Program of Coastal Resources Management, Department of Fisheries and Marine Science, Diponegoro University. Indonesia Department of Fisheries and Marine Sciences, Jenderal Soedirman University. Indonesia</p> <p style="text-align: center;">Muhammad Zainuri Departement of Oceanography, Fisheries and Marine Science Department, Diponegoro University</p> <p style="text-align: center;">Sutrisno Anggoro Coastal Resources Management Doctoral Program, Fisheries and Marine Science Department, Diponegoro University</p> <p style="text-align: center;">Tjahjo Winanto</p>

	<p>Fisheries and Marine Science Department, Jenderal Soedirman University</p> <p>Hadi Endrawati Fisheries and Marine Science Department, Diponegoro University</p> <p>Abstract</p> <p>Segara Anakan is a large lagoon, located along the southern coast on western part of Central Java, Indonesia 108°46'–109 ° 05'E; 7 ° 34'–7 ° 48'S. It has an important ecosystem role as a nursery ground, so that it is important to have further study of the primary productivity. The human activities around the area and natural factors sedimentation has changed the inrush input to the lagoon. Feared, it will influence the change in tropic status of the lagoon, and will cause the average degradation of the primary productivity value. The aim of the research is to explore the study of the primary productivity in Segara Anakan lagoon (SAL) with tropic status assesment. Index TRIX has been used for evaluating long-term trend and spatial trophic pattern in the lagoon with linear combination of the log of 4 state variables: chlorophyll-a, aD%O, macronutrient : Total Nitrogen (TN) and Total phospat (TP). The main objective of this study is to estimating tropic status with spatio-temporal approach. The spatial approach is done on 7 stations (S) with representations: (S) natural factors and (S) the presence of anthropogenic activities. The temporal approach (time series) for a year refers to the monsoon wind pattern (west, transition I, east and transition II) season. The results of laboratory tests are discussed descriptively. Index TRIX assesment in SAL shows that point values, exceeding 6 TRIX units are typical of highly productive coastal waters, where the effects of eutrophication determine frequent episodes of anoxia in bottom waters and indicated by high Habs phytoplankton. The effects of highest rainfall at transition II season, anthropogenic pressure, aquatic hydrodynamics are thought to cause in the increasing of SAL macronutrients which trigger eutrophication of waters. Management and lagoon management strategies are required by the local government, stakeholders and communities to prevent the phenomenon of eutrophication of the lagoon.</p> <p>Keywords : Segara Anakan Lagoon, Macronutrient, Tropic Status Assesment, Index TRIX</p>
 <p>Dian Windy Dwiasi GICICRST1808069</p>	<p>Intercalation Of Benzoate Anion Into The Mg-Al LDH Interlayer Gallery And Its Application As An Amoxicillin Adsorbent</p> <p>Dian Windy Dwiasi Department Of Chemistry, Faculty Of Mathematics Natural Sciences University of jenderal soedirman, Indonesia University of gadjah mada, Indonesia</p> <p>Mudasir Department Of Chemistry, Faculty Of Mathematics Natural Sciences University of gadjah mada, Indonesia</p> <p>Roto Postgraduated Program Of Chemistry, Chemistry Department Faculty Of Mathematics Natural Sciences, University Of Gadjah Mada Sekip Utara Yogyakarta 55281 Indonesia</p> <p>Abstract</p> <p>Hydrotalcite is generally used as a host structure for several anions. In this study, benzoate anion were intercalated in the interlayer gallery of a layered double hydroxide Mg-Al-NO₃. The intercalation was performed using coprecipitation method followed by hydrothermal treatment at 120 °C for 20 hours. This intercalation was based on anion exchange between interlayer anions (NO₃-) and benzoate anion. The intercalation compounds obtained</p>


	<p>have been characterized by X-ray powder diffraction, FT-IR absorption spectroscopy techniques, and thermogravimetric analysis. After intercalation, there was a basal spacing shift where the Mg-Al-NO₃ hydrotalcite had a d₀₀₃ of 8.90 Å while Mg-Al-benzoate had d₀₀₃ of 17.28 Å. The FTIR spectra for Mg-Al-benzoate exhibited the characteristic bands at 1597.06 cm⁻¹ and 1543.05 cm⁻¹ which were vibrant benzene frameworks. Adsorption of amoxicillin is using batch method. A batch method was used to evaluate the effects of pH, contact time, sorbent amount, and concentration on the adsorption. The kinetics of adsorption follows pseudo order 2. Keywords : hydrotalcite, layered double hydroxide, intercalation, organic anions, coprecipitation, hydrothermal</p>
<p style="text-align: center;">Iis Sopyan GICICRST1808070</p>	<p style="text-align: center;">Injectable Calcium Phosphate/Polymer Composite For Bone Filler Applications</p> <p style="text-align: center;">Sufiamie Hablee Department Of Manufacturing And Materials Engineering, Kulliyyah Of Engineering, International Islamic University Malaysia, P.O. Box 10, 50728 Kuala Lumpur, Malaysia.</p> <p style="text-align: center;">Iis Sopyan Department Of Manufacturing And Materials Engineering, Kulliyyah Of Engineering, International Islamic University Malaysia, P.O. Box 10, 50728 Kuala Lumpur, Malaysia.</p> <p style="text-align: center;">Abstract</p> <p>The recently rising interest in developing injectable calcium phosphate cement (CPC) using micro-invasive bone grafting is to fulfill the increasing demand of bone substitute material. The micro-invasive bone grafting technique demanded for injectable materials with setting ability within body temperature. Incorporation of polymer to calcium phosphate is one of the attracting approaches to enhance the properties of CPC relevant for its clinical use. Polymeric additives were added to produce CPC with enhanced physicochemical and mechanical properties, including setting time, injectability, antiwashout, strength and toughness. The addition of polymers is also expected to enhance the biological response of the fabricated CPC. The incorporation of polymers into CPC can be done either in the liquid phase or solid phase, which will produce end products of different structures. The development of calcium phosphate/polymer composites has led to vast researches, which involves both natural and synthetic polymers. The aim of this paper is to overview recent development of injectable calcium phosphate/polymer composites for bone substitute materials. Keywords: bone cement, calcium phosphate, physical properties, polymeric additives, improved performance</p>
<p style="text-align: center;">Miftahil Mawaddah GICICRST1808072</p>	<p style="text-align: center;">(Invasion Of Saturated Vapor Coconut Shell) The Transition Obat Merah To Liquid Smoke Coconut Shell As Solutions In The Treatment Of Wound Outside</p> <p style="text-align: center;">Miftahil Mawaddah Departement of Chemical Engineering, Islamic University of Indonesia, Yogyakarta, Indonesia</p> <p style="text-align: center;">Abstract</p> <p>The area of coconut plantation in Indonesia in 2000 reached 3.76 million ha with total production estimated at 14 billion coconut per year. Coconut shell is a waste generated from the use of coconut itself. Utilization of liquid smoke coconut shell that is not widely known by the public is the content of phenols that can inhibit the growth of bacteria / fungi and can be used in the treatment of external injury. Liquid Smoke is obtained from pyrolysis of coconut shell after heating at temperature variation 300°C, 400°C and 500°C.</p>


	<p>The result of liquid smoke from pyrolysis is then purified by distillation method with temperature variation 80-100 and 100-110°C for each pyrolysis temperature. After obtaining pure liquid smoke was tested using GC-MS, antibacterial test between liquid smoke and red medicine using Staphylococcus aureus bacteria by diffusion method. It is known from the optimum GC-MS phenol results at 400°C pyrolysis temperature with distillation temperature 100-110 and its content of 13.55%. In antibacterial tests known antibiotic efficacy associated with growth inhibition zone, the larger the diameter, the greater the potential of the antibiotic sample. The widest diameter of 15.6 mm contained at 400°C pyrolysis temperature with distillation temperature 100-110°C while on the red diameter of smaller diameter of 10.0 mm. The results showed that the content of phenol in liquid smoke from coconut shells acts as a substitute for the use of red medication, because of its high antimicrobial potential associated with the treatment of infectious diseases such as blisters and ulcers. This is an alternative solution that is easy to manufacture and does not cost a lot.</p> <p>Keywords: liquid smoke, pyrolysis, distillation, GC-MS, Staphylococcus aureus</p>
<p>Muhammad Abu Dzar Al Ghifari GICICRST1808073</p>	<p style="text-align: center;">(Invasion Of Saturated Vapor Coconut Shell) The Transition Obat Merah To Liquid Smoke Coconut Shell As Solutions In The Treatment Of Wound Outside</p> <p style="text-align: center;">Lilis Kistriyani Department of Chemical Engineering, Islamic University of Indonesia</p> <p style="text-align: center;">Miftahil Mawaddah Department of Chemical Engineering, Islamic University of Indonesia</p> <p style="text-align: center;">Muhammad Abu Dzar Al Ghifari Department of Chemical Engineering, Islamic University of Indonesia</p> <p style="text-align: center;">Yolla Dwita Sari Department of Chemical Analyst, Islamic University of Indonesia</p> <p style="text-align: center;">Abstract</p> <p>The area of coconut plantation in Indonesia in 2000 reached 3.76 million ha with total production estimated at 14 billion coconut per year. Coconut shell is a waste generated from the use of coconut itself. Utilization of liquid smoke coconut shell that is not widely known by the public is the content of phenols that can inhibit the growth of bacteria / fungi and can be used in the treatment of external injury. Liquid Smoke is obtained from pyrolysis of coconut shell after heating at temperature variation 300oC, 400oC and 500oC. The result of liquid smoke from pyrolysis is then purified by distillation method with temperature variation 80-100 and 100-110oC for each pyrolysis temperature. After obtaining pure liquid smoke was tested using GC-MS, antibacterial test between liquid smoke and red medicine using Staphylococcus aureus bacteria by diffusion method. It is known from the optimum GC-MS phenol results at 400oC pyrolysis temperature with distillation temperature 100-110 and its content of 13.55%. In antibacterial tests known antibiotic efficacy associated with growth inhibition zone, the larger the diameter, the greater the potential of the antibiotic sample. The widest diameter of 15.6 mm contained at 400oC pyrolysis temperature with distillation temperature 100-110oC while on the red diameter of smaller diameter of 10.0 mm. The results showed that the content of phenol in liquid smoke from coconut shells acts as a substitute for the use of red medication, because of its high antimicrobial potential associated with the treatment of infectious diseases such as blisters and ulcers. This is an alternative solution that is easy to manufacture and does not cost a lot.</p>

	<p>Keywords: liquid smoke, pyrolysis, distillation, GC-MS, Staphylococcus aureus</p>
<p>Farras Adam Pramudy GICICRST1808074</p>	<p style="text-align: center;">Hidaro (Hindari Asap Rokok) Gel Based Pregnance Glycoside To Adsorb Cigarette Smoke In The Room</p> <p style="text-align: center;">Lilis Kistriyani Department Of Chemical Engineering, Islamic University Of Indonesia</p> <p style="text-align: center;">Farras Adam Pramudy Department Of Chemical Engineering, Islamic University Of Indonesia</p> <p style="text-align: center;">Taufik Akfa Department Of Chemical Engineering, Islamic University Of Indonesia</p> <p style="text-align: center;">Abstract Pollution from cigarette smoke is a problem that has not found the solution until now. Data from the Ministry of Health of the Republic of Indonesia increase in the prevalence of smokers from 27% in 1995, increasing to 36.3% in 2013. Sansevieria trifasciata is a type of ornamental plant that is widely developed by the people of Indonesia. This plant has an active pregnance glycoside which can reduce the pollutant to amino acid, sugar and organic acid. The general objective of this research make use of pregnance glycoside active compound for the material of air gel filter that has the ability to absorb pollutants in a room. The research methodology was done by sansiviera trifasciata leaf extraction method which made gel product. The result showed that with the time of 1 hour absorption concentration 5/300 g / ml obtained release of CO to 10,1492% and H2 to 7,1563%, and with concentration 10/300 g / ml obtained release CO to 6,541% and H2 of 4.512%. Water Holding Capacity Test (WHC) obtained percentage ranged from 79 to 81.2%, The result of total plate numbers was obtained that is 4,7 x 10³. The diffusivity value of gel with a concentration of 5/300 g / ml ranged from 1,0580 x10⁻¹¹ – 1,0941 x 10⁻¹² m²/s and the gel concentration of 10/300 g / ml obtained the diffusivity value of 2 x 10⁻¹¹ – 3 x 10⁻¹¹ m² /s. The greater the concentration of leaf sansiviera trifasciata the more pollutants are absorbed. At room temperature, gel resistance ranges from 1-1.5 months. The result of total plate numbers indicate that the number of bacteria is still in good category. As well as The greater the concentration of leaf sansiviera trifasciata the more pollutants are diffused into the gel.</p> <p>Keywords: Sansiviera trifasciata, gel, pregnane glikoside, concentration</p>
<p>Siddhi Sreemahadevan GICICRST1808075</p>	<p style="text-align: center;">Techno-economic analysis of industrial scale ethanol production process from rice straw employing fungal pretreatment and modified oscillatory baffled reactor</p> <p style="text-align: center;">Siddhi Sreemahadevan Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology Delhi, Hauz Khas, New Delhi, India 110016.</p> <p style="text-align: center;">Shaikh Ziauddin Ahammad Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology Delhi, Hauz Khas, New Delhi, India 110016.</p> <p style="text-align: center;">Abstract Energy data for process technologies are available only for laboratory scale ethanol production. Also, the best energy efficient process need not have the least production costs. Therefore, energy and cost analysis need to be done simultaneously for deriving the best possible process. Production costs can be assessed and reduced by adopting techno-economic models, while developing the research for an ethanol production process. The objective of this study is to perform techno-economic analysis of an industrial scale ethanol production</p>

	<p>plant of capacity 1 tonne rice straw/day employing fungal pretreatment and modified oscillatory baffled reactor.</p> <p>The experimental data of the lab scale process of capacity 120 g rice straw (5 L) was considered for the analysis where, following fungal pretreatment and enzymatic hydrolysis of rice straw, the hydrolysate was subjected to co-fermentation in modified oscillatory baffled reactor. Process simulation as well as material and energy balances of the industrial scale process were obtained from the software Aspen Plus (v8.6). Techno economic and energy analysis of the process was carried out for four scenarios in Aspen Process Economic Analyser (v8.0). The results were compared and profit analysis was carried out.</p> <p>The results suggest that the total production costs can be reduced if lignin wastes are sold directly or after transformation to value added products. Also, the raw material costs can be reduced if in-house production of cellulase enzymes is adopted. Profit analysis by modified internal rate of return indicated that the designed plant is profitable from the year of implementation, when the selling price of ethanol is 0.62 \$/L. However, by the analysis of net present value, the plant turns profitable after 10 years of operation. Therefore, approximation of plant production costs from linear scale up of pilot scale process reactions is much more realistic than direct linear scale up from lab scale experiments.</p> <p>Keywords Ethanol; Techno-economic analysis; Industrial scale; Process simulation; Cost analysis</p>
<p style="text-align: center;">Yicun Pang GICICRST1808052</p>	<p style="text-align: center;">The Pursuit of New Chinese Timber Structure Architecture Technology</p> <p style="text-align: center;">Yicun Pang Architecture, Southeast University, Nanjing, China</p> <p style="text-align: center;">Abstract</p> <p>Ancient Chinese timber structure architecture technology in the past thousands of years has reached the pinnacle of the state, which also had a profound impact on that of other countries in the world. Unfortunately, the sophisticated technology has not been inherited and improved in the development of Chinese modern architecture, while the reinforced concrete construction has become the main body of the city. Nowadays, Chinese timber structure architecture has a chance of recovery under the language environment, in which new technology and conception of timber structure architecture are being popularized on the global stage. People come to realize the characteristics of timberwork building, namely, energy conservation, environmental protection and good seismic performance, which has a great significance for the future construction of sustainable urban environment.</p> <p>The study of new timber structure architecture technology is the excavation and reapplication of Chinese timber structure construction, which has great theoretical and practical value to the development of timberwork in China. The author will discuss the development history of timber structure architecture in China, new materials and timber structure system. A detailed analysis technological achievements and classic case (Zhongjia Ecology Model District of Exhibition Center in Tianjin, 33 Villas of Mangrove Bay in Hainan, etc.) of Chinese new timber structure in the design field will be held in this paper to sum up advantages, development prospects, problems and countermeasures. Domestic land use, construction cost, design and technical issues, functions and protection, and a series of problems and strategies will be deeply analyzed. This paper also discuss the past and present of timberwork in order to enlighten future application fields and technical route of new timber structure architecture in China.</p>
<p style="text-align: center;">Recep Kulcu GICICRST1808056</p>	<p style="text-align: center;">Determination Of The Effects Of Different Packaging Methods And Materials On Storage Time In Dried Apple</p>

	<p style="text-align: center;">Recep Kulcu Suleyman Demirel University, Faculty Of Agriculture Department Of Agricultural Machinery And Technologies Engineering, Turkey</p> <p style="text-align: center;">Abstract</p> <p>The aim of this project was to determine the effects of different packaging materials and packaging methods on changes in product characteristics during the storage period of dry products. In the experiments dried apples were used which were cut into cubes as dry product. In the packaging of dried apples, transparent doypack, metallized doypack, aluminum doypack, transparent plastic and pouch materials are used. Dried products are placed in packing materials using special dosing machines to be 200 g each in each case. While atmospheric and vacuum packaging applications were used as packaging methods, only atmospheric packaging method was used in transparent plastic and pouch paper packages in terms of material properties. A total of 30 samples were prepared from each application. The packaged products were stored in the cabins of the SDU Agricultural Machinery and Technology Engineering Department laboratory. The temperature and humidity values in the cabin are recorded in the storage case. The products were stored for one year and one sample was opened and analyzed every fifteen day during the preservation process. The result of the study is that the vacuum packaging is more successful and the aluminum layer material as the packaging material provides the highest protection. This study was supported by the BAP department of Süleyman Demirel University (Project Number: 4419-M1-15). Keywords: Packing material, packaging methods, dried apple</p>
<p style="text-align: center;">Tadahiro Wada GICICRST1808062</p>	<p style="text-align: center;">Properties Of Tawn And Tan/Tawn Coating Film Deposited On Wc-Co- Based Cemented Carbide Using Magnetron Sputter Ion Plating</p> <p style="text-align: center;">Tadahiro Wada Nara National College Of Technology, Yamatokoriyama, Japan</p> <p style="text-align: center;">Abstract</p> <p>As these difficult-to-cut materials are required to be machined under high efficiency to improve productivity, it is necessary that the tool materials have good wear-resistance. Polycrystalline cubic boron nitride compact (cBN) seems to be an effective tool material. However, in cutting, e. g. turning at a high feed or a large depth of cut, milling, drilling and tapping, a major tool failure of cBN readily occurs by fracture because cBN has poor fracture toughness. In this case, coated cemented carbide tools, which have good fracture toughness and wear resistance, seem to be effective tool materials. Titanium based coating films are generally used as the coating film. However, tantalum based coating films are not applied as the coating film for cutting tools. Moreover, it is unclear whether TaWN coating film can be used as a coating film of WC-Co cemented carbide cutting tools. In this study, to clarify the effectiveness of TaWN and TaN/TaWN coating film, we measured the thickness, hardness and scratch strength (critical load measured by scratch tester) of TaWN and TaN/TaWN coating film formed on the surface of a substrate of cemented carbide ISO K10 by the magnetron sputter ion plating process. The hardened steel AISI D2 (JIS SKD11) was turned with the TaWN and the TaN/TaWN coated cemented carbide tools. The tool wear of the TaWN and TaN/TaWN coated cemented carbide tool was experimentally investigated and compared with that of the TaN coated tool. The following results were obtained: (1) Droplets on the surface of both the TaWN and TaN/TaWN coating film, which has the K10 substrate, were negligible. (2) The TaWN coating film 2340 HV0.25N was slightly less hard than the TaN or TaN/TaWN coating film, and there was little difference in hardness between the TaN 2570 HV0.25N and the TaN/TaWN 2630 HV0.25N. (3) The critical scratch load of both the TaWN and TaN/TaWN coating film was over 130N.</p>

	<p>(4) The mean value of the friction coefficient of the TaN/TaWN coating film, 0.44, was smaller than that of the TaN coating film, 0.53. (5) In cutting the hardened steel using TaN, TaWN and TaN/TaWN coated tools, the wear progress of the TaN/TaWN coated carbide tool was slowest among the three types of coated carbide tools.</p> <p>Keywords Coating technology, Physical vapor deposition coating film (PVD), Tantalum/tungsten-based coating films (TaWN coating film), Hardened steel</p>
 <p>Sakshi Aggarwal GICICRST1808076</p>	<p style="text-align: center;">Truncations in α-mating factor secretion signal to enhance the secretory efficiency of granulocyte colony-stimulating factor in <i>Pichia pastoris</i></p> <p style="text-align: center;">Sakshi Aggarwal Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology Delhi, New Delhi, India</p> <p style="text-align: center;">Saroj Mishra Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology Delhi, New Delhi, India</p> <p style="text-align: center;">Abstract</p> <p>The methylotrophic yeast, <i>Pichia pastoris</i>, has been used effectively as a host for production of bioactive granulocyte colony-stimulating factor (G-CSF) under <i>Saccharomyces cerevisiae</i> derived α-mating factor (MATα) under the control of the Alcohol Oxidase 1 promoter. A maximum of 75 mg/L of the product was detected in the extracellular medium. In the present study, strategy involving truncations in the pro-region of the leader peptide was adopted to boost extracellular levels of G-CSF. Deletion in amino acid residues (MATα:\square57-70, MATα:\square30-43, MATα:\square47-49) and their combinations (MATα:\square57-70,30-43 and MATα:\square57-70,47-49) were carried out by site-directed mutagenesis. All mutants were evaluated for growth and extracellular protein production. It was found that out of a number of deletions, MATα:\square57-70 showed a 5-fold increase in G-CSF secretion, and, about 1.5-fold increase in total extracellular protein levels, as compared to the wild-type construct. The molecular modeling of the mutant α-mating factor signal peptide was carried out and the results indicated that the distortion in the secondary structure favored greater flexibility of the pro-peptide to freely interact with the cargo protein, thereby promoting elevated levels of G-CSF. The present findings raises the possibility to alter these sequences for expression of other heterologous proteins in the <i>P. pastoris</i> system.</p> <p>Keywords: <i>Pichia pastoris</i>; G-CSF production; Site-directed mutagenesis; α-Mating factor</p>
<p>Cho Cho Myint GICICRST1808077</p>	<p style="text-align: center;">Microcontroller- based pH and turbidity measuring system</p> <p style="text-align: center;">Cho Cho Myint Lecturer Department of Natural Science University of Computer Studies (Mandalay) Mandalay Myanmar</p> <p style="text-align: center;">Abstract</p> <p>Introduction: Maintaining and controlling proper pH levels is essential in agricultural, industrial and environmental processes. Several different testing methods are available for measuring pH values. For measurement of the pH level, it is crucial to choose the right pH probe. Turbidity which refers to the degree of clarity can be measured by turbidity meters for the evaluation of the quality of water or the efficiency of a filtration process. Turbidity is an optical characteristic which refers to the degree of clarity of a liquid and measured in NTU, Nephelometric Turbidity Units.</p> <p>Research Objectives: To investigate the water quality of streams and lakes, to measure various pH levels of liquids and to measure different turbidity values</p>

	<p>of liquids.</p> <p>Methodology: The microcontroller based pH level and turbidity measuring system is designed and constructed using a pH probe -KADY pH tester / meter (Model -MT8060), amplifier circuit, turbidity sensor, PIC 16F887 microcontroller circuit, 16 x 2 line LCD module and power supply circuit.</p> <p>Findings and Research outcomes: In pure water, pH reading is 5.5-6.9 and voltage signal is 700-720mV. In coca, pH reading is 2-3 and voltage signal is 620 – 640 mV. In salt water, pH reading is 9-10 and voltage signal is 780-800 mV.</p> <p>When testing the turbidity; in orange, turbidity reading is 300-900 NTU and voltage signal is 1.0V-0.7V. In coca, turbidity reading is 65-80 NTU and voltage signal is 1.4 – 1.58V. In milk, turbidity reading is >4000 and voltage signal is 0-0.1 V.</p> <p>Future scope: The pH sensor circuit, temperature sensor circuit and turbidity sensor circuit will be assembled together with constructed microcontroller circuit. Other quantities of liquid such as conductivity, salinity will be attempted to measure.</p> <p>Keywords: microcontroller-based, pH, turbidity, liquids</p>
 <p>Ni Ni Myint Htun GICICRST1808078</p>	<p style="text-align: center;">Design And Construction Of Fpga Based 16 Channels Logic Analyzer</p> <p style="text-align: center;">Ni Ni Myint Htun Demonstrator Department of Physics University of Medicine (Mandalay) Mandalay Myanmar</p> <p style="text-align: center;">Abstract</p> <p>Introduction : Logic analyzer is an electronic instrument that captures and displays multiple signals from a digital circuit. It may convert the captured data into timing diagrams, protocol decodes, state machine traces and assembly language. The signals enter the various channels and are converted into a high or low state for further processing within the analyzer.</p> <p>Research Objectives: To construct 16 channels logic analyzer by using Field Programmable Gate Array (FPGA) board and other electric components. Then to study digital waveforms of 16 different output signals those are produced from digital circuitry.</p> <p>Methodology : Altera’s Cyclone IV FPGA board will be used as a main control device. 16 channels digital input circuit will be used in conjunction with FPGA board. 16 channel digital output waveforms from FPGA board will be send and display on the PC’s monitor by interface circuit.</p> <p>Findings and Research Outcomes : The circuit boards for the 8 switches, 8 LEDS and two seven-segment displays had been designed and constructed. The final circuit of 8 switches as inputs, 8 LEDS and two seven-segment displays as parallel outputs before connection with PC. After 1-Ph.D research, half of 16 channels switches, also half of 16 LEDs and two seven-segment displays had been made as 8 channels inputs and outputs.</p> <p>Future Scope : Next 8 channels inputs switchboard will be constructed to be 16 channels input circuit. In practical, 16 real data signals were produced from other measurable circuits as inputs to FPGA board, 16 probes will be used instead of 16 input switches. Next two seven-segment displays board and next 8 LEDS combination board will be constructed to be 16 channels output digits. And power supply circuit will be constructed. PC interface circuit will be constructed to display output waveforms from FPGA board on PC monitor.</p>
<p style="text-align: center;">Dewi fortuna GICICRST1808080</p>	<p style="text-align: center;">Dracaena Angustifolia, The Pollutant Binder for Healthy Indonesia 2025</p> <p style="text-align: center;">Lilis Kistriyani Universitas Islam Indonesia, Yogyakarta, Indonesia</p> <p style="text-align: center;">Tri wahyuni Universitas Islam Indonesia, Yogyakarta, Indonesia</p>

	<p style="text-align: center;">Rizka Fadhillah Yandra Universitas Islam Indonesia, Yogyakarta, Indonesia</p> <p style="text-align: center;">Dewi fortuna Universitas Islam Indonesia, Yogyakarta, Indonesia</p> <p style="text-align: center;">Abstract</p> <p>The WHO data on 2014 shows the Tobacco Epidemic has killed about 6 million people per year. Chemical substances like nicotine, carbon monoxide, tar consist 85% of the gas components. The goals are studying pollutant binding process, knowing distance can be reached, and knowing the optimum emittable concentration of suji extract. Suji is one of the plants that have clorophyll more than average. Solid-liquid method is used to extract it. According to literature reviews, organic solvent and distilled water can be used in the process. The method used is Maceration, because it does not emit calor that might damage the chlorophyll. This study is focused to provide new method in reducing cigarette smoke pollutant using chlorophyll from Suji leaf, in form of smoke detecting sensor circuit. Materials used in this research are MQ-2 sensor that is connected to LCD and microcontroller by adding a device called Arduino Uno. The result showed reduction of CO and smoke per concentration per time due to the chorophyll reacting with the pollutant. However, H2O in the air will make the chlorophyll form covalent coordinate bonds. The maximum range of smoke according to calculation is 21.213 cm. The maximum smoke concentration that can be reduced is 30/200 g/mol with 25 sprays which reach 98.05% within 5 minutes. Difusivites of CO, C6H6, CH3OH, H2S, N2O, NH3, NO to the air are 0.0228 m2/s; 0.0099 m2/s; 0.0174 m2/s; 0.0181 m2/s; 0.0179 m2/s; 0.0244 m2/s; 0.0231 m2/s. By comparing the concentration from calculation and sensor, it is proved that Puff modelling is not compatible to be used.</p>
<p style="text-align: center;">Till D. Frank GICICRST1808081</p>	<p style="text-align: center;">Modeling polyrhythmic behavioral and neuronal dynamics with canonical dissipative oscillators a numerical analysis</p> <p style="text-align: center;">Till D. Frank Department of Psychological Sciences, University of Connecticut, 406 Babbidge Road, Storrs, CT, USA</p> <p style="text-align: center;">Saman Mongkolsakulvong Department of Physics, Faculty of Science, Kasetsart University, Bangkok, 10900, Thailand</p> <p style="text-align: center;">Abstract</p> <p>Recent work by Mongkolsakulvong and Frank (Condensed Matter Physics, Vol. 20, article 44001, 2017) has examined two oscillator systems that feature third invariants of motions in terms of Smorodinsky-Winternitz potentials. It has been shown that within the framework of canonical-dissipative systems such third invariants can be used to coupled limit cycle oscillators such that they exhibit synchronization. While in the aforementioned previous work it has been shown that coupling via Smorodinsky-Winternitz potentials leads to monofrequency synchronization, in the current work, it is shown that a Fokas-Lagerstrom potential coupling can establish multifrequency synchronization between two limit cycle oscillators. To this end, numerical simulation results are presented for the deterministic (unperturbed) and stochastic (perturbed) case. In particular, the relationship between the degree of synchronization and the coupling strength between the oscillators is examined. Multifrequency synchronization as such has not only applications in the design of electronic circuitry but is an important topic for understanding synchronization of brain activity between different frequency bands and polyrhythmic movements produced by humans.</p>

Keywords: Synchronization, canonical-dissipative systems, limit cycle oscillators, Fokas-Lagerstrom potential, polyrhythmic movements
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