



PROGRAM AND ABSTRACT BOOK

ICST2020



UNIVERSITAS GADJAH MADA
BADAN PENERBIT DAN PUBLIKASI



The 6th International Conference on Science and Technology

7–8 September 2020 | Yogyakarta, Indonesia

Computer and Information Technology

Electronics, Power, Communication, Control, and Instrumentation

Geoscience and Environmental Management

Life Sciences, Materials, and Applied Chemistry

Mechanical and Industrial Engineering

Remote Sensing and Geomatics



About **Universitas Gadjah Mada**

Universitas Gadjah Mada (UGM) was established on December 19, 1949 as a state and national university. Considered one of the oldest universities in Indonesia, it serves as a pillar of educational awakening in Indonesia, and purports to be a defender and disseminator of Pancasila.

UGM headquarters is located in the Bulaksumur Campus, Yogyakarta. As of today, UGM has 18 faculties, a vocational school, and a graduate school, offering more than 251 courses. UGM's mission is inspired by the spirit of Tri Dharma of Higher Education (Tri Dharma Perguruan Tinggi), comprised of Teaching, Research, and Community Services. More than 56,000 students, both domestic and international, are studying at UGM in a myriad of vocational, undergraduate, and graduate programs.

Citizenship commitment is manifested in community services as well as community empowerment activities, one of which by assigning students to a rural internship program in all regions of Indonesia.



UGM humanizes academic and non-academic activities in the principle of educopolis environment. This principle is elaborated multidisciplinary collaborative learning process in which responsive to ecological issues. The vision of UGM is to be a pioneer world class national university, excellent and innovative university, to serve the nation and humanity based on national cultural values and the national Ideology, Pancasila. The mission of UGM is to carry out education, research, and community service as well as preservation and development of knowledge that is excellent and useful for society.

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About

Badan Penerbit dan Publikasi UGM

Badan Penerbit dan Publikasi Universitas Gadjah Mada (BPP UGM) is a supporting unit for publishing as University's Tridharma (Education, Research, and Community Service). Established since February 2015, the objective is to encourage and support the academicians' publication work in international scientific journals. BPP also together with UGM Press as an academic publisher in UGM. We lead publishing journals and books from UGM's academic works.

The International Conference on Science and Technology (ICST), the International Conference on South East Asia Studies (ICSEAS), the International Conference on Tropical Agriculture (ICTA), the International Conference on Health Sciences (ICHS), the International Conference on Bioinformatics, Biotechnology, and Biomedical Engineering (BioMIC), and the International Conference on Smart and Innovative Agriculture (ICoSIA) are parts of UGM Annual Scientific Conferences (UASC) which organized by BPP UGM.

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About UGM Press

UGM Press continuously supports the vision of UGM to be a pioneer world class national university, excellent and innovative university, especially in the field of education through a mission to provide a high-quality education by publishing academic publications. Established since 1971, UGM Press's objective is to encourage and facilitate academic publications to become a trusted partner in educating the nation.

UGM Press proved to be one of the university publishers in Indonesia recognized by Southeast Asia University seen from the number of books published. Every year UGM Press publications continue to increase. Counting from 1971 to 2017, more than 2,000 book titles have been published.

Currently UGM Press initiated the reading community through the "Let's Buy Original Books" campaign since the increase in the purchase of the original book will increase the productivity of writing the book.

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The 6th International Conference on Science and Technology

A part of UGM Annual Scientific Conference 2020

Organized by Badan Penerbit dan Publikasi Universitas Gadjah Mada

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Welcoming Remarks from the Chairman

The honorable Rector of Universitas Gadjah Mada, Prof. Dr. Panut Mulyono.

Dear distinguished guests, invited speakers, and participants.

It is my great pleasure and honor to welcome you to the 6th International Conference on Science and Technology (ICST 2020). This year, the organizing committee of ICST 2020 has come to the difficult decision to hold the conference online. We are making this decision after much consideration of the ongoing spread of COVID-19, striving to take the most socially responsible action while maintaining a forum in which our community can share their work, discovery, and latest research results and exchange their ideas. In addition, direct contacts among the researchers and scientists will therefore promote not only national but also international research networking as well as collaboration in the future.

The ICST 2020 consists of five symposia, namely Computer and Information Technology symposium; Electronics, Power, Communication, Control, and Instrumentation symposium; Life Sciences, Materials, and Applied Chemistry symposium; Mechanical and Industrial Engineering symposium; and Remote Sensing and Geomatics symposium and in conjunction with the 1st Geoscience and Environmental Management symposium.

The conference committee has invited six renowned speakers: Prof. Keisuke Ohto from Saga University, Japan, Prof. Josaphat Tetuko Sri Sumantyo from Chiba University, Japan, Prof. Pitoyo Peter Hartono from Chukyo University, Japan, Dr. Fatwa Firdaus Abdi from Helmholtz Zentrum Berlin, Germany, Dr. Hui Luo from Imperial College London, United Kingdom, and Prof. Nalan Kabay from Ege University, Turkey. This year, the ICST 2020 has received 230 submissions from 20 countries throughout the world. All submitted papers went through a rigorous peer-review process. Based on the results of the review process, 111 papers have been selected, which constitute the acceptance rate of 48.26. All accepted and presented papers will be submitted to IEEE Conference Proceedings that are indexed by Scopus. This conference will not become a reality without support and

assistance of many parties. In this occasion, I would like to sincerely thank the Rector of Universitas Gadjah Mada, BPP, DSSDI officers and staffs, and also all invited speakers.

Last but not least, we also wish to thank reviewers for invaluable comments and suggestions and the organizing committee for arranging all needed facilities to the success of this conference.

Yogyakarta, September 7, 2020

Chairman of the Organizing Committee,

Dr.Eng. Ahmad Kusumaatmaja

Welcoming Remarks from the Rector of Universitas Gadjah Mada

Dear distinguished invited speakers, participants, ladies and gentlemen,

On behalf of Universitas Gadjah Mada, it is my pleasure and privilege to welcome you to the 6th International Conference on Science and Technology (ICST 2020), hosted by Universitas Gadjah Mada (UGM). In particular, I would like to extend my gratitude to distinguished keynote speaker. First of all, please allow me to express my sincere appreciation for Dr. Hui Luo from Imperial College London, United Kingdom; Prof. Josaphat Tetuko Sri Sumantyo from Chiba University, Japan; and Prof. Keisuke Ohto from Saga University, Japan.

This conference brings together academics and professionals across the whole spectrum of science and technology in a time of exciting technological advancement. As we know, society has never moved faster without the whole acceleration spectrum of science and technology timelines. History of UGM's education has earned a reputation as a pioneering university, pushing the boundaries between academics and professionals across the world, to serve and discover scientific progress as a valuable source of knowledge for the benefit of humankind.

Today, the world is in a pandemic situation, which requires us to adapt to the current situation. The pandemic has changed many habits of human life, but we believe that this situation cannot diminish our intellectual ability to always contribute knowledge to the world. The wonderful thing about ICST is bridging the gap between disciplines through this conference to bring and share their innovation, research, and ideas about our scientific issues today. UGM is proud to be leading the way in facilitating the interdisciplinary research dissemination of cutting-edge information. We are proud to conduct this conference, even though we conduct this conference virtually.

After 5 years, ICST as a part of the Annual Scientific Conference Series holding annual gatherings for the brilliant minds from Indonesia and abroad to share the latest findings in their fields. It proves UGM's consistency to preserve the international academic's relation. This series has been an enormous success to bring collaboration with our international partners, shaping the scientific networks, increasing Indonesia author's greatness in the global publication scopes, and with a global readership, and underscoring UGM's place as a standard-bearer of scientific development.

We are honored and humbled to many experts who have attended this year's conference. We thank the speakers for the expertise and knowledge that will bring to spur great discussion during the conference. Special thanks are also extended to the organizing committee members for their hard work, as well as the entire staff of UGM's Badan Penerbit dan Publikasi (BPP) for making and bringing the ICST 2020 to life. And finally, we would like to thank all the conference participants who will contribute to making this truly the most memorable ICST yet. For unfinished business, this event should impact the fields of science, technology and also our humanity for the next many years.

I am sure you will have fruitful and rewarding exchanges.
I hope you all enjoy this conference. Thank you.

Rector of Universitas Gadjah Mada,
Prof. Ir. Panut Mulyono, M.Eng., D.Eng.

SCHEDULE



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DAY 1 Conferenceschedule

MONDAY, 7 SEPTEMBER 2020

Time	Program	Venue
07:00–08:00	REGISTRATION	Iris room
OPENING CEREMONY		
08:00–08:40	Dr.Eng. Ahmad Kusumaatmaja <i>ICST 2020 Chairman</i> 	Iris room
	Prof. Panut Mulyono <i>Rector of Universitas Gadjah Mada</i> 	
PLENARY SESSION I		
08:40–09:20	Prof. Keisuke Ohto <i>Saga University, Japan</i> 	Iris room
DISCUSSION		
09:20–09:25	MORNING BREAK	
09:25–10:55	SYMPOSIA SESSION I	Breakout rooms
		
10:55–12:25	SYMPOSIA SESSION II	Breakout rooms
		
12:25–13:10	PRAYER AND LUNCH BREAK	
13:10–14:40	SYMPOSIA SESSION III	Breakout rooms
		

14:40–16:10

SYMPOSIA SESSION IV

Breakout rooms



16:10–16:20

AFTERNOON BREAK

PLENARY SESSION II

16:20–17:00



Dr. Hui Luo

Imperial College London, United Kingdom

Iris room

DISCUSSION

DAY 1

Computer and Information Technology Symposium

LAPIZ LAZULI ROOM

Code	Title and Authors
	SYMPORIUM SESSION 1 09:25 – 10:55
1570654099	 Prof. Pitoyo Peter Hartono Chukyo University, Japan
	SYMPORIUM SESSION 2 10:55 – 12:25
1570640938	Low-Cost and Simple Configuration Device-Free Indoor Localization: A Review Dwi Joko Suroso, Nur Abdillah, Refa Rupaksi and Aditya Krisnawan (Universitas Gadjah Mada, Indonesia)
1570634004	AR Heart: A User Experience Study in Cardiac Anatomy Learning Using Augmented Reality Putrika Prastuti Ratna Gharini (Universitas Gadjah Mada & Sardjito General Hospital, Indonesia); Herianto Herianto (Universitas Gadjah Mada, Indonesia); Nur Arfian (Medical Faculty Gadjah Mada University, Indonesia); Ferdinandus Satria, Hanum Salsabila and Vita Arfiana Nurul Fatimah (Universitas Gadjah Mada, Indonesia)
1570652752	The Adoption of MOOC to Improve Engineering Design Skill in a Capstone Project Ridi Ferdiana (Universitas Gadjah Mada, Indonesia)
1570645013	Analysis of Success Factors in the Implementation of ERP System in State Owned Enterprise Case Study PT. XYZ Faiz Kautsar (University of Indonesia & PT. Bukalapak.com, Indonesia); Indra Budi (Faculty of Computer Science & Universitas Indonesia, Indonesia)
	An Augmented Reality Application for Animal Learning Media at Alian Butterfly Park Adhistya Erna Permanasari, Indriana Hidayah and Intan Sakkina (Universitas Gadjah Mada, Indonesia)

Code	Title and Authors
SYMPOSIUM SESSION 3	
13:10 – 14:40	
1570637017	<p>Non-Linear EEG Based Emotional Classification Using K-Nearest Neighbor and Weighted K-Nearest Neighbor with Variation of Features Selection Methods</p> <p>Dessy Ana Laila Laila Sari (Universitas Indonesia, Indonesia)</p>
1570644229	<p>The Improvement of Character Recognition on ANPR Algorithm Using CNN Method with Efficient Grid Size Reduction</p> <p>Ahmad Mushthofa (University of Gadjah Mada, Indonesia); Agus Bejo (Universitas Gadjah Mada, Indonesia); Risanuri Hidayat (Gadjah Mada University (UGM), Indonesia)</p>
1570636832	<p>Topological Signatures as Complementary Features for Deep Learning Model: A Survey</p> <p>Bijak Rabbani and Widjianto Nugroho (University of Indonesia, Indonesia)</p>
1570651802	<p>A Study of Event Detection Methods in Eye-Tracking Based on Its Properties</p> <p>Hafzatin Nurlatifa and Sunu Wibirama (Universitas Gadjah Mada, Indonesia); Rudy Hartanto (Gadjah Mada University & Electrical Engineering and Information Technology Department, Faculty of Engineering Gadjah Mada University, Indonesia)</p>
1570641295	<p>Improvement of the Automatic Gamma Correction Method in Cloud Image Detection</p> <p>Bayu Nadya Kusuma (Universitas Amikom Yogyakarta, Indonesia); Dian Budhi Santoso (Universitas Singaperbangsa Karawang, Indonesia)</p>

Code	Title and Authors
SYMPOSIUM SESSION 4 14:40 – 16:10	
1570651432	<p>Operational Dashboard Development as A Data Quality Monitoring Tools Using Data Deduplication Profiling Result</p> <p>Sesillia Fajar Kristyanti (Jl. Gunung Jati RT 05 RW 08, Dampit, Malang & Telkom University, Indonesia); Tien Fabrianti Kusumasari and Ekky Novrizza Alam (Telkom University, Indonesia)</p>
1570637485	<p>Determinant Factors of Hospital Information System (HIS) Success at XYZ Hospital Using Delone McLean IS Success Model</p> <p>Nervy Meilin Siagian (Universitas Indonesia, Indonesia); Abdullah Jamil and Sofian Lusa (University of Indonesia, Indonesia); Pudy Prima and Dana I. Sensuse (Universitas Indonesia, Indonesia)</p>
1570636759	<p>Factors Affecting the Implementation of SIKD at the National Archives of the Republic of Indonesia</p> <p>Lufi Herawan (University of Indonesia & National Archives of The Republic of Indonesia, Indonesia)</p>
1570639940	<p>Designing an Information System Effectiveness and Efficiency Measurement Model by Modifying the Human Organization Technology-Fit Model</p> <p>Elvira Esperanza Sala (Institut Teknologi Sepuluh Nopember Indonesia, Indonesia); Apol Pribadji Subriadi (Institut Teknologi Sepuluh Nopember, Indonesia)</p>
1570651520	<p>The Study of the Barriers to Digital Transformation in Higher Education: A Preliminary Investigation in Indonesia</p> <p>Bayu Rima Aditya (Telkom University, Indonesia); Ridi Ferdiana and Sri Suning Kusumawardani (Universitas Gadjah Mada, Indonesia)</p>

DAY 1

Computer and Information Technology Symposium

SAPPHIRE ROOM

Code	Title and Authors
SYMPORIUM SESSION 5 10:55 – 12:25	
<hr/>	
1570644094	Designing ERP System for Smart SMEs Using Service Oriented Architecture Method for Smart Point of Sale Dhiya Fathia, Umar Yunan Hedyanto and Muhardi Saputra (Telkom University, Indonesia)
1570645517	A Specific Infinity Loop Model in TCG Yuanzhe Jin (Northwestern University, USA); Yunru Ge (Carnegie Mellon University, USA); Jingting Liang (Harvard University, USA)
1570644191	Modelization of Corium from Fukushima-Daichi Powerplant Using PANTHERE Codes Rionaldy Rionaldy (UGM, Indonesia); Andang Harto (Universitas GadjahMada, Indonesia)
1570645079	Performance Analysis of Profiling Module in Data Quality Management Application Using Open Source Tools Karina Farizki Salmawati, Tien Fabrianti Kusumasari and Ekky Novrizza Alam (Telkom University, Indonesia)
1570640135	Analysis of Extended Enterprise Implementation in E-Commerce Business Model Case Study PT. XYZ Bravyto Takwa Pangukir (University of Indonesia, Indonesia); Muhammad Rifki Shihab (Faculty of Computer Science, Universitas Indonesia, Indonesia); Bambang Parikenan (Universitas Indonesia, Indonesia); Faiz Kautsar (University of Indonesia & PT. Bukalapak.com, Indonesia); Kevin Christian (University of Indonesia, Indonesia)

Code	Title and Authors
SYMPOSIUM SESSION 6	
	13:10 – 14:40
1570645431	<p>Cardinality Single Column Analysis for Data Profiling Using an Open Source Platform</p> <p>Tien Fabrianti Kusumasari, Sandy Amethyst and Muhammad Hasibuan (Telkom University, Indonesia); Widyatasya Nurtrisha (Bandung Institute of Technology, Indonesia)</p>
1570654131	<p>Correlation Analysis of Breast Cancer Patient Data in Dr. Sardjito Hospital Yogyakarta</p> <p>M Ivan Ariful Fathoni (Universitas Gadjah Mada & Universitas Nahdlatul Ulama Sunan Giri, Indonesia); Gunardi Gunardi, Fajar Adi-Kusumo and Susanna Hilda Hutajulu (Gadjah Mada University, Indonesia)</p>
1570645514	<p>Design Guidelines and Process of Reference Data Quality Management Based on Data Management Body of Knowledge</p> <p>Rangga Patra Pratikto, Tien Fabrianti Kusumasari and Rokhman Fauzi (Telkom University, Indonesia)</p>
1570651135	<p>Data Cleansing Processing Using Pentaho Data Integration: Case Study Data Deduplication</p> <p>Dwi Cahya Setyawan, Tien Fabrianti Kusumasari and Ekky Novrizza Alam (Telkom University, Indonesia)</p>
1570651800	<p>Sentiment Analysis Website of Online Hotel Booking Application Reviews Using the Naive Bayes Algorithm</p> <p>Zalina Fatima Azzahra, Rachmadita Andreswari and Muhammad Hasibuan (Telkom University, Indonesia)</p>

DAY 1

Electronics, Power, Communication, Control, and Instrumentation Symposium

SAPPHIRE ROOM

Code	Title and Authors
SYMPORIUM SESSION 1 14:40 – 16:10	
1570640922	<p>Radio Resource Management for Improving the Spectral Efficiency on D2D Underlaying Communications Using A Modified Joint-Greedy Algorithm Bayu Setho Kusuma, Arfianto Fahmi, Vinsensius Sigit Widhi Prabowo and Dhoni Putra Setiawan (Telkom University, Indonesia)</p>
1570638237	<p>Optimization of Placement and Sizing DG and Capacitor Bank with Network Reconfiguration Considering Non Linear Load on Radial Distribution Network Muhira Faraby M (Institut Teknologi Sepuluh Nopember, Indonesia); Ontoseno Penangsang (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia); Rony Seto Wibowo (Institut Teknologi Sepuluh Nopember, Indonesia)</p>
1570651152	<p>EEG Channel Selection Using Spatial Selection for Emotion Classification Elfan Alveraldo and Hilman Fauzi (Telkom University, Indonesia); Inung Wijayanto (Telkom University & Universitas Gadjah Mada, Indonesia); Achmad Rizal (Telkom University, Indonesia)</p>
1570636824	<p>Performance Analysis of On-Off Keying Modulation on Underwater Visible Light Communication Brian Pamukti, Akhmad Hambali and Annisa Izmi Amalia (Telkom University, Indonesia)</p>
1570653941	<p>Impulse Noise Modeling in an Indoor Narrowband Power Line Communication Channel Using M-QAM and a Software-Defined Radio Approach Akintunde Oluremi Iyiola, Ayokunle Damilola Familua, Thokozani Calvin Shongwe and Theo G. Swart (University of Johannesburg, South Africa)</p>

DAY 1

Mechanical and Industrial Engineering Symposium

RUBY ROOM

Code	Title and Authors
SYMPORIUM SESSION 1 09:25 – 10:55	
1570645490	<p>Study of the Parametric Design of Small Scale LNG Carriers Based on Hull Dimensions for the Optimum Load Capacity</p> <p>Muhammad Arif Budiyanto (Universitas Indonesia, Indonesia); Devi Adlyani (Naval Architecture and Marine Engineering, Universitas Indonesia, Indonesia)</p>
1570645500	<p>Initial Study on the Increase of Quay Cranes to Reduce Dwelling Time at the Container Terminal</p> <p>Muhammad Arif Budiyanto (Universitas Indonesia, Indonesia); Mohammad Irfan Zaki and Sangga M. B. Suhendar (Departement of Mechanical Engineering, Universitas Indonesia, Indonesia)</p>
1570641136	<p>Wear Behaviors of Cp-Ti and UHMWPE Artificial Lumbar Disc for Center of Radius Variations</p> <p>Lilik Dwi Setyana (Universitas Gadjah Mada, Indonesia); Suyitno Suyitno and Muslim Mahardika (Gadjah Mada University, Indonesia)</p>
1570644235	<p>Performance Analysis of Liquid Rocket Attitude and Trajectory Estimation</p> <p>Arif Nur Hakim (National Institute of Aeronautics and Space, Indonesia); Idris Putro (LAPAN, Indonesia & Technische Universität München (TUM), Germany)</p>
1570644187	<p>Implementation of Simple Throttling for Liquid Rocket Engine ECX1000H2-4</p> <p>Arif Nur Hakim (National Institute of Aeronautics and Space, Indonesia); Hudoro Tahdi (National Institute of Aeronautics and Space (LAPAN), Indonesia); Faishol Luthfy Mahendra (National Institute of Aeronautics and Space, Indonesia)</p>
SYMPORIUM SESSION 2 10:55 – 12:25	
1570639545	<p>Strategy Designed Toward Asset Management System Improvement</p> <p>Winda Nur Cahyo, Nael Fiantama and Haris Hadiyanto (Universitas Islam Indonesia, Indonesia)</p>
1570640327	<p>The Implementation of Risk Management Based on ISO 31000: Framework at SME Bamboo Bantul, Yogyakarta</p> <p>Mirga Maulana Rachmadhani and Agus Mansur (Universitas Islam Indonesia, Indonesia)</p>

Code	Title and Authors
1570653711	Quality Evaluation in Development of 3D Printed Chocolate Products Aiza Yudha Pratama (Gadjah Mada University, Indonesia); Herianto Herianto (Universitas Gadjah Mada, Indonesia)
1570651537	The Classification of Chili (<i>Capsicum Annum L.</i>) Powder Quality by Using Image Processing and Artificial Neural Networks Anggrai Saputro (Universitas Gadjah Mada, Indonesia); Nafis Khuriyati and Atris Suyantohadi (Universitas Gadjah Mada, Faculty of Agricultural Technology, Indonesia)
1570644489	Value Stream Mapping and Critical Path Method for Waste Reduction: A Case Study of Transformer Production Suci Miranda (Universitas Islam Indonesia, Indonesia); Wawan Tripiawan (Telkom University, Indonesia); Sri Indrawati (Universitas Islam Indonesia, Indonesia)
1570636186	Green Productivity Approach in Batik Industry Fasa Dzukran Shofari (Universitas Islam Negeri Sunan Kalijaga, Indonesia); Dwi Agustina Kurniawati (Sunan Kalijaga State Islamic University, Indonesia); Herninanjati Paramawardhani (Universitas Islam Negeri Sunan Kalijaga, Indonesia)
SYMPOSIUM SESSION 3 13:10 – 14:40	
1570636925	Review on Current Thermal Issue and Cooling Technology Development on Electric Vehicles Battery Muhammad Aulia Rahman and Indro Pranoto (Universitas Gadjah Mada, Indonesia)
1570645501	Preliminary Research on the Effect of the Number of Truck Terminals on Yards Throughput at the Container Terminal Muhammad Arif Budiyanto (Universitas Indonesia, Indonesia); Sangga M. B. Suhendar and Mohammad Irfan Zaki (Departement of Mechanical Engineering, Universitas Indonesia, Indonesia)
1570650610	Numerical Study of Effect of Blade and Guide Vane Configuration on Performance of Savonius Wind Turbine (a Case Study on Irrigation Water Pump in Kepongkok's Agricultural Land) Fauzun Fauzun (Universitas Gadjah Mada, Indonesia)
1570653996	Development of Verification Scheme of the Safety Critical Element for Corrosion Protection in Piping Systems Soni Candra Saragih and Andi Rahadiyan Wijaya (Gadjah Mada University, Indonesia); Fitri Trapsilawati (Universitas Gadjah Mada, Indonesia); Rini Dharmastiti (Gadjah Mada University, Indonesia)

Code	Title and Authors
1570654093	<p>Value Analysis of Predictive Maintenance in Cooling System Casting Process by Data SCADA Engelbert Harsandi Erik Suryadarma and The Jin Ai (Universitas Atma Jaya Yogyakarta, Indonesia); P. W. Anggoro (University of Atma Jaya Yogyakarta & Siti Badriyah UNDIP Group Research for Prosthetic and Orthotic, Indonesia)</p> <hr/>

DAY 1 Remote Sensing and Geomatics Symposium

JASPER ROOM

Code	Title and Authors
SYMPOSIUM SESSION 1 13:10 – 14:40	
Application of Remote Sensing Technology and SIG for Extraction of Groundwater Potential Zone Parameters in Gesing Watershed, Purworejo	
1570653513	Sudaryatno Sudaryatno, Noorhadi Rahardjo and Winanda Nanda (Universitas Gadjah Mada, Indonesia)
Hybrid Remote Sensing for Estimating Timber Production and Carbon in Tropical Rainforest	
1570634519	Wahyu Wardhana (University of Gadjah Mada, Indonesia); Wirastuti Widyatmanti (Faculty of Geography Gadjah Mada University, Indonesia); Emma Soraya (Faculty of Forestry University of Gadjah Mada, Indonesia); Bekti Larasati (University of Gadjah Mada, Indonesia); Deha Agus Umarhadi and Rian Adi Sumarto (Universitas Gadjah Mada, Indonesia); Fahmi Idris (Faculty of Forestry Gadjah Mada University, Indonesia)
Estimation of Fractional Canopy Cover of Bedul Mangrove Forest Using PlanetScope Imagery	
1570653663	Shifa A Mahardhika and Muhammad Kamal (Universitas Gadjah Mada, Indonesia)
Estimation Soil Erosion Using MUSLE Method and TRMM Data in Mongo Watershed, Purworejo	
1570653471	Shelly Yeni Saputri, Sudaryatno Sudaryatno and Noorhadi Rahardjo (Universitas Gadjah Mada, Indonesia)
SYMPOSIUM SESSION 2 14:40 – 16:10	
Integrating GIS and ABM for Overland Flow Model in Central Celebes, Indonesia	
1570645480	Sandy Budi Wibowo and Idea Wening Nurani (Universitas Gadjah Mada, Indonesia); Taufik Purwanto (Gadjah Mada University, Indonesia); Nur Mohammad Farda (Universitas Gadjah Mada, Indonesia)
Seabed Classification Using Multibeam Echosounder Measurement Data	
1570644864	Rachmat Nitriansyah (Universitas Gadjah Mada, Indonesia); Bambang Kun Cahyono (Universitas Gadjah Mada & Faculty of Engineering, Indonesia)

**Estimation of Strain Rate in the Opak Fault with Postseismic Correction
After the 2006 Yogyakarta Earthquake**

1570641202

Nurul Ninatin (Universitas Gadjah Mada, Indonesia); Nurrohmat Widjajanti (Gadjah Mada University, Indonesia); Cecep Pratama (Universitas Gadjah Mada, Indonesia)

**Susceptibility Distribution Analysis of Tsunami Using Spatial Multi-Criteria
Evaluation (SMCE) Method in Parangtritis, Indonesia**

1570637622

Taufik Budi Waskita, Rahma Aulia Zahra, Muslih Biladi, Muhammad Nadafa Isnain, Pegi Melati and Anugrah Aditya Insani (Universitas Gadjah Mada, Indonesia); Ikhwan Amri (Gadjah Mada University, Indonesia); Djati Mardiatno (Universitas Gadjah Mada, Indonesia); Ratih Putri (Faculty of Geography, Universitas Gadjah Mada, Indonesia)

**Evaluating Multi-sensor Combination of Normalized Difference Vegetation
Index (NDVI) Time Series Data over Southeast Asia**

1570650974

Sanjiwana Arjasakusuma and Sandiaga Kusuma (Universitas Gadjah Mada, Indonesia)

DAY 2 Conferenceschedule

TUESDAY, 8 SEPTEMBER 2020

Time	Program	Venue
07:00-08:00	REGISTRATION	
PLENARY SESSION III		
08:00-08:40	 Prof. Yosaphat Tetuko Sri Sumantyo <i>Chiba University, Japan</i>	Iris room
DISCUSSION		
08:40-08:45	MORNING BREAK	
08:45-10:15	SYMPOSIA SESSION IV	Breakout rooms
		
10:15-11:45	SYMPOSIA SESSION V	Breakout rooms
		
11:45-12:45	PRAYER AND LUNCH BREAK	
12:45-14:15	SYMPOSIA SESSION VI	Breakout rooms
		
14:15-16:00	AFTERNOON BREAK	

Time	Program	Venue
CLOSING CEREMONY		
16:00-17:00	BEST PAPER AWARDS	Iris room
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 drg. Ika Dewi Ana, Ph.D. <i>Vice Rector for Research and Community Services</i>		
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PHOTO SESSION		
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DAY 2

Computer and Information Technology Symposium

LAPIZ LAZULI ROOM

Code	Title and Authors
SYMPORIUM SESSION 7 08:45 – 10:15	
<p>Deep Learning for Sentiment Analysis in Indonesian Novel Review</p>	
1570638738	Rifqi Fauzi Rahmadzani (University of Gadjah Mada, Indonesia); Widy Widyanan (Gadjah Mada University, Indonesia); Teguh Bharata Adji (Universitas Gadjah Mada, Indonesia)
1570648412	Indonesian Question Classification Using Feature Extraction and Selection Approach on Coarse and Fine Taxonomy Irfandy Thalib and Widy Widyanan (Gadjah Mada University, Indonesia); Indah Soesanti (Universitas Gadjah Mada, Indonesia)
1570641114	Classification of Visual-Verbal Cognitive Style in Multimedia Learning Using Eye-Tracking and Machine Learning Aloysius Gonzaga Pradhyia Sidhawara, Sunu Wibirama and Teguh Bharata Adji (Universitas Gadjah Mada, Indonesia); Sri Kusrohmaniah (Gadjah Mada University, Indonesia)
1570636771	Classification Driver's Behaviour Using Supervised Algorithm Phounsiri Sihakhom (Universitas Gadjah Mada, Indonesia); Selo Sulistyo (Gadjah Mada University, Indonesia); I Wayan Mustika (Universitas Gadjah Mada, Indonesia)
1570644362	Phonocardiogram Classification Using Multilevel Wavelet Packet Entropy and Random Forest Achmad Rizal (Telkom University, Indonesia); Inung Wijayanto (Telkom University & Universitas Gadjah Mada, Indonesia)

Code	Title and Authors
SYMPOSIUM SESSION 8	
10:15 – 11:45	
1570640151	<p>Lung and Colon Cancer Detection with Convolutional Neural Networks on Histopathological Images</p> <p>Radical Rakhman Wahid, Chilyatun Nisa' and Rahayu Prabawati Amaliyah (Universitas Pembangunan Nasional Veteran Jawa Timur & Informatika, Indonesia); E Y Puspaningrum (Universitas Pembangunan Nasional Veteran Jawa Timur, Indonesia)</p>
1570652984	<p>Estimation of Playout Time in Networks Using Fuzzy Logic Approach</p> <p>Mohamed Elsayed Elkattan (Nuclear Materials Authority, Egypt)</p>
1570653937	<p>Question Answering System in the Domain of Early Childhood Education in Bahasa Indonesia</p> <p>Andri Dwi Utomo (Hasanuddin University, Indonesia); Zahir Zainuddin (University of Hasanuddin, Indonesia); Syafruddin Syarif (Hasanuddin University, Indonesia)</p>
1570650226	<p>Image Enhancement on You Only Look Once (YOLO) Method to Detect Public Transportation of CCTV Image</p> <p>Hudalizaman Hudalizaman (Universitas Gadjah Mada, Indonesia); Igi Ardiyanto (Universitas Gadjah Mada & Faculty of Engineering, Indonesia); Sunu Wibirama (Universitas Gadjah Mada, Indonesia)</p>
SYMPOSIUM SESSION 9	
12:45 – 14:15	
1570636255	<p>Combination of First Order Statistical Feature and Gray Level Co-Occurrence Matrix for Cirebon Mask Classification</p> <p>Felix Indra Kurniadi (Tanri Abeng University, Indonesia); Vinnia Kemala Putri (Universitas Indonesia & Fakultas Ilmu Komputer, Indonesia)</p>
1570637620	<p>Network Architecture Search Method on Hyperparameter Optimization of Convolutional Neural Network: Review</p> <p>Hudalizaman Hudalizaman (Universitas Gadjah Mada, Indonesia); Igi Ardiyanto (Universitas Gadjah Mada & Faculty of Engineering, Indonesia); Sunu Wibirama (Universitas Gadjah Mada, Indonesia)</p>
1570651839	<p>Predicting Customer Churn of Fire Insurance Policy: A Case Study in an Indonesian Insurance Company</p> <p>Riyanto Jayadi, Adrianus Kelvin, Jerry Jerry, Pravasta Rifyansyah, Muhammad Mufarih and Hafizh Firmantyo (Bina Nusantara University, Indonesia)</p>
1570640240	<p>Deep Learning Indonesian Chatbot Using PyTorch for Customer Support Automation</p> <p>Mutiara Auliya (Universitas Gadjah Mada, Indonesia); Widy Widyan (Gadjah Mada University, Indonesia); Lukito Edi Nugroho (Universitas Gadjah Mada, Indonesia)</p>

Code	Title and Authors
	<p style="text-align: center;">SYMPOSIUM SESSION 10 14:15 – 15:45</p>
1570636120	<p>Linear Dislocated Time Series - Deep Neural Network for Bearing Fault Classification</p> <p>Pramudyana A Harlianto, Noor Akhmad Setiawan and Teguh Bharata Adji (Universitas Gadjah Mada, Indonesia)</p>
1570644043	<p>Applying Fuzzy Logic to Improve the Accuracy of Duval Triangle State Estimation Analysis for DGA Based Transformer Fault Classification</p> <p>Teguh Handjojo Dwiputrantri, Noor Akhmad Setiawan and Teguh Bharata Adji (Universitas Gadjah Mada, Indonesia)</p>
1570644361	<p>Epileptic Electroencephalogram Signal Classification Using Wavelet Energy and Random Forest</p> <p>Inung Wijayanto (Telkom University & Universitas Gadjah Mada, Indonesia); Syamsul Rizal (Telkom University, Indonesia); Sugondo Hadiyoso (Telkom University & Institut Teknologi Bandung, Indonesia)</p>
1570653104	<p>Classification of P-wave Morphology Using New Local Distance Transform and Random Forests</p> <p>Anton Purnawirawan (Institut Teknologi Sepuluh Nopember (ITS) Surabaya East Java, Indonesia); Adhi D Wibawa (Institut Teknologi Sepuluh Nopember, Indonesia); Diah Wulandari (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia)</p>
1570636170	<p>User Interface and Usability Assessment of Mobile-Based Smart City Using Webqual 4.0 Approach: An Insight of Madura Island Districts</p> <p>Aang Kisnu Darmawan, Dr (Madura Islamic University & Faculty of Engineering, Indonesia); Daniel Siahaan (Institut teknologi Sepuluh Nopember, Indonesia); Tony Dwi Susanto (ITS, Indonesia); Hoiriyah Hoiriyah, Busro Umam and Bakir Bakir (Madura Islamic University, Indonesia)</p>

DAY 2

Computer and Information Technology Symposium

SAPPHIRE ROOM

Code	Title and Authors
	SYMPOSIUM SESSION 11 08:45 – 10:15
1570652412	Analysis of Title Influence on Popularity of Forum Postings Using Text Mining: Case Study on Kaskus.com Friska Ginting, Natasha Angelica, Alkaton Sutikno and Riyanto Jayadi (Bina Nusantara University, Indonesia)
1570648475	Modeling of Personality Traits Based on Demographic Data on Multi-Races Samples of Ages from 13 to 50 Years Old: Investigating the Effect of Race on Model Iman Paryudi, Edi Winarko and Sigit Priyanta (Universitas Gadjah Mada, Indonesia); Sri Rezeki Candra Nursari (Pancasila University, Indonesia)
1570641745	A Review of Feature Selection Techniques in Sentiment Analysis Using Filter, Wrapper, and Hybrid Methods Pulung Hendro Prastyo (Universitas Gadjah Mada, Indonesia); Igi Ardiyanto (Universitas Gadjah Mada & Faculty of Engineering, Indonesia); Risanuri Hidayat (Gadjah Mada University (UGM), Indonesia)
1570651907	Credit Card Fraud Detection Using Stacked Generalization Siddartha Mootha (College of Engineering, Guindy, India); Sashank Sridhar (Anna University, India)

Code	Title and Authors
SYMPOSIUM SESSION 12	
10:15 – 11:45	
1570651548	<p>Comparison of Vigenere Cipher and Affine Cipher in Three-Pass Protocol for Securing Image</p> <p>Rahma Isnaini Masya (Universitas of Indonesia, Indonesia); Rizal Aji (University of Indonesia, Indonesia); Setiadi Yazid (Universitas Indonesia, Indonesia)</p>
1570640154	<p>Comprehensive Survey of Cloud Intrusion Detection System</p> <p>Aditya Nur Cahyo, Tri K Priyambodo and Mardhani Riasetiawan (Universitas Gadjah Mada, Indonesia)</p>
1570645499	<p>Modeling Study of Priority Intrusion Response Selected on Intrusion Detection System Alert</p> <p>Ariani Ariani (University of Indonesia, Indonesia); Muhammad Salman (Universitas Indonesia, Indonesia)</p>
1570653821	<p>2D Modelling and Simulation Using Discrete Event Simulation and Agent-Based Simulation for Pesticide Manufacturing</p> <p>Nurhayati Sembiring and Ryan I P Sipayung (USU, Indonesia)</p>
1570650293	<p>Numerical Simulation of the Effect of Residual Stress on Dented Pipe to the Pipeline Failure</p> <p>Andy Marlano (Gadjah Mada University, Indonesia); Joko Waluyo (University of Gadjah Mada, Indonesia)</p>

DAY 2

Electronics, Power, Communication, Control, and Instrumentation Symposium

SAPPHIRE ROOM

Code	Title and Authors
SYMPORIUM SESSION 2 12:45 – 14:15	
1570645518	Otaku: Intelligent Management System for Student-Intensive Dormitory Yuanzhe Jin and Maorong Wang (Northwestern University, USA); Chenrui Zhang (Southeast University, China)
1570636033	Implementation and Performance Analysis WebSocket on Prototype of System Monitoring ATM Room Unan Y Oktiawati (Universitas Gadjah Mada, Indonesia)
1570642758	DIY Home Security System: Functional and Performance Testing Unan Y Oktiawati (Universitas Gadjah Mada, Indonesia)
1570641244	Embedded Application for Driver Drowsiness Monitoring System A Review Susaf Noor Azhar (University of Gadjah Mada, Indonesia); Igi Ardiyanto (Universitas Gadjah Mada & Faculty of Engineering, Indonesia); Agus Bejo (Universitas Gadjah Mada, Indonesia)
1570645387	MMFO: Modifying the Moth Flame Optimization to Provide Fast Cluster Formation in VANET Ronald Adrian (Universitas Gadjah Mada, Indonesia); Selo Sulistyo (Gadjah Mada University, Indonesia); I Wayan Mustika (Universitas Gadjah Mada, Indonesia); Sahirul Alam (UGM, Indonesia)

Code	Title and Authors
SYMPOSIUM SESSION 3 14:15 – 15:45	
1570636115	
	<p>Techno-Economic Analysis of Implementation IEEE 802.11Ah Standard for Smart Meter Application in Bandung Area</p> <p>Fachri Nugraha Adhiatma and Doan Perdana (Telkom University, Indonesia); Nachwan Mufti Adriansyah (Universitas Telkom, Indonesia)</p>
1570644170	
	<p>Review on Battery Energy Storage System for Power System with Grid Connected Wind Farm</p> <p>Evando Diotama (Gadjah Mada University, Indonesia); Lesnanto Multa Putranto (Universitas Gadjah Mada, Indonesia); Sarjiya Sarjiya and Roni Irnawan (Gadjah Mada University, Indonesia)</p>
1570639674	
	<p>Multi-Agent Formation with Size Scaling via Self-Position Feedback</p> <p>Djati Wibowo Djamar, Muhamad Rausyan Fikri, Malik Athafarras and Nadhifatul Maulidati (Sampoerna University, Indonesia); Steven Mark Levy (University of Arizona, Indonesia); Abdul Dwi Nur Cahyo, Maria Anggi Octaviani, Mohammad Farhan Ramdhany and Farid Triawan (Sampoerna University, Indonesia)</p>
1570644281	
	<p>A Simple Modeling of Wind Turbine When the Lightning Strike</p> <p>A P Kurniawan (Universitas Gadjah Mada, Indonesia); Danang Wijaya (UGM, Indonesia); Sasongko Hadi (Universitas Gadjah Mada, Indonesia)</p>

DAY 2

Mechanical and Industrial Engineering Symposium

RUBY ROOM

Code	Title and Authors
SYMPORIUM SESSION 4 08:45 – 10:15	
1570636724	Analysis of the Music Effect to the Worker of Leather Craft Industry Nindya Laksita Laras, Mirwan Ushada and Suharno Suharno (Universitas Gadjah Mada, Faculty of Agricultural Technology, Indonesia)
1570653672	Gait Analysis of Stunting Children Compared to Healthy Children Using 2D Video Data Ibrahim Aji and Adhi D Wibawa (Institut Teknologi Sepuluh Nopember, Indonesia); Surya Sumpeno (Institute Teknologi Sepuluh Nopember, Indonesia)
1570653999	The Influence of Personality and Risk Attitude on the Accuracy of Project Duration Estimation Anirawilda Purba (Gadjah Mada University, Indonesia); Budi Hartono (Universitas Gadjah Mada, Indonesia)
1570649815	The Influence of Complexity on the Final Project Performance from Students' Perspectives Huki Chandra and Budi Hartono (Universitas Gadjah Mada, Indonesia)
1570641256	Novelty Does Matter: SLM is a Convenient Way Finding a Research Originality Winda Nur Cahyo (Universitas Islam Indonesia, Indonesia)
SYMPORIUM SESSION 5 10:15 – 11:45	
1570642289	Cooperation Strategy Between Electric Suppliers Using Multi Echelon Economic Dispatch Wahyuda Wahyuda and Muslimin Muslimin (Universitas Mulawarman, Indonesia)
1570641444	Green Supply Chain Performance Improvement Through Green SCOR in an Indonesian Paper Mill Sri Indrawati and Nurizqi Sarinastiti (Universitas Islam Indonesia, Indonesia)

Code	Title and Authors
1570640723	Supplier Relationship Performance Measurement Model: A Case Study in A Service Company Elisa Kusriini (Islamic University of Indonesia, Indonesia); Asih Ahistasari (UJI, Indonesia)
1570641130	Multi-Objective Location Routing Problem with Time Windows for Cost Minimization and Customer Service Level Maximization Nararya Dharmika and Sugandhini Maruti (Universitas Gadjah Mada, Indonesia); Sekar Sakti and Anna Maria Asih (Gadjah Mada University, Indonesia)
1570636656	Relief Mapping Assessment Using Two-Echelon Vehicle Routing Problem with Drone Anak Agung Ngurah Perwira Redi (Bina Nusantara University, Indonesia); Rahmad Inca Liperda (Universitas Pertamina, Indonesia); Bertha Sophia (Universitas Gadjah Mada, Indonesia); Anna Maria Asih (Gadjah Mada University, Indonesia); Nandini Niramaya Sekarintyasa and Handina Boedhy Astiana (Universitas Pertamina, Indonesia)
SYMPOSIUM SESSION 6 12:45 – 14:15	
1570651629	The Role of Industry Mastery in Achieving Internationalization Success: An Empirical Study on Information Technology Offshoring Yogi Y. Wibisono (Parahyangan Catholic University, Indonesia)
1570654229	Determination of Attributes Levelling Through Online Customer Reviews Using Natural Language Processing Yanti Pasmati (Universitas Gadjah Mada & Universitas Bina Darma, Indonesia); Alva Tortowi (Gadjah Mada University, Indonesia); Budi Hartono and Titis Wijayanto (Universitas Gadjah Mada, Indonesia)
1570654085	Interpretive Structural Modeling (ISM) Approach to Identify Success Factors for Implementing A Kaizen Culture Elisa Kusriini (Islamic University of Indonesia, Indonesia); Vembri Noor Helia and Ramadhan Ahmad (Universitas Islam Indonesia, Indonesia)
1570651679	Unsupervised and Semi-Supervised Clustering for Insight Tracking in Social Media Analytics Dwi Adi Purnama (Universitas Gadjah Mada, Indonesia); Subagyo Subagyo and Nur Aini Masrurah (Gadjah Mada University, Indonesia)
1570651470	The Differences of Green Manufacturing's Adoption by Small and Medium-Sized Enterprises (SMEs) in Developed and Developing Countries: A Review Ira Setyaningsih and Wakhid Ciptono (Faculty of Economics and Business Universitas Gadjah Mada, Indonesia); Nurul Indarti (Universitas Gadjah Mada, Indonesia); Nofie Vidya Kemal (Faculty of Economics and Business Universitas Gadjah Mada, Indonesia)

DAY 2 Remote Sensing and Geomatics Symposium

JASPER ROOM

Code	Title and Authors
SYMPORIUM SESSION 3 10:15 – 11:45	
Identification of Reef Characteristics Using Remote Sensing Technology in Ayau Islands, Indonesia	
1570651415	Muhammad Hafizt (Research Center for Oceanography, Indonesia); Gusti Ayu Ismayanti and Mutiara Rachmat Putri (Bandung Institute of Technology, Indonesia); Yoniar Hufan Ramadhani (Geospatial Information Agency, Indonesia); Ir. Suyarso (Research Center for Oceanography, Indonesia)
1570641119	Estimation of Slip Rate and the Opak Fault Geometry Based on GNSS Measurement Jiyon Ataa Nurmufti Adam (Universitas Gadjah Mada, Indonesia); Nurrohmat Widjajanti (Gadjah Mada University, Indonesia); Cecep Pratama (Universitas Gadjah Mada, Indonesia)
1570642853	Spatio-Temporal Analysis of Post-Disaster Built-Up Expansion in Banda Aceh City, Indonesia Ikhwani Amri (Gadjah Mada University, Indonesia); Ihsan Prabaswara (University of Gadjah Mada, Indonesia); Sri Riyarsih (Gadjah Mada University, Indonesia)
1570644377	Gravity Disturbance Derived from Airborne Gravity and Its Geodynamics Interpretation of Sulawesi Island Fildzah Zainati Fadhilah and Leni Sophia Heliani (Universitas Gadjah Mada, Indonesia)
1570639997	Built-Up Area Monitoring Using Cloud Computing-Based on Remotely Sensed Imagery in Samarinda City, Indonesia Bayu Elwantyo Bagus Dewantoro, Lucky Rakananda Hasandy and Sheffiera Indriyaningtyas (Universitas Gadjah Mada, Indonesia)
SYMPORIUM SESSION 4 12:45 – 14:15	
1570653571	Estimation of Mangrove Fractional Canopy Cover Using Sentinel-2A Imagery Artha Parela (Gadjah Mada University & Indonesia, Indonesia); Muhammad Kamal (Universitas Gadjah Mada, Indonesia)
1570651245	Comparison of Supervised Algorithms for Built-Up Classification in Indonesia Metropolitan Achmad Fauzi Bagus Firmansyah (Statistics Indonesia, Indonesia)

Code	Title and Authors
1570640620	Modification of Temperature Vegetation Dryness Index (Tvdi) Method for Detecting Drought with Multi-Scale Image A Sediyo Adi Nugraha (Universitas Pendidikan Ganesha, Indonesia); Totok Gunawan and Muhammad Kamal (Universitas Gadjah Mada, Indonesia)
1570654127	Cirrus Cloud Correction in Landsat 8 Image Using Combined Image-Based Approach and Various Classification Schemes Abdul Basith, Ratna Prastyani and Indah Restumi (Universitas Gadjah Mada, Indonesia)



ABSTRACTS

A close-up, slightly blurred photograph of a blue microphone with a textured, perforated grille. The microphone is positioned in the lower-left foreground, angled towards the right. The background is a large, dimly lit room, possibly a conference hall or auditorium, with rows of yellow chairs and a stage area with red and white curtains. The overall atmosphere is professional and suggests a speaking event.

SPEAKERS



Plenary 1

Extraction behavior of trivalent rare earth metal ions with diphosphonic acid type extraction reagent

Keisuke Ohto^{1*}, Shinpei Nakashima¹, Yudai Tanaka¹, Shintaro Morisada¹, Hidetaka Kawakita¹, and Tatsuya Oshima²

¹Department of chemistry and applied chemistry, Saga University, Japan

²Department of applied chemistry, University of Miyazaki, Japan

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Bis(phenyl hydrogen phosphonato)-1-hydroxy-4,6,6-trimethylheptane has been prepared to investigate the extraction behavior of a series of trivalent rare earth metal ions. This diphosphonic acid extraction reagent exhibited high extraction ability to all ions examined, especially Sc ion. It did not exhibit apparent dependency in acid concentration, which corresponds to the ion-exchange mechanism, probably due to extremely high extraction ability. Although the mutual separation of rare earth metals was difficult with this reagent, group separation of rare earth metals over divalent base metals can be accomplished. Compared with the extraction of base metals, it was found that this reagent with branched alkyl chain exhibited lower in extraction ability than diphosphonic acid with linear chain, bis(phenyl hydrogen phosphonato)-1-hydroxy-hexadecane.

Keywords: Diphosphonic acid, rare earth metal ions, extraction

Plenary 2

Carbon Dots: Emerging Solar Energy Conversion Materials

Hui Luo* and Maria-Magdalena Titirici

Imperial College London, United Kingdom

Email address: hui.luo@imperial.ac.uk

Solar hydrogen production from catalytic water splitting is one of the many options available to help generate clean power and alleviate the threatening environmental concerns stemming from the use of fossil fuels. During the past decade, carbon dots (CDs) have shown great potential in their application for solar-driven hydrogen production owing to their exceptional photophysical and electrical properties derived from their sp₂/sp₃ hybridized core structure and rich surface functionality. In our group, we focus on the development of hydrothermally synthesized CDs. Combining structural, photophysical, and electrochemical experiments, we demonstrate the importance of understanding the excited state relaxation processes in finely tuned CD structures is crucial for tuning their optical properties for any potential commercial applications, especially in photocatalysis. The charge injection and electronic communication between CDs and their catalyst support are crucial for enhancing the catalytic activities, and the easy synthetic process of Pt single atoms holds great potential in future advanced catalyst design.

Parallel 1

Dimensionality Reduction and Topological Internal Representations of Neural Network

Pitoyo Hartono

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In this talk, a hierarchical neural network called Soft-supervised Topological Autoencoder (STA) [1,2] will be explained. As shown in Fig. 1, STA is a three-layered feedforward network in which the hidden layer is a topologically-constrained two-dimensional map. Observing a high dimensional input, STA can be trained as an autoencoder, a classifier or the mix of both. The low dimensionality of the hidden layer allows human to visualize the internal representation of the neural network and to gain understanding on the structure of the data in their relevance with the concept attached. Different from most of dimensionality reduction methods, which are either supervised or unsupervised, STA has more flexibility for high dimensional data visualization.

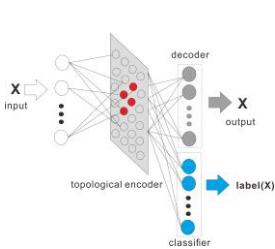


Fig. 1 Outline of STA

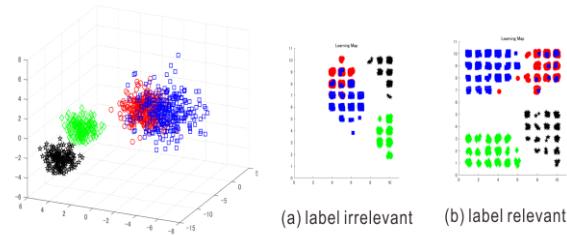


Fig. 2 Topological Maps

Figure 2 illustrates the visualization flexibility of STA, in that (a) shows the two-dimensional representations of three-dimensional data in the leftmost of this figure when the STA is trained as an autoencoder (irrelevant to the labels of the data), while (b) shows the two-dimensional representations. From Fig. 2(a) and Fig. 2(b) it is obvious that the presence of the labels of the data change the structure of the internal representations, and hence the visualization generated by STA is not only topological but also conceptual, allowing the STA to be flexibly utilized in visual data analysis settings.

The first part of the talk will be for explaining the mathematical behavior of the STA, while the later part will be for explaining its application in real world problems.

The first application of STA is in a new algorithm for predicting the number of cases in COVID-19 in a particular country as recently proposed in [3]. The prediction is executed

based on pairwise similarity between a target country to be predicted and a reference country that has a similar but longer time series of effective cases than the target country. Here, the role of STA is to generate a topological map, which reflects the similarities and dissimilarities of 250 countries/areas' dynamics, that will be further used to select a reference country. Two samples of dynamics' maps are shown in Fig. 3.

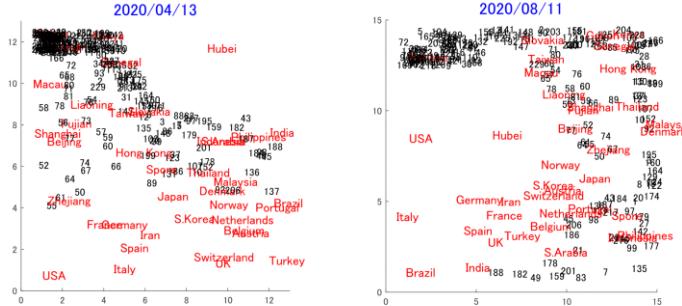


Fig. 3 Dynamics's topological map on covid-19 confirm cases (up to April 13 and Aug. 11)

The second application is for visualizing the internal representation of a neural network trained with reinforcement learning for controlling an autonomous robot in real world environment. The visualization allows human to intuitively understand the behavior of the robot in its running environment, and thus giving better explainability and accountability for machine learning algorithms in real world problems. This application shows the potential contribution of STA to the field of Explainable AI (XAI).

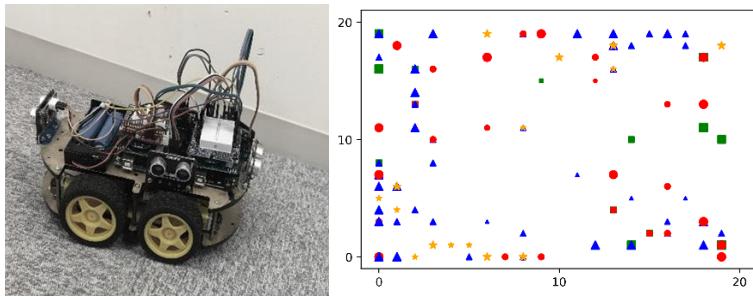


Fig. 4 Learning robot and its topological internal representation

The talk will be concluded with discussion on new ideas for developing self-supervised learning based on the topological internal representation of STA.

References

- [1] P. Hartono, Mixing autoencoder with classifier: conceptual data visualization, IEEE Access, Vol. 8, pp.105301 -105310 (2020).
- [2] P. Hartono, P. Hollensen, T. Trappenberg, Learning-Regulated Context Relevant Topographical Map, IEEE Trans. on Neural Networks and Learning Systems, Vol. 26, No. 10, pp. 2323-2335 (2015).
- [3] P. Hartono, Similarity Maps and Pairwise Prediction for Transmission Dynamics of COVID-19 with Neural Networks, Informatics in Medicine Unlocked, Vol. 20, 100386 (2020).
- [4] S. Kuramoto, H. Sawada, P. Hartono, Visualization of topographical internal representation of learning robots, Proc. Int. Joint. Conf. on Neural Networks (IJCNN 2020) (in press).

Parallel 2

Towards Efficient Solar Fuels Production—from materials to large-area devices

Fatwa F. Abdi

Institute for Solar Fuels, Helmholtz-Zentrum Berlin, Germany

The generation of chemical fuels (e.g., hydrogen, hydrocarbons) using sunlight offers a carbon-neutral route to meet the ever-increasing world's energy needs. In recent years, significant progress has been reported, especially in solar water splitting, but two major challenges remain. First, although solar-to-hydrogen (STH) efficiency as high as 30% has been demonstrated, the use of expensive and non-scalable III-V semiconductors is required.[1] On the other hand, low-cost metal-oxide based devices, using mainly BiVO₄ as the absorber, have only achieved STH efficiency of less than 10%, due to the limited absorption of BiVO₄. [2,3] Novel metal oxide semiconductors with a bandgap of 1.7-1.9 eV, which are stable and efficient, are therefore desired. The second challenge is related to the scale-up of the devices, from laboratory experiments to large-area device demonstrations. Several efforts exist, but the performance of the large-area devices is still significantly smaller (up to a factor of 5) as compared to the small-area equivalent.

In this talk, the principle of solar fuel devices, both from the material requirements and the device architecture's point-of-view will be elaborated, and our efforts in overcoming the two challenges above will be presented. As for the novel metal oxide semiconductors, we have recently reported high-quality 1.9eV bandgap α -SnWO₄ films prepared by pulsed laser deposition.[4] These films were found to self-passivate due to the fast oxidation of Sn²⁺ to Sn⁴⁺ by the photogenerated holes. This could, however, be prevented by applying a suitable protection layer, resulting in stable sulfite oxidation photocurrents of up to 0.75 mA/cm² at 1.23 V vs. RHE. The basic bulk and interfacial properties, challenges, and perspectives of this new material will be critically discussed. Concerning the scale-up of devices, we discovered that straightforward scale-up of spray-deposited BiVO₄ photoanodes from <1 to 50 cm² results in significant ohmic losses, which scales with increasing area. An unbiased 50 cm² solar water splitting device is demonstrated with an STH efficiency of 2.1%. [5] While this is the highest reported value for a large-area (> 10 cm²) BiVO₄-based water splitting device, it is still a factor of 2-3 lower than the efficiency achieved using the same small-area device. By performing a series of control experiments, we found that factors other than the BiVO₄ itself, such as substrate conductivity, electrolyte conductivity, and cell geometry, are responsible for a total voltage loss of 600 mV and therefore limit the performance of the large-area device.

The different loss mechanisms associated with scaling-up photoelectrodes were further quantified using a combination of finite element analysis multiphysics modeling and in-

situ quantitative analysis of the fluid dynamics and pH of the electrolyte using particle image velocimetry and fluorescence techniques. Based on these insights, electrochemical engineering strategies to overcome the losses associated with scale-up are offered, which would limit the voltage loss for large-area devices to less than 50 mV.

References

- [1] J. Jia, L. C. Seitz, J. D. Benck, Y. Huo, Y. Chen, J. W. D. Ng, T. Bilir, J. S. Harris and T. F. Jaramillo, *Nat. Commun.*, 2016, 7, 13237
- [2] J. H. Kim, J.-W. Jang, Y. H. Jo, F. F. Abdi, Y. H. Lee, R. van de Krol and J. S. Lee, *Nat. Commun.*, 2016, 7, 13380
- [3] F. F. Abdi, L. Han, A. H. M. Smets, M. Zeman, B. Dam and R. van de Krol, *Nat. Commun.*, 2013, 4, 2195
- [4] M. Kölbach, I. J. Pereira, K. Harbauer, P. Plate, K. Höflich, S. P. Berglund, D. Friedrich, R. van de Krol and F. F. Abdi, *Chem. Mater.*, 2018, 30, 8322-8331
- [5] I. Y. Ahmet, Y. Ma, J.-W. Jang, T. Henschel, B. Stannowski, T. Lopes, A. Vilanova, A. Mendes, F. F. Abdi and R. van de Krol, *Sustainable Energy Fuels*, 2019, 3, 2366-2379

Parallel 3

Selective separations by ion exchange resins and ion exchange membranes

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Ion exchangers are defined as insoluble materials carrying reversibly fixed ions. These ions can be stoichiometrically exchanged for other ions of the same sign in an aqueous solution. Ion exchange polymers, particularly ion exchange resins, are crosslinked polymers having fixed functional groups or sites. Functional groups could be charged acidic, basic, or chelating groups attached to the polymer matrix. The charge of each group is normally compensated by an exchangeable ion. Inorganic ion exchange materials do not include functional groups (1, 2). The ion exchange chromatography is one of the most important applications of ion exchange resins. This method is applicable for separation and analyses of all or almost all ionised and ionisable substances such as inorganic ions, organometallics, amino acids, carboxylic acids, organic substances, peptides, proteins etc. In addition, there are many applications for utilization of the ion exchangers in pretreatment prior to the chemical analyses of trace amounts of metals by ICP or AAS methods (2).

Another class of ion exchange materials is ion exchange membranes. Their chemical structures are the same as structure of the ion exchange resins and they are manufactured as sheets, tubes, disks, etc. They can be homogeneous/heterogeneous and used as a separation barrier between two solutions (2).

In this presentation, some case studies using chelating ion exchange resins and ion exchange membranes for environmental clean-up and resource recovery from natural waters will be discussed.

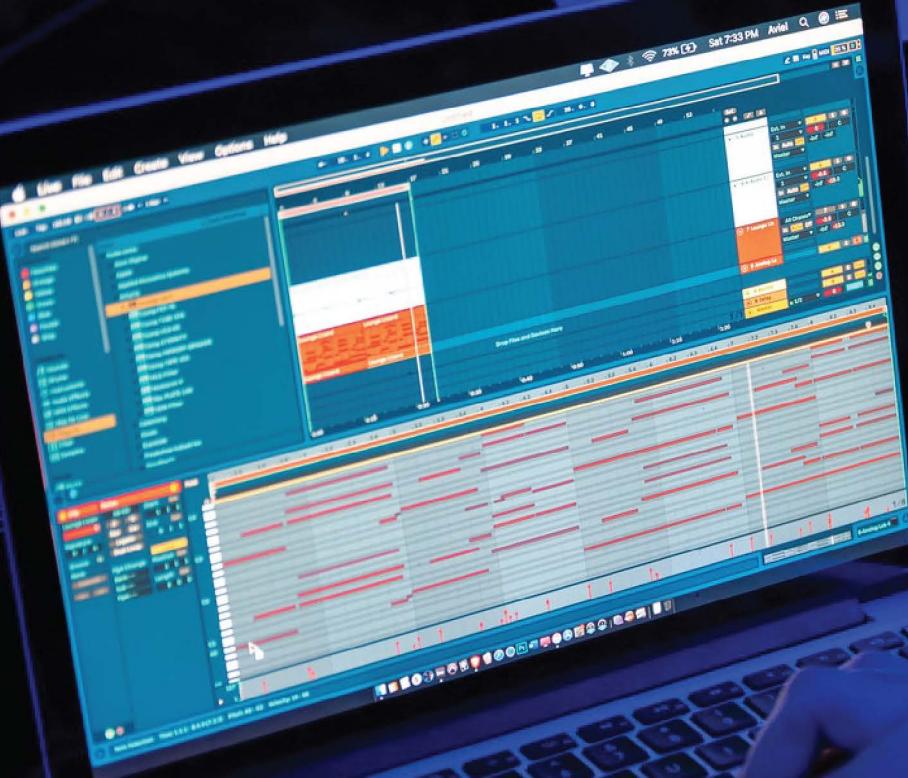
Key words: ion exchange membrane, ion exchange resin, electrodialysis, separation, water.

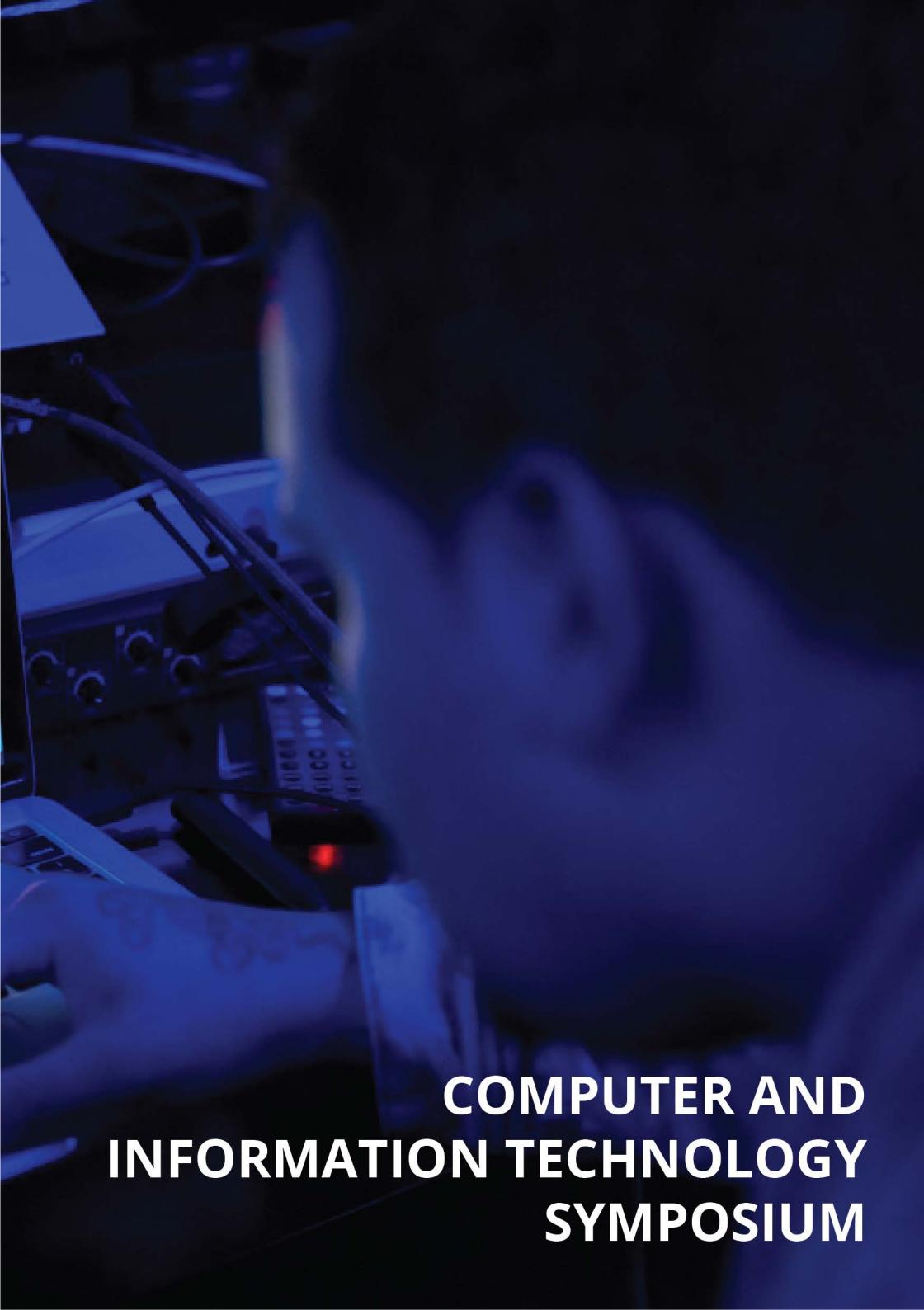
This research has been financially supported by TÜBİTAK-NCBR (Project No. 117M023). I would like to thank Organizing Committee for the kind invitation to give this presentation. I am also grateful to my co-workers and students who have contributed greatly our research work.

References

[1] Helfferich, F. (1962) Ion Exchange, McGraw Hill, New York.

[2] Zagorodni, A.A. (2007) Ion Exchange Materials-Properties and Applications, Elsevier, Amsterdam.



A dark, moody photograph showing a person's hands on a computer keyboard. The scene is lit from the side, creating strong shadows and highlights against a dark background. The person is wearing a light-colored long-sleeved shirt. In the background, a computer monitor is visible, though its screen content is not clear. The overall atmosphere is focused and professional.

COMPUTER AND INFORMATION TECHNOLOGY SYMPOSIUM

The Adoption of MOOC to Improve Engineering Design Skill in a Capstone Project

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One of the efforts to improve the quality of Engineering education is to implement Outcome-based education (OBE). OBE emphasizes how every educational process produces outcomes that can help students achieve the competencies listed in student outcomes (SO). In engineering education, one of the aspects that become the competence of Engineering students is the ability to do Engineering Design (ED). Engineering design is a summative ability to identify problems, analyze problems, design solutions, and measure the success of solutions. One way to achieve this capability is to apply the Capstone Project (CP) in the learning delivery. The capstone project provides a multifaceted project that serves as a culminating academic and intellectual experience for students. However, the limitation of credit hours and the uniqueness of each course in a study program implement the Capstone Project challenge. Therefore, the quality of the capstone project will be different between one student to others. This research sees the opportunity of MOOC (Massive Open Online Course) to accelerate the engineering design skill by implementing the capstone project in blended learning delivery or as enrichment material. The article proposes an instructional report that shows how to implement a capstone project with the help of MOOC. As a result, it is shown that the xMOOC model can be applied to enriching engineering design skill. It shows that the assessment model that conducted in MOOC provides an effective way to measure the student skill that planned in course outcome.

Keywords: outcome-based education, engineering design, capstone project, MOOC

User Interface and Usability Assessment of mobilebased Smart City using Webqual 4.0 Approach: an insight of Madura Island Districts

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User Interface and Usability is one of the essential factors that must be well-thought-out in designing and implementing mobile-based smart city services. This is done to ensure the usability and convenience aspects of the system to be carried out by clients in using smart city services. However, the application of smart city services still does not pay much attention to user interface and usability factors, affecting mobile-based smart city services to be inaccessible and causes user motivation to use the system to become very low. This study aims to conduct an assessment of mobile-based smart city services as of the perspective of stakeholders of smart city service users. The method used in this study is WEBQUAL 4.0, with data collection using stratified random sampling conducted on 328 stakeholder respondents who use mobilebased smart city services. Data analysis was performed with the help of AMOS software version 23.0. The result is a significant correlation between the variables in the Webqual model. This research contributes to the confirmation of modelling in the study of technology adoption in mobile-based smart cities and offers references to the government to give more thought to the factors that are important in the realization of smart city adoption.

Keywords: mobile-base smart city, user interface, usability, webqual 4.0, technology adoption

Linear Dislocated Time Series – Deep Neural Network for Bearing Fault Classification

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Bearing is a critical component in an induction motor. Diagnosing bearing fault is one of important task in maintenance activities. Deep learning has been applied for diagnosing bearing fault. This paper compares several dislocating methods as the input for Deep Neural Network (DNN) which will be used for classifying electric motor bearing fault. Linear Dislocated Time Series (LDTS) is proposed and evaluated for feeding (input) of Deep Neural Network. The result shows that LDTS gives the better accuracy (97.29%) compared to other dislocating methods.

Keywords: Classification, Linear Dislocated Time Series, Deep Neural Network, Bearing Fault, Accuracy

Combination of First Order Statistical Feature and Gray Level co-occurrence Matrix for Cirebon Mask Classification

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Indonesia culture captivates people both domestically and internationally. One of the prominent cultures is Cirebon Mask. There are five types of Cirebon masks: Panji, Samba, Rumyang, Tumenggung, and Kelana. Sadly, the Cirebon mask is already on the verge of extinction because of the local people do not want to learn and preserve the understanding of Cirebon mask. To prevent extinction, we digitise the mask and build a machine learning model to categorized the Cirebon Mask based on its type, which will be used as content-based image retrieval. In this work, we present texture features using a combination of first-order statistical features and GLCM features while K-Nearest Neighbour and Support Vector Machine acted as the classifier. The best accuracy of this research is 92.96% Index

Keywords: Cirebon Mask; Combination features; GLCM; Indonesian culture; first order statistical features

Factors Affecting the Implementation of SIKD at the National Archives of the Republic of Indonesia

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SIKD is an application designed by the National Archives of the Republic of Indonesia (ANRI) to handle the records management. The functionality of application includes the creation, use and maintenance, and disposal of records. This application can be used in the management of records for agencies, including ANRI. Based on the evaluation report on the implementation of applications in 2019, the users were only amounted to 86% of the target users. With these results, the management of records becomes less effective because of the incomplete records filling, while the records must be ensured that they are authentic, complete, and reliable. This study uses the Technology Acceptance Model (TAM) as a basis and external variables from the ISSM and UTAUT model. The questionnaire was designed as an instrument to collect data. Valid samples collected were 112 out of 125 total population of application users. The data obtained were processed using Structural Equation Modeling (SEM). The research framework contributed to 0.625 (R square). From 9 (nine) independent variables, it was found that 5 (five) factors had a significant influence in using SIKD application, they are Information Quality, System Quality, Perceived Value of Records, Self-Efficacy, and Top Management Support.

Keywords: SIKD; Information System; Application; e-Government; Records Management System; User Acceptance; Technology Acceptance Model.

Topological Signatures as Complementary Features for Deep Learning Model: A Survey

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In the past recent years, the applications of topological data analysis in machine learning context has grown rapidly and covered a wide variety of problems. This trend can be explained through the nature of topological signatures which offers a compact description about the shape of data. One of the most used method of topological data analysis is persistent homology. Some studies have suggested that persistent homology could extract features that hardly noticed by other methods. Thus, incorporating persistent homology in machine learning frameworks could give additional information to the model and potentially produce better results. On the other hand, deep learning has shown its remarkable ability to automatically learn features from data. However, it is hard to know what kind of features it may learn and whether there are other useful features which are overlooked by the model. This paper reviews some of the applications of persistent homology in machine learning problems. More specifically, we try to focus on how topological features are exploited along side features which are generated from neural network layers. We systematically analyze the methods used to combine those features and why topological information can be helpful in those problems. The purpose of this study is to summarize evidence about the role of topological features as complementary information to a deep learning model and provide ideas about what kind of problem could benefit from it. We found that data with meaningful spatial relationship and insensitiveness towards tiny fluctuation could take advantage from using persistent homology.

Keywords: machine learning, topological data analysis, persistent homology

Determinant Factors of Hospital Information System (HIS) Success at XYZ Hospital Using Delone McLean IS Success Model

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As a government institution, XYZ hospital is currently trying to transform its service to improve patient satisfaction by implementing a Hospital Information System. After being implemented in a year, there are many complaints related to the new system. This study is intended to find out factors influencing user satisfaction and net benefit perceived by users at XYZ hospital by using Delone McLean IS Success model. To collect the required data, a set of questionnaires was developed according to the model. Partial Least Square-Structural Equation Model (PLS-SEM) was used to test the research model with SmartPLS 3.0 software. The result of this study with 73 respondents shows that system use, user satisfaction, and organizational factors influence net benefit, while information quality, system quality, and service quality has a significant effect on system use, but only information quality and system use has a significant effect on user satisfaction.

Keywords: Hospital Information System, Delone McLean IS Success Model

Network Architecture Search Method on Hyperparameter Optimization of Convolutional Neural Network: Review

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Deep Learning is a widely used method to solve various kinds of problems. One of the deep learning methods that are used for image classification is Convolutional Neural Network. Convolutional Neural Network has a lot of architecture. Those architectures were manually made and had excellent performance. However, due to a large number of cases tested, it results in the architecture has to be adjusted to the case. If this is manually done, then it should be time-consuming. So there should be an automatic approach to search the appropriate architecture. Neural Architecture Search is one method that is used to search for the appropriate architecture. This paper is containing reviews of Neural Architecture Search method for hyperparameter optimization on Convolutional Neural Network which is done by today's researchers.

Keywords: Neural Architecture Search, Convolutional Neural Network, hyperparameter, optimization

Deep Learning for Sentiment Analysis in Indonesian Novel Review

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The rapid development of technology, especially in the internet field, is influencing the increasing number of texts available. In recent years, there has been an increase in research on the internet or social media to find out the sentiments in the review text. Sentiment analysis is a part of Natural Language Processing (NLP), which can help to show whether certain opinions tend to contain positive opinions or negative opinions. In this study, three sentiment polarities were studied using an Indonesian novel review dataset. Data was classified using the Long Short-Term Memory (LSTM) approach, one of the deep learning methods. To increase success rate, we used pre-trained word embedding to represent words into vectors. The analysis was performed by comparing the word embedding model using GloVe, Word2Vec i.e. Continuous Bag of Words and Skip-gram, and FastText i.e. Continuous Bag of Words and Skip-gram. The experimental results showed that sentiment analysis using the FastText Continuous Bag of Words model reached the highest accuracy of 80% while the Word2Vec Skip-gram model had the lowest accuracy of 78.3%. So, it can be concluded that the implementation of the FastText CBOW model is accurately used as a word representation to analyze sentiments on Indonesian novel review.

Keywords: Sentiment analysis, Word Embedding, GloVe, Word2Vec, FastText, LSTM

Designing an Information System Effectiveness and Efficiency Measurement Model by Modifying The Human Organization Technology-Fit Model

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Assessing the effectiveness and efficiency of the information system remains a challenge. Based on the literature, there is no specific model for measuring the effectiveness and efficiency of the information system. This is in line with the assessment of effectiveness and efficiency information systems in the field of government service. This paper remodeling the domains and indicators of the Human Organization Technology (HOT) Fit model to measure the effectiveness and efficiency of the information system. It was designed to be used on an information system in the local government. Indicators found and developed should be matched to the object. The result of the study is the modified HOT Fit model with the elements of effectiveness and efficiency be used to measure government information systems.

Keywords: effectiveness indicators, efficiency indicators, HOT Fit Model, government service, effectiveness measurement, efficiency measurement

Analysis of Extended Enterprise Implementation in E-Commerce Business Model Case Study PT. XYZ

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XYZ is one of the online marketplace businesses in Indonesia that applied extended enterprise to support its business processes. This study aimed to find out how the application of extended enterprise carried out by XYZ and its partners. The capabilities, benefits, and challenges faced by XYZ in implementing this extended enterprise were analyzed. This research also formulate recommendations for the improvement of XYZ's extended enterprise. The qualitative methodology used in this study. Data collected based on observations, interviews, and literature studies which mapped to list out challenges based on factors of the extended enterprise and ABC model to show recommendations. The results of this study indicate several challenges faced, such as information mismatch, lack of service standards by partners, and differences in work culture between partners and XYZ. Recommendations that given include the provision of tools and support systems, establishing SLAs with partners, and the application of knowledge sharing between the organization's business units.

Keywords: extended enterprise, ABC model, e-commerce, business model, collaboration

Lung and Colon Cancer Detection with Convolutional Neural Networks on Histopathological Images

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Lung cancer is deadly cancer same as colon cancer, both of them can grow simultaneously. Most researchers conduct research to detect one disease on one single body organ. So in this study, we proposed a computer-aided diagnosing system using the Convolutional Neural Network (CNN) to detect lung and colon cancer tissues on the LC25000 dataset. The LC25000 dataset contains 25000 histopathological color image samples of colon and lung tissues which indicated cancer (adenocarcinoma) or not. In this study, we used three pre-trained CNN models, which are ShuffleNet V2, GoogLeNet, and ResNet18 also one simple customized CNN model. From the evaluation metrics tables given in this study, the highest accuracy to classify lung cancer was gained by ResNet18 with 98.82% accuracy but the shortest training time gained by ShuffleNet V2 with 1749.5 seconds. ShuffleNet V2 was the best model used to classify colon data, it gives 99.87% accuracy with the fastest training times 1202.3 seconds. The customized CNN model proposed by us get 93.02% accuracy to classify lung cancer and 88.26% accuracy for colon cancer. The proposed CNN model also gained the shortest training time which was better than GoogLeNet and ResNet18.

Keywords: lung and colon, histopathological data, image classification, convolutional neural network, deep learning

Comprehensive Survey of Cloud Intrusion Detection System

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Intrusion Detection System provides services related to surveillance of computer security, as one of the minimum components that must exist in a computer network architecture. Regarding the adoption of cloud technology, many users have switched to using cloud computers to operate servers, applications or the web in cloud computing. To meet the security needs of users, various open source and commercial tools are being developed. Although many developments have taken place in the IDS area, in cloud-based IDS many challenges such as security, interoperability, resource scheduling, virtualization still need to be improved. This paper reviews the paradigms and surveys about the Intrusion Detection System that runs on cloud computing in terms of concepts, technology, tools, and various challenges. A systematic literature review of selected papers, published from 2016 to 2020, was carried out to properly understand the Intrusion detection System paradigm in cloud computing and the security challenges faced in cloud computing. This review paper helps researchers who want to start their research careers in the cloud computing-based Intrusion Detection System.

Keyword: ids, intrusion detection, cloud, cids, cloud security

Deep Learning Indonesian Chatbot Using PyTorch for Customer Support Automation

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Abstract – Customer is the frontline as a tool for marketing products or receiving product complaints. Increasing the business process will be increasing the response rate and response time of answering the customer. Chatbot can automate the customer support system to answer various customer needs. Chatbot is a software that allows human interaction with machines using natural language. The Generative Chatbot can be trained using the conversation dataset and generate response based on input. In this research, are build the generative Indonesian chatbot model using Deep Learning. The method of Deep Learning is Sequence to Sequence with Attention using PyTorch framework. This chatbot make customer support automation and help the customer support faster to answer the question. The initial result of this chatbot have BLEU Score of 0.982.

Keywords: Deep Learning, Generative Model, Indonesian Chatbot, PyTorch, Customer Support Automation

Classification of Visual-Verbal Cognitive Style in Multimedia Learning using Eye-Tracking and Machine Learning

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Multimedia learning is defined as building mental representations from words and pictures. In multimedia learning, the difference in cognitive style indicates different learning strategies. The cognitive styles of visual and verbal exert influence on behavior, preferences, and even learning outcomes. On the other hand, eye-tracking has been used to study cognitive aspects during multimedia learning. Unfortunately, previous studies on the identification of cognitive styles were limited to statistical descriptive analysis. The use of eye-tracking was limited merely for validation purposes. In addition, previous studies have yet to apply automatic classification of cognitive style based on eye-tracking data. Hence, this study proposes a method to automatically classify visual-verbal cognitive styles based on eye-tracking metrics. We implemented three shallow classifiers: K-Nearest Neighbors, Random Forest, and Support Vector Machine. Based on our experimental results, Random Forest—enhanced with two selected features from SelectKBest—gained 78% of classification accuracy. Our study has been the first investigation that reveals the possibility of implementing machine learning for automatic classification of cognitive styles based on eye-tracking data.

Keywords: cognitive style, visual-verbal, multimedia learning, eye-tracking, machine learning

Improvement of the Automatic Gamma Correction Method in Cloud Image Detection

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Clouds become an important part of human life and study in several disciplines in the form of important analyses in some applications. Examples of application of cloud analysis on solar panels or photovoltaics, accurate weather forecasts, accuracy of rainfall predictions, application in the field of meteorology, imaging of the sky in some cases, air humidity survey, and the case of turbulence on Aircraft caused by clouds cumulonimbus. The structure and shape of the clouds are continuously changing, becoming an interesting part to detect. The cloud detection process can be done by taking several samples of imagery from the cloud and the image processing process is done. Most research processes RGB cloud imagery into HSV cloud imagery, Some research using the image detection method of flying apply the channel's convolution R-B, R/B, , and chroma C = max (R, G, B)- min(R, G, B). Gamma correction has an efficient characteristic of storing and dividing imagery by small bits, thus the study proposed an image detection development using automatic gamma correction, with ground truth being Image data from SWIMSEG Nanyang Technological University Singapore. The proposed method in the proposed study obtained precision value, and better computing time with a precision value of 0.93 and a computational time of 0.71 sec.

Keywords: Cloud Detection, Gamma Correction, Image Processing

Applying fuzzy logic to improve the accuracy of Duval Triangle State Estimation Analysis for DGA based transformer fault classification

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In the electricity transmission and distribution network, power transformers are one of the most important and expensive equipment. This transformer equipment determines the availability and reliability of the power grid. Availability and reliability of transformer equipment will have a direct impact on the distribution of electricity to consumers so that it also has an impact on the financial sector. One of the most popular methods to keep the transformer from failing is to conduct dissolved gas analysis on transformer oil that is called Dissolved Gas-In-Oil Analysis (DGA). Duval's Triangle State Estimation Analysis is one of the popular DGA based methods. Because the behavior of DGA data is considered not linear, then a non-linear approach to improve the accuracy of this method is required. The purpose of this experiment is to demonstrate whether the non-linear approach based on fuzzy logic is able to provide an improvement in the accuracy of the Duval's method in diagnosing power transformer potential fault types based on DGA data. The result of this experiment shows that in overall the fuzzy logic approach increase the accuracy of 91.88% compared to the 82.90% of the original Duval's method.

Keywords: transformer, Dissolved Gas-in-oil Analysis (DGA), Duval's Triangle, fuzzy logic

Designing ERP System for Smart SMEs using Service Oriented Architecture Method for Smart Point of Sale

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SMEs play an important role in economic growth, especially in Indonesia. With the increasing number of SMEs in Indonesia each year, competition is increasing. In the activity of selling in offline stores, most SMEs still do it manually so that errors often occur such as the daily sales data, financial data, and stock data. Therefore one of the solutions to improve quality and also competitiveness is, SMEs must develop a system that can be used as a standard to carry out sales activities in offline stores that are carried out daily. In this research, the solution provided is to design Cloud-based ERP system for SMEs named Smart SME by implementing a point of sale module in Odoo with the advantages of Smart features integrated with accounting and warehouse, there are also automatic receipts and invoices that can be sent directly to the customer's email. In this design using the Service Oriented Architecture method but only at the design stage, namely the Service Oriented Design stage. The results of this study are the design of ERP-based Smart SME systems by implementing the Point of Sale module to be standardized in sales activities in offline stores.

Index Terms: ERP, OpenERP/Odoo, Smart SMEs, Point of Sale, SOA

The Improvement of Character Recognition on ANPR Algorithm using CNN Method with Efficient Grid Size Reduction

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Automatic Number Plate Recognition (ANPR) is mainly divided into three steps: plate localization, character segmentation, and character recognition. Among those steps, character recognition is the most significant influencer on ANPR accuracy. One of the popular methods that have impressive performance and commonly used recently is Convolution Neural Network (CNN). However, max-pooling layers within CNN architecture are prone to lose information during the downsampling of feature maps. Our proposed method is using efficient grid size reduction, replacing the max-pooling layer to overcome the problem. To evaluate our proposed method, a dataset that contains images of number plate characters divided into 36 classes, which represent letters A - Z and numbers 0 - 9. Each class consists of 100 images as a data test and 400 images as a data train. Experiments showed that our proposed method improved accuracy from 91.51% to 93.87%, which is 2.36% better.

Keywords: ANPR, CNN, Convolution, max-pooling, character recognition, concatenate

Epileptic Electroencephalogram Signal Classification using Wavelet Energy and Random Forest

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Epilepsy is a severe neurological disease that affects more than 50 million people worldwide. The diagnose of epilepsy can be done by analyzing the electroencephalography (EEG) recordings. Neurologist needs to find minimum one seizure (ictal) condition in the recording through a visual inspection. However, this process is time-consuming and needs a lot of practice. A computer-aided diagnose to detect the ictal condition is needed to assist the neurologist in inspecting the EEG signal recordings. This study proposes the use of Wavelet energy (WE) as the feature extraction method to extract the information of the EEG signal. The calculation of WE is done in five EEG sub-bands producing five features for each signal. The features then fed to Random Forest (RF) classifier to classify three epileptic EEG conditions using five classification problems (CPs), covering the ictal vs. nonictal condition. The combination is able to reach 100% of accuracy to classify interictal vs. ictal conditions (CP2). While the other CPs achieves accuracy from 73% to 98%. These results indicate that the use of WE is suitable for extracting the information of the EEG signal to detect epilepsy by finding the ictal condition.

Keywords—EEG, Epilepsy, Random Forest, Seizure, Wavelet Energy

Phonocardiogram Classification using Multilevel Wavelet Packet Entropy and Random Forest

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Heart sound is an acoustic signal that occurs due to the pumping process of blood in the heart. Heart sounds have different information than ECG signals because they reflect different processes. Heart sounds are heard using a stethoscope and are assessed subjectively. Various methods are used to analyze heart sounds digitally. In this study, a multilevel wavelet packet entropy (MWPE) method was proposed for the heart sounds feature extraction. MWPE was performed using five types of mother wavelets with decomposition level 7 and tested on four classes of heart sound data. The highest classification accuracy reached 96.7% using the random forest as a classifier. These results indicated that the proposed method provides pretty good performance for the classification of heart sounds.

Keywords: heart sound, random forest, wavelet packet entropy

An Augmented Reality Application for Animal Learning Media at Alian Butterfly Park

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Augmented Reality (AR) is an interactive computer program that combines real and virtual objects. In this study, we developed an AR technology that aims to educate visitors to the Alian butterfly park. The application development is based on a preliminary study to the Alian butterfly park location, there are several obstacles in the system of providing educational information to visitors, including butterfly education depending on the facilitator, in an uncertain season the butterflies result in the number of butterflies in the park having small amount, the butterfly museum collection does not display complete information because there is only the name of the butterfly and a brief explanation and the absence of interactive learning support media. Based on the problems, AR application developed packaged in the form of interactive information and educational games targeted to kindergarten to elementary school students. The development method used in this study id Feature-Driven Development. The result of this development, there are three main features developed in this application, namely, butterfly introduction game, quiz, and collecting butterfly cards. From the result of black box testing, it concludes that all the features are well functioned. Therefore, this application is ready to use. This research is limited to the features development, for further research can evaluate the developed application.

Keywords: Augmented Reality, Gamification, Educational application

Performance Analysis of Profiling Module in Data Quality Management Application using Open Source Tools

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Data quality becomes one of the important data management processes in an organization. Each organization has a goal to improve data quality by reducing data that is inconsistent, wrong, lost, and duplicate in data sets. Initial detection in the data quality process begins with the process of data profiling according to the phase-in data quality management. The use of pentaho logic components and job triggers in DQM applications that have been made requires a further review of the effects on application performance. This paper aims to measure and improve the performance of the profiling data process in the open source-based DQM application that has been made. Measurement of application performance level in this study using performance testing methods. Performance testing is used to measure the level of response, throughput, and application reliability. The results of this study will compare the performance level of existing DQM applications with DQM applications after adjustments are made to find out which performance is superior. The advantage of this research is knowing the importance of performance and performance measurement in the application.

Keywords: data quality, data quality management, data profiling, application performance, performance testing

Cardinality Single Column Analysis for Data Profiling using an Open Source Platform

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Abstract—Data quality is essential for an enterprise system. However, several problems can eradicate the quality of data. One of them is the unfiltered data received. To overcome this issue, data engineer usually handle this such data by deploying data profiling process. There are several tools available to do this process. Each tool has its advantages according to needs. The main focus of this research is to compare the analysis results of two open-source data profiling tools based on cardinality method. The tools are Pentaho Data Integration (PDI) and Data Cleaner. The results of this study indicate that Pentaho can search for median values and distinct values for the data performed by profiling, while data cleaners cannot search for these values. Thus that Pentaho Data Integration is more detailed and specific compared to Data Cleaner

Keywords: data profiling; cardinality; pentaho data integration; open source; single column analysis

Design Guidelines and Process Of Reference Data Quality Management Based on Data Management Body of Knowledge

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The rapid development of technology produces diverse data and information that influences the process of decision making. Therefore, organization needs quality data as a basis for decision making that are accurate and trustworthy. Data quality is an essential supporting factor to process a data in order to produce a valid information that is needed by the company. One of the solutions is data governance process namely data quality management. This becomes the groundwork in the design of a data quality management since it becomes the academic and professional issue. This research focused on the analysis of data quality methodologies with guidelines, process and improve data quality in application or organization based on Data Management Body of Knowledge. This is necessary in order to measure and identify the deficiency and choose the best strategy to enhance data quality so that the company can maintain the consistency of its high-data quality.

Keywords: data governance, data quality, data quality management, guidelines, validation

A Specific Infinity Loop Model in TCG

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Trading card games have been known since their emergence for their complexity and versatility. Among them, there are various possibilities for cooperation between the cards. An ideal state is that players can achieve "infinite" operations through a specific combination of cards, which can then defeat any opponent and achieve the ultimate victory in the game. This paper observes the "infinite" phenomenon in a card game. It assumes specific operation and game scenarios and abstracts it into a mathematical model. The emergence of this model means that TCG developers need to carefully consider the possible multi-card-chain reaction when designing cards to avoid possible problems when the game is running.

Keywords: Game Design, Trading Card Game, Hearthstone, Infinity Loop Model, Mathematical Model

Indonesian Question Classification Using Feature Extraction and Selection Approach on Coarse and Fine Taxonomy

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The question classification phase is considered as one of the most significant phases in a Question Answering System to help the system find or construct an accurate answer which results in an improvement of the quality of question answering systems. In this work, we proposed a question classification into a 2-layer taxonomy called Coarse-Fine taxonomy. This is the first work for Indonesian question classification into Coarse-Fine taxonomy. We employed a feature selection and machine learning classification using Support Vector Machine algorithm. In the feature selection, we found that Unigram + TFIDF + Word Shape is the best combination that reached the highest accuracy with 92.9% in Coarse category. On the other hand, the combination of Unigram + TFIDF + WH word features is the best combination for Fine category with 79.3% accuracy.

Keywords: question answering system, machine learning, natural language processing, question classification, text mining

Modeling of Personality Traits based on Demographic Data on Multi-Races Samples of Ages from 13 to 50 Years Old: Investigating the Effect of Race on Model

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The current method to predict personality in personality-based recommender systems is by using Personality Extraction from Text (PET). Since this method has a flexibility weakness, a new method that is based on demographic data is proposed. The objective of this paper is to study the effect of race on the resulted model. In this study, we compare models obtained from International data, which comprise many races, and SE Asian data containing only one race. The results of the study reveal that races do influence the accuracy of the model. The International models are less accurate than those of SE Asian models are. We suspect that this happens because each race has its own personality level. This claim is supported by previous studies on personality differences across nations. These studies have found that personality differences across nations do exist. Therefore, we hypothesize that the more homogenous the data in terms of race, the more accurate the model.

Keywords: modeling; personality traits; demographic data; personality-based recommender system; cross-cultural personality difference; two-way analysis of variance

Image Enhancement on You Only Look Once (YOLO) Method to Detect Public Transportation of CCTV Image

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Traffic congestion can cause many problems. Traffic congestion is usually caused by unmanaged public transportation on traffic. To manage public transportation, a system capable of automatic detection from CCTV is needed. This research aims to identify the public transportation on the CCTV image automatically. This automatic system is using artificial intelligence. The artificial intelligence method used in this research is You Only Look Once (YOLO), one of the deep learning methods. In this research, we implement a contrast adjustment method on an image before training deep learning. The YOLO method can detect public transportation from CCTV dataset. This method of this research obtained a high mAP score. The mAP score in this research is 92.79%.

Keyword: artificial intelligence, deep learning, Image Enhancement, Object Detection, Yolo

Numerical Simulation of the Effect of Residual Stress on Dented Pipe to the Pipeline Failure

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Abstract— Dent defect on the pipeline can cause the failures of pipeline system. This research uses numerical simulation to discuss the effect of residual stress, which arises from indentation process, on the pipeline failure subjected to internal pressure variation. Finite element method, including nonlinear material property and geometry, is used on this analysis. Dent defect is formed from a rectangular indenter. The magnitude of load in the form of pipe internal pressure is varied so that the stresses distribution causing the failure of pipe material is identified. The failure criterion uses von Mises yield theory. The simulation results show that the failure of pressurized dented pipe is significantly affected by the associated residual stress. The maximum von Mises stress, as critical stress, is around the magnitude of residual stress when the dented pipeline is subject to various internal pressures. The reduction of internal pressure on the pipe does not change the location that causes the pipeline failure. The dent area remains the critical location.

Keywords: pipeline, dent, simulation, residual stress, internal pressure

Operational Dashboard Development as A Data Quality Monitoring Tools Using Data Deduplication Profiling Result

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Data quality is a crucial thing presently. Poor data quality can lead to business failure and wrong decision making. One problem that arises when merging several databases is the emergence of data duplication. When merging two applications of a government agency first, it causes 39,3% of data duplication. It can cause some business problems such as storage cost, wasted marketing budget, lack of a single customer view, and lost productivity. For this reason, data quality monitoring needed to monitor and control the duplicated data. This study is a follow-up study focusing on developing a data quality monitoring module using data deduplication profiling results. The method used to develop the dashboard in this study is the operational dashboard development methodology that proposed by Suryatiningsih on her research (2011). The methodology consists of six stages, namely requirement identification, plan process, prototype design, review prototype, implementation process, and system testing. By adjusting to the predefined business rule and KPI, the operational dashboard will help the organization to monitor and control their data quality.

Keywords: data quality management, data quality monitoring, operational dashboard, data deduplication, KPI

The Study of the Barriers to Digital Transformation in Higher Education: A Preliminary Investigation in Indonesia

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The implementation of digital transformation has been carried out in various industrial sectors, including the higher education sector. Many countries have considered changing their education system by doing digital transformation. Although digital transformation has the potential to improve the education system, developing countries still find it difficult to reap the benefits caused by certain barriers. The purpose of this study is to investigate the barriers faced when implementing digital transformation in higher education, in this case in Indonesia. The results of the questionnaire survey ensured that of the twenty-two barriers identified based on a literature review, eleven barriers significantly affecting the implementation of digital transformation in Indonesian higher education. This study contributes by revealing initial set barriers of digital transformation in the higher education sector. The findings of this study will help identify barriers that influence the direction of decision strategies for implementing digital transformation in higher education institutions in Indonesia.

Keywords: digital transformation, barriers, higher education, new educational system, developing country.

Comparison of Vigenere Cipher and Affine Cipher in Three-pass Protocol for Securing Image

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In the current era, internet development has forced data confidentiality to become more crucial. There are several file types that frequently exchanged through the internet, such as text, image, video, audio, and so on. Image file is the most frequently misused by the irresponsible internet user, thus image security is highly important to conduct. Cryptography is a field of study to keep up the confidentiality of data distributed through networks. In this study, authors conduct image security using the classical cryptography algorithm, Vigenere Cipher, and Affine Cipher, and both Vigenere Cipher and Affine Cipher are implemented in Three-pass Protocol to avoid exchanging keys. It is impossible for the attacker to obtain the key since each sender and recipient keeps the key securely. The purpose of this study is to implement Vigenere Cipher and Affine Cipher in Three-pass Protocol and perform a comparison based on encryption result and execution time at each stage of the Three-pass Protocol. The results show that Affine Cipher in Three-pass Protocol performs encryption better than Vigenere Cipher in Three-pass Protocol in terms of its encryption results. However, in terms of execution time, Affine Cipher in Three-pass Protocol takes execution time longer than Vigenere Cipher in Three-pass Protocol.

Keywords: cryptography, vigenere cipher, affine cipher, three-pass protocol, image security

Sentiment Analysis Website of Online Hotel Booking Application Reviews Using the Naive Bayes Algorithm

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Today, there are many applications available on the Google Play Store, especially the online hotel booking application. In Indonesia, 2 out of 3 people book hotels online and users also rely on digital reviews for travel inspiration as well as research and bookings. Users can find out user satisfaction by looking at reviews from previous users, but it is very problematic if we read the reviews of this application one by one because it takes a very long time. Measuring the level of user satisfaction of an application can be done by knowing how the sentiment from the public. This paper provides an approach to analyzing sentiments for online hotel booking applications based on user reviews on the Google Play Store using the Naive Bayes algorithm. The process starts with data collection using web-scraping, text preprocessing using python, data labeling using SentiStrength, classification with the Naive Bayes algorithm, and website development using Django Web Framework. This website provides information support for users in choosing an online hotel booking application. From this study, the highest accuracy value obtained was 94%.

Keywords: Django web framework, Google Play Store, Naive Bayes algorithm, online hotel booking, sentiment analysis.

A Study of Event Detection Methods in Eye-Tracking Based on Its Properties

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The eye is one of means of human and computer interaction. Naturally, someone will direct their gaze to interesting objects. Eye-tracking is a technology aimed at understanding the direction of human gaze. Event-detection is a process of detecting and classifying eye movements that are divided into several types. Various studies in the field of event detection play an essential role in improving the quality of eye-tracking technology. Discussion of research properties is important to see trends in event detection research and to introduce this research to new researchers. This paper reviews some properties used in eye-tracking research, especially in the field of event detection, including eye data, sampling frequency, types of video-based eye-trackers, types of stimulus, types of eye movements, and signal denoising. This paper also discusses the development of research over the past few years and the challenges faced in event detection research. This review paper can be a guide for new researchers who wish to continue research in the field of eye-tracking, especially event detection.

Keyword: eye-tracking, eye movement, event detection, HCI, human-computer interaction

Predicting Customer Churn of Fire Insurance Policy: A Case Study in an Indonesian Insurance Company

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In an Indonesian insurance company, since 2015, the value of the fire insurance policy portfolio increases from year to year in an Indonesia insurance company. However, the retention rate of their consumers who extend their insurance policies showing a downward trend. In this study, we showcase the application of the Decision Tree model and the Naïve Bayes model to predict loyal or disloyal customers on their insurance subscription. The decision tree model produces better accuracy of 92.4 percent compared with Naïve Bayes model accuracy 82.9 percent. These predictions model help the company to create a more effective marketing strategy by accurately predicting its consumer churn behavior.

Keywords: Fire Insurance; Classification; Decision Tree; C4.5 algorithm; Naïve Bayes

Credit Card Fraud Detection using Stacked Generalization

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Over the years, credit cards have evolved into being the primary payment method. The credit card is an extremely simple payment device issued by a bank. The number of fraudulent credit card transactions is increasing year by year. Malevolent users gain access to sensitive information about a credit card and perform unauthorized transactions. In 2018, the loss due to fraudulent transactions was \$24 billion, it is estimated to be \$31 billion in 2020. With the help of machine learning, it is possible to build a system that can identify whether a transaction was fraudulent or not. This paper proposes a stacking ensemble technique to detect whether a transaction was fraudulent or not. Two open-source datasets have been used, i.e. The German Credit Card Dataset and The Australian Credit Card Dataset. To evaluate the system, it is compared against various supervised learning algorithms as well as existing systems that make use of the same dataset. The proposed system has an accuracy of 97% for the Australian Credit Card dataset and an accuracy of 94% for the German Credit Card dataset and outperforms the various supervised algorithms as well as the existing systems.

Keywords: Fraud Detection, Multi-Layer Perceptron, Ensemble Learning

Analysis of Title Influence on Popularity of Forum Postings using Text Mining: Case Study on Kaskus.com

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The increasing number of internet user influence the rise of internet data. One of the increasing internet data takes the form of online forum postings. These forum postings could be accessed from numerous postings portals on the internet. Some portals show only the posting title to let the readers decide whether they want to read it or not by reading the title only. In this study, the author study whether an online postings headline or title could influence reading interest in the community by using the Naïve Bayes and decision tree methods as a comparison. Based on analysis using Naïve Bayes and Decision Tree algorithm, the result shows that title of postings can influence as high as 73% popularity of the postings.

Keywords: Postings, Text Mining, Naïve Bayes, Decision Tree,

Analysis of Success Factors in The Implementation of ERP System In State Owned Enterprise Case Study PT. XYZ

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PT XYZ is a state-owned company that implements SAP-based ERP system as the part of its IT Governance. However there are many problems that occur since the implementation process is carried out, there are a lot of user complaints related to the system and some users do not understand the use of the system which results in obstruction of their work (blockers). This cause some negative impacts on the company, especially related to financial aspects and employee productivity. Therefore, it is necessary to conduct a study to evaluate what factors influence the success of the implementation process and after that this research will suggest recommendations related to these factors. This study uses a research model adapted from D&M Model, TAM, and ERP CSF. Research variables in this study are Information Quality (IQ), System Quality (SYQ), and Service Quality (SEQ), Perceived Usefulness (PU), Perceived Ease of Use (PE), and Project Success (PS). Data processing and analysis methods in this study used a statistical descriptive analysis approach and SEM-PLS variant analysis. The results of this research are, PS positively affected by PU and PE, PE is positively affected SYQ and SEQ, and PU is positively affected by SYQ, SEQ, and IQ.

Keywords: Enterprise Resource Planning, Success Factor, SEM-PLS, D&M IS Success Model, TAM, IT Governance, State Owned Enterprise.

Estimation of Playout Time in Networks using Fuzzy Logic Approach

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Network quality of service is mainly affected by deficiencies such as jitter, packet loss, and delay. Network jitter as a variable delay represents a serious problem in communication networks. Several attempts have been made to adjust the playout time of packets at the network node, which suffers from variable delay. Some of these attempts tend to make the playout time fixed; another advanced contribution is to have an adaptive scheme to cope with the variable network conditions. In this paper the optimal use of artificial intelligence as an effective tool for taking smart decisions is proposed as a solution to adapt the playout time. First an algorithm was developed to simulations single node in network in different conditions. Several network behavior patterns were extracted from these simulations to represent diverse jitter responses. Next, we introduce an adaptive approach using fuzzy logic model to estimate the playout time. The algorithm has been tested against different network condition patterns. Results reveal that the proposed approach has good results versus various delay conditions. Finally, a comparison has been made to evaluate the performance of the fuzzy logic approach.

Keywords: Fuzzy Logic, Jitter, Network, Playout Time

Classification of P-wave Morphology Using New Local Distance Transform and Random Forests

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P-waves are a form of first wave development in ECG signals that have substantial atrial medical information. Analysing P-waves with manual inspection is difficult because P-waves are small, vary and have a noisy appearance. Automatic classification of P-waves to detect atrial abnormalities is necessary to assist clinicians with faster process. This paper presents a P-wave morphological analysis using a random forest classification from 134 patients. The algorithm defines the data into five classes, namely, Normal, Left Atrial enlargement (LAE), Right Atrial Enlargement (RAE), Biatrial Enlargement (BE) and Atrial Fibrillation (AFib). This study uses ECG Lead II data from 12 standard medical leads. Signal processing and denoising are applied by using two filters, a derivative and Butterworth filter. Feature extraction is explored by using a new local distance transform, which is more efficient than other similar methods. The features used are P-wave morphological attributes such as duration, amplitude, number of appearances, standard deviation, and symmetry. The overall accuracy of our approach was 94.77%, the specificity (SP) was 98%, while the sensitivity (Se) at 10-fold validating the training set was 93%. This result comparable to other best performing algorithms and might be considered a second opinion for cardiologists.

Keywords: electrocardiogram (ECG);P-wave detection; local distance transform; P-wave morphology; random forest classification; Atrium Enlargement; Atrial Fibrillation (AFib).

Question Answering System in the Domain of Early Childhood Education in Bahasa Indonesia

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The purpose of this study is to create a media for teaching staff in early childhood education schools, which is one of the features of the education robot answering system. Speech is used as input and output data from the system. The question answering system is a conversation data in the domain of early childhood education that is collected. Preprocessing stages are performed in the dataset to produce data that can be processed by the system. The question answering system uses the RNN algorithm with the Seq2Seq model. The highest results of the training process are 89.5% accuracy, precision 99.02%, and 70.5% recall. The response generation test also obtained an accuracy of 75%. The results of testing the response to the questions according to the dataset produce maximum value.

Keywords: Question answering system, RNN, Seq2Seq Model, Educational robot, Dataset

Low-cost and Simple Configuration Device-free Indoor Localization: A Review

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This paper focuses on the review of the recent advancement and development of indoor localization focusing on device-free indoor localization (DFIL). DFIL offers more flexibility for the user or object point-of-view. The basic idea is to free the object from the device attached for localization process. The most popular technologies for DFIL are based on wireless technology. However, if we discuss the low-cost system, we have to discuss the fusion or hybrid of many sensors output data to increase accuracy. Some of the accessible technology used for these low-cost systems are wireless-based, i.e., Wi-Fi, ZigBee, radio frequency identification (RFID) and an optical-based, visible light communication (VLC). Wireless-based probably the most used in the low-cost and simple configuration of an indoor localization since the parameter used can be directly obtained from its device. The most used parameter in the wireless-based system is received signal strength indicator (RSSI), which merely the derivation of power by the distance. By this parameter, the technique such as trilateration, min-max, and RSSI database can be used as the location. In the DFIL, RSSI can be applied as the Wi-Fi -based radio map from two or more links and applying an algorithm such as the Bayes Inference, resulting in the accuracy of object tracking up to 86%. On the other hand, ZigBee applies to mesh network and need more nodes to gather more information for higher accuracy results. The RFID has advantages in no-contact, and a good accuracy even in non-line-of-sight (LoS) condition. Optical-based VLC can provide high accuracy but dependent on the light noise and shadow effect in the object. From these benefits and disadvantages of some low-cost systems, we can make the best of them by fusing the sensor or developing the hybrid system.

Keywords—indoor localization, device-free, low-cost, Wi-Fi, ZigBee, RFID, VLC

Classification Driver's Behaviour Using Supervised Algorithm

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At the present time, we discuss the human behavior of driving and death rates due to an accident on the road around the world. Hence, the real-time response of notification about the risk on road is insufficient. Moreover, the most problem is people's lack of knowledge for driving, especially people careless while driving that may lead to an accident. Driver's behavior classification is required in order to prevent unfortunate accidents on the road. Many previous studies, researchers focused on simulation driver and limited road pattern to collect data for classification. However, the main problem is the data is inadequate and the driver's data should be collected from the driver's daily life to get an effective classification. This work deals with an efficient supervised learning procedure to predict driver's behavior by comparison from five classifiers and vote the highest score to predict data. All data are collected from sensors embedded in the vehicle's in Indonesia. Throughout the dataset over one million records DBC which classify Aggressive and Non-aggressive, the result show F1-score is 86% of twenty thousand labels.

Keywords: Supervised learning, Binary classification, Logistic regression, Hyperparameters, ITS.

Non-Linear EEG Based Emotional Classification using K-Nearest Neighbor and Weighted K-Nearest Neighbor with Variation of Features Selection Methods

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Emotion classification gaining more popular in research world, especially in healthcare. There are many methods can be used to classify emotional state of human and one of them is by using supervised machine learning such as kNN and W-kNN. DEAP's EEG dataset will be used as input signal because of its high dimension. In this research, EEG's non-linear features used to classify the emotional state. We compare recognition rate after variation in feature selection steps to choose which features best uses for this classification. For the emotion classification system we used variation of k parameter in kNN and W-kNN classifier. The results showed that the highest recognition rate was by using Chi-Square selection method with value of 60.15%, but by using those feature selection method did not really give significant difference. Based on that fact, we conclude that DEAP dataset need another reliable method to extract its feature and select those feature accurately.

Keywords: EEG, Emotion Classification, Feature Selection, DEAP, Recognition Rate, kNN, W-kNN

Modelization of Corium from Fukushima-Daiichi Powerplant Using PANTHERE Codes

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This study is about radioprotection in the case of the Fukushima-Daiichi Nuclear Power Plant accident that happened in 2011. It focusses on the retrieval of the corium in the core of the reactor. OAKRIDGE created a project that also responds to the international call of IRID (International Research Institute for Nuclear Decommissioning). The concept is based on the rapid pneumatic transfer of closed capsules that contain debris of corium. This project is now focused on the utilization of developed computing software that can be experimented on the dose rate of corium based on previous works. This software is called PANTHERE. With PANTHERE, we can propose multiple methods of online attenuation calculation with the dose rate (DED H*(10) in mSv/h, KERMA in the air in mGy/h, flux-dose in particles/cm²/s or energy fluencies in MeV/cm²/s). With PANTHERE, we modelized the corium and ran a corium retrieval simulation based on a point of observation to calculate the dose rate of corium inside the capsule inside the BWR Fukushima reactor. After that, we also modelized the trajectory of the capsule from when it is inside the RPV (Reactor Pressure Vessel) until when it is inside the storage system in SFP (Spent Fuel Pool). The highest dose rate given by the calculation was 3.24×10^{-3} mSv/h.

Keywords: Corium modelization, PANTHERE code, Simulation, Fukushima Daiichi, BWR

Modeling Study of Priority Intrusion Response Selected on Intrusion Detection System Alert

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The main purpose of the security service is to provide security for its users, one through the intrusion detection system alerts the user when there is an attack on the computer. Then, the alert of intrusion not only for our information if there is suspicious activity, but also a log for analysis and take action to protect network and information system from threat before caused more impact. Most detection system tools provide information about intrusions that occur as high or low priority intrusion based on what is caused. This priority information would be important while the amount of intrusion happened very much for select options response to handle it first. This prioritization is typically based on the priority of severity by system or score of common vulnerability enumeration. In this paper, we would be modeling study some method common used for prioritize the alert of intrusion detection system. And for the model responses we use response model time management concept.

Keywords: intrusion detection system, priority intrusion, intrusion response selected, modeling study, model response

Correlation Analysis of Breast Cancer Patient Data in dr. Sardjito Hospital Yogyakarta

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Breast Cancer is a malignant tumor that attacks breast tissue. In Yogyakarta, breast cancer incidence reaches 22.8 / 100,000 / year and ranks highest of all cancers. This disease is treatable as long as it is detected early and is still in its initial stages. In addition to the late treatment factor, patient data also influence the success rate of cancer treatment and the survival rate of the patient. This research was conducted by taking primary data from breast cancer patients in RSUP dr. Sardjito Yogyakarta in collaboration with the Cancer team from the TULIP. In this study, data analysis includes descriptive analysis and correlation analysis. The data obtained were grouped into five groups, namely laboratory investigation, Socio-Demographic, Clinical Examination, Therapy, and Pathology. Data analysis aims to determine the characteristics of breast cancer patients seeking treatment at the hospital. Based on the Kendall-Tau correlation test results, they have obtained. Variables that correlated strongly with the survival status of patients from the most powerful were Karnofsky Index, Albumin, Stages, GOT, Hormone therapy, Radiotherapy, Neutrophils, Therapy Regimen, and Lymphocytes. Variables that are positively correlated with patient survival status are Neutrophils, GOT, and Stages. Apart from that, it is negatively correlated. The results of data processing in this study can be applied to determine further analyzes, such as causality and survival analysis.

Keywords: breast cancer, patient data, descriptive analysis, correlation analysis, chemotherapy

Non-Linear EEG Based Emotional Classification using K-Nearest Neighbor and Weighted K-Nearest Neighbor with Variation of Features Selection Methods

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Emotion classification gaining more popular in research world, especially in healthcare. There are many methods can be used to classify emotional state of human and one of them is by using supervised machine learning such as kNN and W-kNN. DEAP's EEG dataset will be used as input signal because of its high dimension. In this research, EEG's non-linear features used to classify the emotional state. We compare recognition rate after variation in feature selection steps to choose which features best uses for this classification. For the emotion classification system we used variation of k parameter in kNN and W-kNN classifier. The results showed that the highest recognition rate was by using Chi-Square selection method with value of 60.15%, but by using those feature selection method did not really give significant difference. Based on that fact, we conclude that DEAP dataset need another reliable method to extract its feature and select those feature accurately.

Keywords: EEG, Emotion Classification, Feature Selection, DEAP, Recognition Rate, kNN, W-kNN

AR Heart: A User Experience Study in Cardiac Anatomy Learning using Augmented Reality

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Augmented Reality (AR) has gained much popularity in medicine and education as training and learning tool to supplement 2-dimensional-based traditional learning methods. Its use has been proven to improve users' understanding and learning experience. In the context of cardiac anatomy learning, AR permits immersive learning that can help users better visualize the 3-dimensional nature of organs. This study explains the development and user testing of the AR Heart, an AR-based mobile learning application of cardiac anatomy. The application was built using Vuforia and Unity for both Android and iOS platforms. A distinct image key was required to pop the virtual heart model. Features of the AR Heart include English anatomical nominals, heart beating movement, and rotatable view comprising anterior, posterior, superior, full and inside view. A short version of the User Experience Questionnaire (UEQ-S) in Bahasa was used to evaluate the application. A total of 44 students consisting 50:50 nursing and medical students identified the positive values in pragmatic quality (1.94 [95% CI 1.72–2.15]), hedonic quality (2.39 [95% CI 2.19–2.58]), and overall aspects (2.16 [95% CI 1.97–2.35]) with sufficient consistency (alpha coefficient >0.7). Based on the UEQ-S items assessed, the application achieved superiority in appeal and novelty while efficiency and ease of use were found to be its weakness. There is still room for further improvements to enrich the content and refine the features. Feedback from the testing in this study can be applied to make such improvements. Retesting the application with a larger population of subjects and a control group is paramount in the near future.

Keywords: Augmented Reality, cardiac anatomy learning, immersive learning, User Experience Questionnaire, user testing.

A Review of Feature Selection Techniques in Sentiment Analysis Using Filter, Wrapper, or Hybrid Methods

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Sentiment analysis is one of the text mining fields that classify the polarity of document texts and determine positive, neutral, or negative opinions. Document texts tend to have noise features or irrelevant features, so that feature selection is needed to overcome the problems. The feature selection is a challenge in sentiment analysis to produce accurate models. It is crucial for improving machine learning algorithms because it can reduce the dimensionality of feature space, remove irrelevant features, select valuable features, and increase learning accuracy. Therefore, this study focuses on reviewing feature selection techniques classified into three categories, such as filter, wrapper, and hybrid methods. The review results concluded that all feature selection techniques could select essential features, reduce the dimensionality of feature space, and improve the accuracy of machine learning algorithms. Filter methods are easy to implement and faster than wrapper and hybrid methods, whereas wrapper methods are better than filter methods in terms of accuracy but slower than filter methods. The hybrid techniques are the best feature selection method to resolve redundant and irrelevant data and increase the classifier's performance. However, hybrid methods are complicated. Thus, they need a high computational cost.

Keywords: Sentiment Analysis, feature selection, machine learning, filter, wrapper, hybrid

Data Cleansing Processing using Pentaho Data Integration: Case Study Data Deduplication

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Now is the era of data. Every field has data and uses it to progress towards an innovative future. But often, the amount of data that is not balanced with good data quality ranges from differences in data formats, duplicate data, and errors in the data input process. One technique for maintaining and improving data quality is the data cleansing technique. This paper aims to propose data cleansing processing in the case of data deduplication cases using Pentaho Data Integration tools. Pentaho Data Integration done in 4 phases: Analyze, Mapping function, Design and setting, and Evaluation and test. PDI results are tested and compared with the Talend Open Studio tool. The dataset tested was data on factory names at a company in Indonesia tasked with overseeing the distribution of medicines and food. This research is expected to meet the needs of companies, especially in the field of data quality management, especially cases of data duplication and to find out the comparative results of the tools used.

Keywords: Data Cleansing, Data Deduplication, Data Quality Management, Open-source, Pentaho Data Integration

1570653821

2D Modelling and Simulation Using Discrete Event Simulation and Agent-Based Simulation for Pesticide Manufacturing

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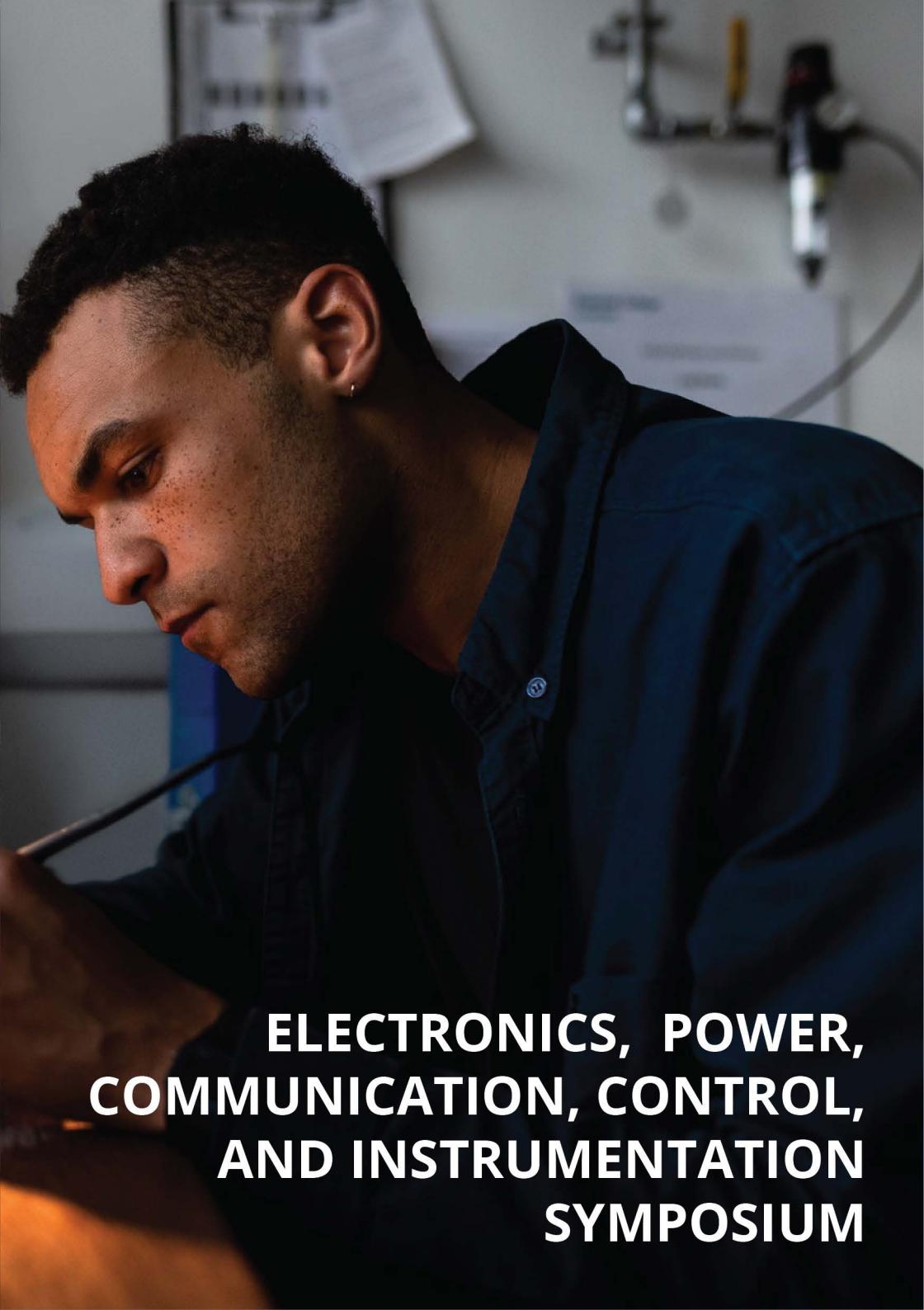
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Modelling and Simulation (MS) is considered very useful in providing information related to the performance of a system. Through MS, we can imitate and project the real state of a method to get information about the time of manufacture. Our research focuses on modelling and simulation with Discrete Event Simulation (DES) and Agent-Based Simulation (ABS) using AnyLogic Software to provide information related to the pesticide production process at PT DAI. The results of this study provide an overview of the production process in 2D with some information such as processing time, machine idle time, and overall system utilization. Processing percentage values obtained from nine work stations in the range 89.93% - 99.99% and overall system utilization with a value of 0.94.

Keywords: Discrete Event Simulation, Agent-Based Simulation, Modelling, Manufacturing, AnyLogic.



GXMST50A



ELECTRONICS, POWER, COMMUNICATION, CONTROL, AND INSTRUMENTATION SYMPOSIUM

1570636033

Implementation and Performance Analysis WebSocket on Prototype of System Monitoring ATM Room

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Nowadays, IoT applied to almost all aspects of life. One of the aspect that have not been implementing IoT is ATM room. Whereas, ATM's temperature and humidity must always be maintained to prevent ATM's damage. Furthermore, the lighting system and people's activity inside the ATM room must be monitored for the convenience of customers and reduce the risk of crime. Microcontroller and network module that used in this research is Arduino Mega with Ethershield W5100 and using DHT 22 sensor, LDR Sensor, and Ultrasonic Sensor. The protocol used is WebSocket and interface used is web interface. Test method will be conducted to analyze WebSocket performance in case of the higher resource server usage. The attack scenario that used to stream data on the server has a different quantity of packet per second. The purpose of this research is to measure the performance of WebSocket Protocol in the process of transmitting data from sensor nodes to the server whether there is a different performance between normal condition and the higher resource server usage. The parameters that used to measure the performance in this research are throughput, packet loss, packet delivery and delay. The result of the research analysis are if the higher resource server usage, then, the quality of data transmission is getting worse but still in the very good category when compared to the TIPHON standard.

Keywords: Internet of Things, Arduino Mega; LDR, Ultrasonic, WebSocket, Quality of Service

1570636115

Techno-Economic Analysis of Implementation IEEE 802.11ah Standard for Smart Meter Application in Bandung Area

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The growth of Wireless Fidelity (WiFi) technology is so rapid and popular. The technology most widely used for WiFi services is the IEEE 802.11 families of standards. To support the Internet of Things (IoT) era, 802.11ah standard technology has been developed, and the standard is intended to provide a low-cost mode of operation, with a wider coverage area and can support thousands of devices per cell. This paper Techno-Economic Analysis of Implementation IEEE 802.11ah Standard for Smart Meter Application in Bandung Area, to improve network quality in terms of coverage and capacity to improve the efficiency of the WiFi network so that it can support the IoT service. IEEE 802.11ah standard network technology is a Low Power Wide Area Network (LPWA) technology that can be used as an option for connectivity to the IoT in Indonesia. Based on economic aspects in terms of investment feasibility analysis, the implementation of the IEEE 802.11ah standard network is a viable and positive business for PT Telkom Indonesia (WiFi.id).

Keywords: Techno-economic Analysis, 802.11ah, NPV, IRR, Smart Meter

1570639674

Multi-Agent Formation with Size Scaling via Self-Position Feedback

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This work studies formation control of Multi-Agent Systems (MASs) where its formation size is scalable via a scaling factor (scalable formation). Past works on scalable formation are limited to either fixed undirected graph or fixed directed graph with k-rooted graph condition. This work

proposes a new distributed algorithm for scalable formation based on self-position feedback. When agent is assumed to be able to measure its own position, the proposed algorithm is shown to work under directed switching graph. Under directed fixed graph setting, a distributed observer is designed such that only relative position is needed in the algorithm. Spanning tree condition on directed fixed graph setting is shown to be the necessary and sufficient condition to achieve the scalable formation.

Keywords: Formation, Size Scaling, Switching Network, Multi-agent, Distributed Observer

1570640922

Radio Resource Management for Improving the Spectral Efficiency on D2D Underlaying Communications Using A Modified Joint-Greedy Algorithm

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Device-to-Device (D2D) underlaying communication system may be the solution to increase system data rate and reduce the workload of eNodeB. This communication system shares the same resources to two types of user, the cellular users and D2D pair. However, by using same resources, D2D underlaying communication system will increase the interference level among users. To overcome this problem, a good allocation algorithm is needed to allocate Resource Blocks (RB) which used by Cellular User Equipment (CUE) and D2D simultaneously. This work assumes all CUEs will use the RB first. The D2D pairs RB allocation take place after all CUEs get the resource. A modified Joint-Greedy algorithm is proposed to improve D2D pairs RB allocation process. The algorithm consists of two main phases. In the first phase, all D2D pairs will choose the best RB on the system, that being used by the CUE, and take that RB as a candidate. In the second phase, the eNodeB (eNB) will decides which of these candidates that will be allocated to D2D pair by searching the minimum impact of each CUE. From the simulation process, system with underlaying D2D communication can increase the system spectral efficiency system by 30%. Modified Joint-Greedy algorithm allocates can improve spectral efficiency of the system by 3.059% compared with mean-greedy allocation algorithm and 4.33% compared with a conventional greedy algorithm.

Keywords: Allocation Algorithm, Joint-Greedy, Underlaying, Device-to-Device

1570641244

Embedded Application for Driver Drowsiness Monitoring System A Review

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In recent years, road accident becomes one of the primary causes of death in the world. One of the main factors is the driver drowsiness. To prevent those accidents, many automobile manufacturers have installed driver assistance technology with drowsiness detection feature that controlled by a real-time embedded system. Meanwhile, researchers also have attempted to develop a better method to detect and implement a driver drowsiness monitoring system. This paper presents a state-of-the-art review of recent advancement in the field of Embedded implementation of driver fatigue detection. Each overview will focus on the implementation method using the embedded system.

Keywords: Driver Monitoring, Drowsiness Detection, Embedded System, FPGA, SOC.

1570642758

DIY Home Security System: Functional and Performance Testing

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Smart home security becomes necessary in crime-ridden society. In our previous work, a motion and movement detector prototype has been developed as an Internet of Things (IoT) implementation to support home security system. However, the prototype has not been properly tested. This paper presents functional and performance testing of the prototype. Functional testing was done by placing an object toward the detector. How good the sensor can detect the object is assessed. Performance testing was performed by attacking the system using Syn-flooding method. The attack was executed when the sensors send the data via HTTP and MQTT protocol. The functional testing result shows that the prototype is able to detect motion and movement up to 400 cm and 90°. Meanwhile, the performance testing shows the prototype performs better when transmitting the data using Adafruit IO during attack.

Keywords: home security, IoT, performance, testing

Review on Battery Energy Storage System for Power System with Grid Connected Wind Farm

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Wind power has massive potency to be developed, by the fact that wind resource is more environmentally friendly than conventional non-renewable resources. However, wind power generation tends to unstable due to its intermittency. The installation of BESS (Battery Energy Storage System) on the power system which utilizes wind resource may overcome this intermittency problem. In this paper, a review on placement and sizing optimization of BESS in power system with wind farm integration has presented. The comparison of various methods indicates that placement and sizing optimization of BESS can reduce the loss. Hence the better stability can be obtained.

Keywords: Wind Farm, Battery Energy Storage System, Optimization, Placement, Sizing

A Simple Modeling of Wind Turbine When the Lightning Strike

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Lightning is an inevitable natural phenomenon that causes damage to wind turbines both mechanical and electronic damage. Damage caused by overcurrent which is not immediately discharged to the ground then induces mechanical and electrical equipment. To do the analysis, simple modeling is needed so that the capability of lightning protection on the wind turbine can be determined, both already installed and to be installed. Simple modeling includes down conductor on the blade, sliding contact, spark gap, down conductor on the tower, and grounding. From the results of modeling that has been simulated using ATP Draw 3.5p10 indicates that the wind turbine which has a lightning protection system that uses down conductors on the tower is sufficient to secure the wind turbine from the risk of lightning strikes.

Keywords: Modeling, Wind Turbine, Lightning, Down Conductor, Grounding

MMFO: Modifying the Moth Flame Optimization to Provide Fast Cluster Formation in VANET

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VANET is an important component used to form clusters in a short time. It provides additional time to evaluate dynamic clusters of vehicles in real-time. However, it contributes to vehicle accidents, therefore, the population-based algorithm is an appropriate method used to solve the various limitations associated with this system. The new algorithm, known as Moth Flame Optimization (MFO), is inspired by the moth. It is fast when compared with the Particle Swarm Optimization (PSO) and BAT algorithms. MFO can be modified to increase the impact on the convergence time of cluster formation. This research, therefore, provides the preliminary performance of Modified MFO to determine the fastest convergence time. The result, which was evaluated using the unimodal and multimodal benchmark functions, showed that the cluster formation time improved at around 73%. Furthermore, it affects the computational speed of cluster formation in VANET.

Keywords: Cluster, K-Means, K-Medoids, MFO, Moth, VANET

Otaku: Intelligent Management System for Student-Intensive Dormitory

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In most student dorms in developing countries, a large number of people live in single-function dorm units. The division of dormitory is too fixed, resulting in the dormitory often lacking functional spaces such as entertainment, sports, meetings, etc. At the same time, a large number of people are likely to cause aggregation at a fixed time, which is not conducive to maintaining social distance under pandemic conditions such as COVID-19. This brings a lot of inconvenience to students' life study and management staff. In this paper, we present a smart dormitory system named Otaku using the Internet of Things technology to integrate facilities related to student dormitory life. By splitting the dormitory into several different categories according to their functionality by using smart door lock design, the system can achieve a more effective and flexible resource allocation, which not only helps the school management but also benefits students.

Keywords: Internet of Things, Embedded Systems, Smart Dormitory, Intelligent Control, Smart Campus

EEG Channel Selection using Spatial Selection for Emotion Classification

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Today, brain computer interface has been widely used for many applications, one of which is the one using the emotion signal as its input. The design of BCI application requires the shorter system process with a good performance. Frequently, the BCI design simply consider the performance with no consideration with the length of the system computation running. Many attempts have been done to realize an ideal BCI application; one of which mostly used is by selecting the accurate channels. This is done with a consideration to remove any channels irrelevant with the expected EEG signal and then viewed as the noise channels. Based upon this, this research was aimed to make a design of BCI application system involving the process of channels selection using the spatial selection method in the emotion system. In this research, the EEG record from SJTU Emotion EEG Dataset (SEED) was used as the input for the BCI system. In addition, Power Spectral Density (PSD) and Extreme Learning Machine (ELM) were used as the feature extraction method and classification for the three classes of emotion signal feature. Based on the results of the research, it can be concluded that the selection of EEG channels using the spatial selection method on the emotion signal can increase the accuracy and time of computation of BCI system by 19%.

Keywords: BCI application, EEG, Emotion Classification, Spatial Selection, PSD, ELM

Impulse Noise Modeling in an Indoor Narrowband Power Line Communication Channel using M-QAM and a Software-Defined Radio Approach

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Noise is generated on the indoor Narrowband Power Line Communication channel by the uncoordinated activities of several electrical devices connected to the power line networks, and by radiated environmental disturbances. There is a need to overcome these noise and channel impairments for reliable communication to be achieved. Statistical channel modeling of noise will facilitate the development and optimization of dependable PLC systems. Thus, in this work, we have developed a Software-Defined-PLC transceiver and test-bed that adopts 4, 8 and 16 Quadrature amplitude modulation schemes and uses the Universal Software Radio Peripheral and MATLAB/Simulink platforms to facilitate impulsive noise error measurement and modeling using the three-state Fritchman Markov Model (FMM) and the Baum-Welch Algorithm. The statistical channel models obtained are accurate derived channel models based on experimental measurement. The close match between the experimental and model error-free run distribution and error probabilities justify the modeling of the PLC memory channel using the three-state FMM. The model results obtained will assist in the implementation of error correction systems and novel optimization techniques in an impulsive noise PLC channel environment.

Keywords: Baum-Welch Algorithm (BWA), Fritchman, Markov model, Quadrature Amplitude Modulation (QAM), Narrowband Power Line Communication (NB-PLC), Universal Software Radio Peripheral (USR)

Performance Analysis of On-Off Keying Modulation on Underwater Visible Light Communication

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This research evaluates the performance of On-Off Keying (OOK) Modulation on the Underwater Visible Light Communication (UVLC) system. This research analyses the performance of two types of OOK signal formats, Non-Return to Zero (OOK-NRZ) and Return to Zero (OOK-RZ). This signal formats tested on distance, acceptability, Signal to Noise Ratio (SNR), Q-factor and Bit Error Rate (BER) parameters. From extensive simulations that have been done, the results show that the received power decreased 21.7249% at the maximum distance. In this condition, the UVLC system produced the BER value of the NRZ format $3.28\times$ smaller than the RZ format. The SNR minimum that produced BER value less than the threshold for NRZ format is 17.925% smaller than the RZ format. Meanwhile, the minimum Q-factor that produced BER value less than 10^{-3} for NRZ modulation is $6\times$ smaller than the RZ modulation format. From the results, we take the conclusion that the OOK-NRZ better OOK-RZ on the UVLC system.

Keywords: Underwater Visible Light Communication, On-Off Keying, Return to Zero On-Off Keying, Non-Return to Zero On-Off Keying, Bit Error Rate

Optimization of Placement and Sizing DG and Capacitor Bank with Network Reconfiguration Considering Non Linear Load on Radial Distribution Network

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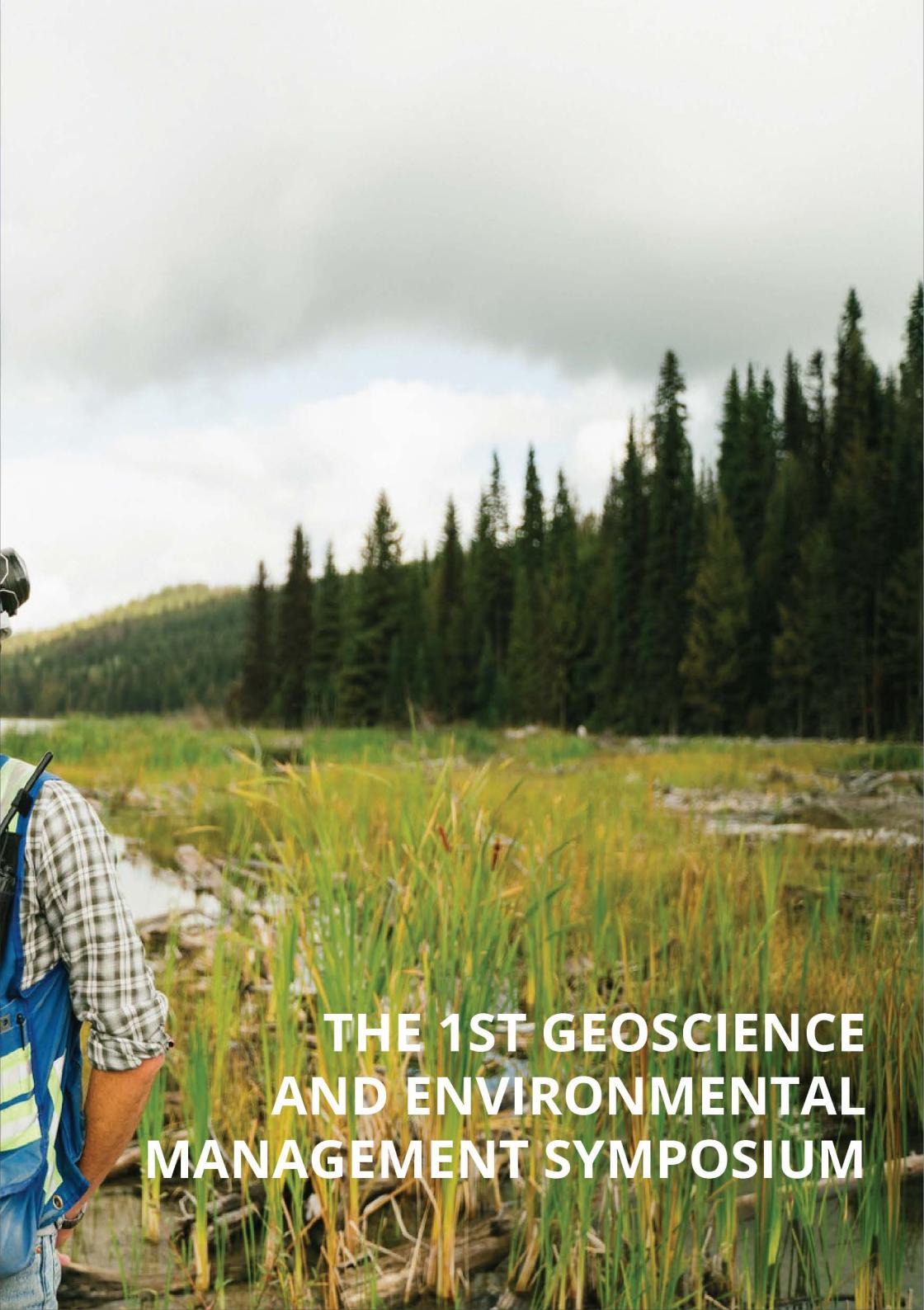
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The use of electricity will continue to increase along with technological developments and population growth so that electricity provider must maintain the availability of energy for costumers with various complex problems. Distributed Generation (DG) and Capacitor placement and Network Reconfiguration are optimization technique that have been hotly discussed in the last decade regarding power quality improvements in Radial Distribution System. In this paper discusses the effect of harmonic spreading on Radial Distribution System after optimizing DG and Capacitor placement and Network Reconfiguration simultaneously using Particle Swarm Optimization Method (PSO) by considering of the use non-linear load. The objective function in the from of minimizing active power loss and THD is considered to be able

to reduce the spread of harmonic presented in several case studies. Case 3 is the best simulation which can reduce active power losses up to 80,61%. The more DG and Capacitor numbers are placed with network reconfiguration simultaneously, the better power quality in the system with a good and efficient computing approach.

Keywords: DG, Capacitor, Reconfiguration, PSO, THD



A photograph of a person from the side, wearing a plaid shirt and blue overalls, standing in a wetland area. The foreground is filled with tall, green and yellow reeds. In the background, there is a dense forest of evergreen trees on a hillside under a cloudy sky.

THE 1ST GEOSCIENCE AND ENVIRONMENTAL MANAGEMENT SYMPOSIUM

Effect of earthquake on concrete gravity dam stability based on numerical simulation

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Concrete gravity dam structures span navigable waterways that are considered as very high-risk structures for earthquake shaking as such, they must be designed to resist the vibrations. However, these earthquake shaking are fundamentally dynamic in nature and a static analysis procedure may not be adequate for designing hydraulic structures like Dam. The entire modelling is based on US-Army Engineering Manuals. The earthquake effect is studied consider the damage control based on SEE performance objectives level in three sets of ground motion acceleration time history, the numerical simulation modelling used reservoir add mass hydrodynamic and linear time-history analysis to assess earthquake performance of critical overflow gravity dam section. The results of linear time history analysis are compared with the EM 1110-2-6051 and EM 1110-2-6053 performance acceptance criteria for gravity dams. This study indicated that the dam would suffer significant cracking along the base for all the selected earthquake Modified acceleration time histories (ground motion) that have been scaling to target spectra SEE level and should be assessed on the basis of nonlinear time-history analysis.

The impacts of COVID-19 pandemic to informal economic sector in Indonesia: theoretical and empirical comparison

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The COVID-19 pandemic has caused a global multidimensional crisis, one of its impacts being the crisis on the informal economy. This paper presents a review of the effects of this pandemic on the informal economy, coupled with empirical evidence based on surveys conducted in Indonesia. Data used in this study was collected by an online survey during the pandemic. Theoretically, there are two points of view about the informal economy roles during a crisis: optimistic views that see informal economy survive in a crisis and pessimistic views that see the ongoing informal economy continue to suffer losses and also informal workers as vulnerable groups during a crisis. The research also discussed the impacts of the crisis triggered by the COVID-19 pandemic on informal employments and incomes, readiness in dealing with the pandemic, and the livelihood conditions of informal workers. The crisis as a result of this pandemic provides a new experience for the informal sector in dealing with the crisis. The informal sector is not always a hero during the crisis but rather an alternative sector that offers business flexibility.

Study Of Environmental Management Based On Peri-Karst Community Interaction Pattern (Case Study: Long Lanuk Village, Sangkulirang-Mangkalihat Karst Area, East Kalimantan)

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Peri-Karst is an area located on the outside of karst formations but still the habitat of troglobxene and stygobxene. Long Lanuk village located on Peri-Karst zone of the Sangkulirang-Mangkalihat Karst area. The exploration of the natural resources in Long Lanuk village trigger changes in the pattern of community interaction. Community interaction pattern changes that occurred was a threat to the sustainability of the karst system that must be protected its existence. The research aims to discover the factors that affect the sustainability of the environment caused by the interaction of behavioral pattern of Peri-Karst community; (2) analyze the level of sustainability of the Peri-Karst on society and (3) formulate management strategies related to the sustainability of Peri-Karst livelihood in the Karst area of Sangkulirang-Mangkalihat, East Kalimantan. The level of sustainability is analyzed using the method of Multi-Dimensional Scaling which are categorized into four (4) dimensions, i.e. the dimension of environmental, economy, social and culture. The results of research regarding the level of sustainability of the Peri-Karst community in Long Lanuk Village based on the method of Multi-Dimensional Scaling shows: on the environmental dimension of attributes that have a high sensitivity value was the level of disruption of the industry has a value of 1,85. On the Economic Dimension, the attribute that has high sensitivity was the nest of the Swallow has a value of 2,4. The Attribute of Social Dimension which has high sensitivity was the potential for social conflict has a value of 2,3. The attribute of the cultural dimension that has a value of high sensitivity was the opportunity to make crafts has a value of 1,95. Environmental management strategies that can be applied to the Peri-Karst community in Long Lanuk village at each dimension that has high sensitivity. Management plan on each dimension is done based on the results of the social mapping interviews method refers to the policy of the Karst area management for the sustainability of community system interaction in Sangkulirang-Mangkalihat Karst area can be maintained.

Keyword : Peri-Karst, Multi Dimensional Scaling, Pattern of Community Interaction

Relationship between extreme rainfall based on GSMAp data with Madden Julian Oscillation (MJO) in Bangka Island

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The effect of MJO events on extreme rainfall events on Bangka Island needs to be spatially studied in more detail. The low quality of rain station data encourages the use of alternative data such as Global Satellite Mapping of Precipitation (GSMAp). This study aimed to analyze the influence of active MJO on extreme rainfall events using GSMAp data on Bangka Island. The methods used are extreme threshold of 95th, 98th and 99th percentile, the Rank Spearman correlation between extreme rainfall events and active MJO and its correlation significance test. The results showed that northern coast has the highest range of extreme threshold. The correlation significance test showed GSMAp grids that have a significant correlation with the MJO are in the north of the Island, especially coast area. MJO phases 3 and 5 have an impact on decreasing of extreme rainfall events which are known through the negative correlation values. From all the three extreme thresholds, it was only MJO phase 4 that increasing extreme rainfall events. Active MJO phase 4 causes Bangka Island as a convective area, while MJO phases 3 and 5 affect the formation of suppressed areas on Bangka Island.

Keywords: Bangka Island, extreme rainfall, GSMAp, MJO, Rank Spearman

The correlation analysis between urbanization phenomena and landuse change on Jakarta Special Province

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The population of Jakarta Special Province continues to grow, most significantly after the 1960s, causing an increase of population density. The expanding population has been stimulating the development of the province, reflecting the rising demand of the population including land. Eventually, it influences the urbanization process and affects the dynamic of land utilization in Jakarta. This research is aimed to understand the correlation between urbanization phenomena and landuse change in Jakarta Special Province. The research implements the utilization of statistics, topographic map, and remote sensing data as well. The satellite image (Sentinel-2 Imagery) was used to determine urban area and non urban area which then describes the land urbanization level. During 3 years, Jakarta has experienced landuse change especially in residential area, green open space, and industrial area. In 2017, the urban area covered 76.89 percent of Jakarta's land and the coverage increased into 78.35 percent in 2019. Land urbanization level raised from 77.16 percent into 78.03 percent which means that roughly 77 percent to 78 percent of land in Jakarta has been urbanized.

Investigating Urban Space: Potential Urban Green Space in Dense City of Yogyakarta

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Urban green space (UGS) is essential for the city to ensure sustainability. The provision of adequate USG, however, is challenging over time, particularly at the city centre area. This study aims to offer a possible framework to identify UGS and assess the potential share from the vacant land into green space using descriptive analysis of remote sensing and secondary data. A case study is applied to assess the UGS and potential area in Yogyakarta City. The result shows that the built-up area in Yogyakarta City is covered around 85% of the total while the UGS remains halved within less than a decade. In addition, the field visit shows a potential UGS on 16.00 ha from the private vacant land. The application of the framework provides a tool for the city council in maintaining and monitoring the land cover, including identifying the UGS throughout the city. Imposing the regulation on vacant land might encourage the private sector involvement and offers less effort to the city council in providing UGS.

Quantifying urban physical growth types in Banda Aceh City after the 2004 Indian Ocean Tsunami

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Banda Aceh was the most affected city by the 2004 Indian Ocean Tsunami. This city has grown rapidly because of disaster recovery activities. Therefore, this study aims to identify the types of urban physical growth in Banda Aceh City quantitatively from 2005 to 2019. The characteristics of growth were identified by integrating geographic information systems and remote sensing. The analysis showed that the main types of urban physical growth in the city were edge-expansion in 2005-2009 and infilling in 2009- 2019. The percentage of spontaneous growth area was the lowest in both periods. The process of reconstruction and rehabilitation was considered to greatly affect the types of urban physical growth, where newly built-up areas were established close to the existing built-up areas. This also caused urban densification in a relatively short time. The process of urbanization had reached a stable stage in the city so that the surrounding suburbs have the potential to experience regional transformation. Overall, the approach used in this study resulted in a more objective understanding of identifying the urban physical growth characteristics for better urban planning.

The Removal of Lead by Natural Zeolite

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This study aimed to evaluate the ability of natural zeolite samples obtained from Gunungkidul, Yogyakarta, Indonesia in the removal of lead (Pb) in solutions. This study included mineralogical characterization as well as a batch test in the laboratory with parameters including grain size, the mass of natural zeolite sample, pH, and initial concentration of the solution. The results of mineralogical characterization showed that the natural zeolite sample have varied constituent on mineral components and relatively have high cation exchange capacity (CEC). The results of the batch test showed that the adsorption behavior depends on the mass of the zeolite sample which the increasing of the sample mass will increase the adsorption capacity. The results of the following batch testing showed that the variations in grain size had a limited effect on the adsorption capacity and the effect of the pH of the solution being a significant parameter. The results of the following batch test also showed that the increasing initial concentration of Pb solution caused a decrease in adsorption capacity. In general, natural zeolite samples in the study area have sufficient adsorption capacity as adsorbent material for Pb solution.

Early Marriage in Yogyakarta

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This research explains about the beginning of marriage in the Special Region of Yogyakarta (DIY). Using descriptive analysis to analyze secondary data collected from the Central Statistics Agency (BPS) and other related institutions, data processing uses Ms. Excel Software and presented in tables, diagrams, and graphs. This study aims to determine the factors associated with early marriage in Yogyakarta and determine the impact of early marriage. In 2018, there were 312 initial marriage dispensations approved by the DIY religious court. This figure is up from 2017 with only 294 dispensations left. Early marriage is not only caused by environmental factors and economic background. This is related to the era of globalization which makes the association of children. Information that is widely disclosed if not accompanied by reasons and parental supervision will become something as dangerous as free sex. Free sex is one of the causes of early marriage, children or adolescents who do not get a strong provision will fall into promiscuity. The impact that will arise in terms of education can be a loss of opportunities for education, other than that the impact in terms of employment will certainly be hampered due to lack of education and will have an impact on the economy.

Keywords: Married, Young Age, Globalization, Impact

Mask R-CNN for Rock-Forming Minerals Identification on Petrography, Case Study at Monterado, West Kalimantan

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This paper explores the experiment of Deep Learning method using Mask Region-Convolutional Neural Network (Mask R-CNN) to identify rock-forming minerals on thin section images from petrographic observation in igneous rocks, which is plagioclase, quartz, alkali feldspar, pyroxene, and hornblende. Train and validation dataset consisted of 2 quartz diorites and 1 granodiorite from Monterado, West Kalimantan, 1 quartz diorite and 1 granite from Nangapinoh, West Kalimantan, and 7 andesite and 2 basalts from Bangli, Bali, while test dataset consisted of 3 quartz diorites from Monterado, West Kalimantan. This study uses 4 Mask R-CNN models, which is influenced by the lighting on polarizing microscope and using ResNet-50 architecture (Model A) or ResNet-101 (Model B), and the models that is not affected by the lighting on polarizing microscope and using ResNet-50 architecture (Model C) or ResNet-101 (Model D). From Average Precision scores, it was found that Model B has the highest score (58.0%), followed by Model A (57.8%), Model C (45.8%), and Model D (43.6%). In conclusion, the lighting of polarizing microscope is a major factor to give a better performances of Mask R-CNN models by 12%-14.4%, while the type of backbone architecture on Mask R-CNN models was not too consequential.

Application of geostatistics to complete uranium resources estimation of Rabau Hulu Sector, Kalan, West Kalimantan

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Kalan is one of the focus areas for uranium exploration in West Borneo that conducted by BATAN. Situated in the central part of Kalan, previous works in Rabau Hulu Sector consisted of surface geology and radiometric anomaly mapping, trenching, drilling, logging, and conventional uranium resource estimation. Nevertheless, the complete resource estimation of the previous work was still using 2D modeling, and the latest one using 3D modeling is a method-application case study in one orebody. To increase the confidence level and completing the uranium resource estimation of all orebodies in this sector, a geostatistical estimation with 3D orebody modeling using SURPAC mine planning software was conducted in this paper. Gamma-ray log data from 32 drill holes were collected and then interpreted to obtain uranium grade-thickness data. Based on the correlation of grade-thickness data according to surface orebody orientation, the orebody 3D modeling was done. It resulted in 26 orebodies with one control system of lithology as the mineralization only taken place in the quartzite unit. This 3D model then used as a constraint for block model with $4 \times 4 \times 2$ m block size and $0.25 \times 0.25 \times 0.125$ m minimum block size. Block model calculation was performed using ordinary kriging which generated the kriging efficiency attribute for the determination of the resource category. Within 25 meters searching radius, the calculation resulted in 408,480 tons of ore, while total uranium resource was 268 tons of uranium with 677 ppm average grade. There were 214 tons of uranium (79%) categorized as measured while the other 54 tons of uranium (21%) categorized as indicated.

Keywords: uranium resource, Kalan, Rabau Hulu, geostatistics, ordinary kriging

Determination of Scandium in mafic and ultramafic rocks of ophiolites from Luk Ulo Complex, Karangsambung, Central Java, Indonesia

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Scandium (Sc) is important element for its utilization in modern industry. Initial Sc content in the parent rocks primary importance controlling the Sc concentrations in its weathered derivatives. This contribution examines the Sc concentrations in parent rocks of mafic and ultramafic rocks related to the ophiolite series in Luk Ulo Complex, Karangsambung, Central Java, Indonesia. The ophiolite series in this area are basalt, microgabbronorite, gabbro-norite, websterite, and serpentinite from 5 locations of Medana, Lokidang, Parakansubah, Selogiri, and Pucangan areas. The general trend from the distribution of Sc in the ophiolite sequence of Medana and Parakansubah-Lokidang Rivers suggests the Sc contents increase from shallow to deeper levels of the sequence. The lowest concentrations of Sc in the ophiolite sequence of Medana and Parakansubah-Lokidang Rivers are in basalt, which are 24–29 ppm. In the middle sequence, the Sc concentrations are 27–34 ppm and 24–43 ppm, respectively in microgabbronorite and gabbro-norite. The highest Sc concentrations are in websterite, which are 51–54 ppm, as the deepest sequence of the ophiolite in this area. Meanwhile, Sc contents in serpentinite from Selogiri and Pucangan areas are 5–11 ppm, which are considered the lowest Sc contents. It suggests that the pre-serpentinization mineral composition rather than the process of serpentization determine the elemental abundance of Sc in serpentinite. The results are used to be an analog for Sc identification in the ophiolite belts in central Indonesia. This also considering that Luk Ulo Complex been established as National Geopark of Karangsambung-Karangbolong, so that mining activities are prohibited in this area.

Relationship between pit slope design and coal reserve estimation in Pit X, Muara Enim, South Sumatra Province

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Mine planning is an important part of mining activity. Improper mine plan will increase production costs, non-optimal extraction of mines and safety factors that do not meet the standard. One of the most important aspects before undertaking mine plan is determining the optimal slope design as a basis for making mine pits for coal extraction. This study aims to estimate the maximum reserves that can be taken from the mine pit by taking account of the safety factor of the pit slope design. The study was conducted using drill log data and rock engineering characteristics. Analysis of slope stability is done using the Rocscience Slide V.6 software while coal reserves estimation is done using Minescape V.5.2. Slope stability analysis is modeled with several scenarios of slope angles until a single optimal slope angle is obtained, with the value of the slope safety factor that meets the safety criteria. The results showed that the maximum single slope angle in a safe pit was 52° with a safety factor of 1.266, while the coal reserves obtained with the said slope angle are 29,965,008 tons.

Groundwater Vulnerability Assessment to Pollution in Kasihan, Bantul Regency: A Comparative Method Study (GOD, SINTACS and DRASTIC)

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Groundwater vulnerability to pollution refers to the ease with which pollutants reach groundwater, in other words indicating the level of ease of an area to experience pollution. At present, the theme is one of the themes that attracts many researchers because pollution is more frequent in an area. The purpose of this study is to assess groundwater vulnerability in the study area for pollution using the GOD method and conduct a study of 3 groundwater vulnerability assessments, to determine the most appropriate assessment to be applied in the study area. The method used to determine groundwater vulnerability to pollution is GOD, which uses three parameters to assess the vulnerability of groundwater, namely aquifer type, rock type above aquifer and groundwater level. Furthermore the results of the vulnerability assessment using the GOD method are compared with the vulnerability assessment according to the SINTACS and DRASTIC methods that have been carried out before in this area. The results showed that the variation of groundwater vulnerability index values in the study area according to the GOD method was from 0.35 to 0.63. Locations that are classified as medium vulnerability are generally located in the limestone Sentolo Formation, while locations that are classified as high vulnerability class are located in the volcanic rock of Yogyakarta Formation. Noting the results of determining groundwater vulnerability from the three methods, it can be said that the three methods are suitable for assessing groundwater vulnerability in the study area. However, looking at the distribution pattern of the level of pollution, the DRASTIC method can provide more detailed results related to the level of vulnerability.

Keywords: groundwater vulnerability, GOD, Bantul Regency

Exposure and Loss Assessment of Soil Liquefaction in Coastal Area of Kulonprogo, Indonesia

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Soil Liquefaction is a phenomenon of loss of strength of the granular soil layers due to increased pore water stress caused by earthquake shocks. Soil liquefaction can cause material and life damage if occurs in the developed area. Kulonprogo Regency based on the Atlas of Liquefaction Susceptibility Zones in 2019, has high susceptibility zones, which has the potential for flow liquefaction, lateral spreading, vertical displacement, and sand boil. This study aims to assess the exposure and loss index in liquefaction hazard zone based on the characteristics of land use and social demographic. Study results show that high exposure surrounding the residential zone in the south of the Wates Urban Area and the construction location of the Yogyakarta International Airport. There are settlement areas potentially affected by lateral spreading in Glagah, Karangwuni, Banaran, and Karangsewu Villages. While the results of the loss assessment show that transport infrastructure and residential buildings are the most affected objects when liquefaction phenomena occur due to the earthquake. Managing the expansion of settlement area through zoning regulation and technical engineering approach is needed to reduce losses due to future liquefaction phenomenon.

Nutrient content, fiber fraction and ethanol production of three cultivars (*Pennisetum purpureum* Schumach.)

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This study aimed to determine nutrient content, fiber fraction, and ethanol production of three cultivars *Pennisetum purpureum* Schumach. Cultivars: tifton, king Thailand and local. The design of this study completed a randomized design of three *Pennisetum purpureum* Schumach cultivars, with three replications for each dose. Grasses were planted with space 1x1 m and then divided into three plots. Variables observed in the study included nutrient content (dry matter, organic matter, crude protein, ether extract, and nitrogen-free extract), fiber fraction (crude fiber, neutral detergent fiber, and acid detergent fiber) and ethanol production. Data obtained were statistically analyzed using analysis of variance as completed randomized design and continued with Duncan's new multiple range test for any difference detected. The results showed that cultivar's variety of napiergrass was significant ($P<0.05$) on dry matter, crude protein, neutral detergent fiber, and ethanol production. King Thailand produced the highest dry matter (20.82%), crude protein (11.85%), neutral detergent fiber (69.55%), and ethanol production (55,90 l/ton). Based on the results of the study it can be concluded that napiergrass cultivars give different results on dry matter, crude protein, neutral detergent fiber, and ethanol production. The best cultivar is King Thailand because it has the highest value on dry matter, crude protein, neutral detergent fiber, and ethanol production.

Analysis of Rainfall-triggered Landslide in Baleagung Village, Magelang Regency, Central Java

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The majority of Magelang Regency is considered as intermediate and high susceptible areas against landslide. As happened in Baleagung Village in January 2018, a landslide has damaged local residency buildings. The landslide occurred because of high-intensity rainfall on the day before. Meanwhile, cracks formed in several areas that were indicated by the slope around the village were still actively moving. Therefore, mitigation is urgently needed to minimize the risk of further landslide movement. This study aimed to analyze the mechanism of ground movement at Baleagung Village which was affected by rainfall. This research was conducted by using back-analysis method to determine the initial groundwater level conditions and its effect on the slope stability. Soil parameters were obtained by laboratory testing and permeability tests in the field. Subsequently, rainfall data was collected from Himawari-8 satellite and used as the data input parameter for numerical analysis using SEEP/W and SLOPE/W. The results obtained from back-analysis showed that rainfall infiltration into the soil affected the degradation of safety factor value that was caused by the increase of pore-water pressure and the decrease of effective stress in a certain period. The degradation of safety factor was caused by the increasing of soil saturation degree when water infiltrated into the ground.

Keywords: landslide susceptibility, rainfall intensity, groundwater level, slope stability, landslide mitigation.

Seasonal Variability of Nitrate Flux in the Northern part of Karangbolong Karst Aquifer, Central Java

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Kalisirah Springs and Jumbleng Spring are located in the northern part of Karangbolong Karst Area, Kebumen Regency. Tracer tests for underground rivers and field surveys indicate that the catchment areas of these two karst springs have the dominant land use of dry land farm and plantation. The condition of the catchment area will affect the chemical content of water resources in karst aquifers. Dry land farm and plantation use fertilizer in the process of planting, but in practice, there is nitrogen lost due to the washing process by rainwater. Karst landforms also have cavities and fissures that allow applied fertilizer to enter the karstic aquifer directly. This study aims to determine the nitrogen flux fluctuations in the form of nitrate (N) in Kalisirah Springs and Jumbleng Springs along with their relationship with discharge and rainfall. The data used in this study were primary data, which included data of the water level, rainfall, water chemistry samples, and the agricultural planting calendar. The N content was analyzed using hydrograph to determine the response of N flux to the discharge. Recording the amount of N used in agricultural activities in the catchment area was conducted by calculating the area of agricultural land use using Topographic Map of Indonesia, and the triangulation method was used to determine fertilizer characteristics in the catchment area. Kalisirah catchment area lost 56.09% N, while the Jumbleng catchment area lost 57.53% N. The extent of this loss is influenced by land use conditions which will have implications for the number and frequency of fertilization.

Keywords: catchment area, karst spring, agriculture, nitrogen loss, N flux

The Comparison Analysis of TL-SDI Values, Within Area Post Administrative on Oecusse Municipality

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Objectives: This study aims to analyze and comparing the value of TL-SDI, within area post administration on Oecusse municipal related with internal migration status.

Method and Data: This study uses a quantitative approach based on the CPH-TL 2015 and TL-SLS 2014 data, using lifetime migration that applied on the concept of TL-SDI, SCI, EcCI, and EnCI within post administrative municipality of Oecesesse. Analysis comparison of TL-SDI uses CSpro, SPSS, and Excel, tools with the amount of sustainable development indexes is the percentage of migration rates applied for four post administrative and municipality of Oecusse. **Results:** The results of this study have produced three (3) type specific values of TL-SDI, rejected the Ho: that the TL-SDI value of the migrant population is higher than that of the non-migrant population. **Significance:** TL-SDI values in each region can be used as an evaluation of the results of development so far has been running and can be used as regional planning material, especially for indigenous people or migrants who come to the region.

Key word: life-time migration, Timor-Leste Sustainable Development Index (TL-SDI), social composite index (SCI), economic composite index (EcCI), environment composite index (EnCI).

Timor-Leste Population on Internal Migration, in the Analysis of Direction, Flow, Pathways, Boundaries, and International Procedures

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Objectives: This study aims to analyze and evaluate internal migration in the population of the country of Timor-Leste based on Ravenstain's theory (1885) and Lee (1966) on types of internal migration with respect push to pull and factors and defining the flow, direction, path and boundaries of internal migration in municipal in the country of Timor-Leste. **Method and Data:** This study uses a quantitative approach, using the concept of lifetime migration and inter-municipal displacement. The analysis of cross tabulation between the place of birth and the place of registration at the time of the CPH-TL2015 has resulted internal migration of population of Timor-Leste first type. This research uses CSpro, and Excel, and GIS analysis tools with the amount of population internal migration is the percentage of migration rates. **Results:** The results of this study have produced first type internal migration of Timor-Leste, specific forms of internal migration such as residents who have carried out lifetime migration internal with direction and flow through international boundaries and procedures. **Significance:** The geographic position each municipality and special for municipality of Oe-cusse as an enclave is particularly important and significantly new type of internal migration.

Key word: life-time migration, flow, stream, international border, internal migration, in-migration, out-migration, gross and net migration.

Groundwater Potency for Domestic Demand in Banguntapan District, Bantul Regency

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Banguntapan District in Bantul Regency is one of the districts bordering the City of Yogyakarta. Because of its strategic location, the development of this district is very rapidly marked by population and settlement growth. As a result, the demand for facilities and infrastructure has also increased including the need for groundwater for domestic water sources. The purpose of this study is to determine the groundwater potency and domestic needs of the population. The study of domestic water demand is carried out to find out the current water needs and the level of criticality. For this reason a static groundwater potential calculation and the water needs are carried out. Calculation and analysis results show that groundwater potency in unconfined aquifers in the study area is 279,004,000 m³/year, with safe yield of groundwater extraction are 13,109,292 m³/year. Although groundwater extraction for domestic demand which amounted to 6,392,874 m³/year is still smaller than the safe yield, according to the calculation of the criticality index the water is almost classified in the critically approaching criteria.

Keywords: groundwater, domestic requirements, Bantul Regency

Groundwater Vulnerability Study Using SINTACS Method in Banguntapan District, Bantul Regency

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As one of the districts in Bantul Regency which borders directly with the City of Yogyakarta, the District of Banguntapan has the potential to be an area affected by city development. This is what drives population growth in this district, so that the waste it generates also increases. The purpose of this study is to determine the level of groundwater vulnerability to pollution by using the SINTACS method and analyzing the dominant factors that influence it. Calculation and analysis results show that the variation of groundwater vulnerability index values in the study area ranged from 182.8 to 200.3, with 10 locations classified as high vulnerability and 2 locations classified as rather high vulnerability. Because it is located in a similar geological condition, namely the Aquifer Unit of Merapi Volcanic Fluvio Plain where most of the constituent material of this aquifer is sand and a little clay as inserts, the difference in groundwater vulnerability to pollution in the study area is only determined by the difference in groundwater depth.

Keywords: groundwater vulnerability, SINTACS Method, Bantul Regency

Integrated Groundwater Resource Management in the Peri-Urban Area of Banguntapan, Bantul

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Banguntapan District in Bantul Regency is one of the peri-urban areas in the Special Region of Yogyakarta. The peri-urban area is an area located between the urban (Jogja City) and the rural (Bantul Regency). As a result of this strategic location, the development of this district is very rapidly marked by the growth of settlements, which in turn further requires water for housing purposes. The purpose of this research is to formulate an integrated water resources management model in the study area. To achieve this goal dynamic modeling is used. The model obtained was then simulated using the Powersim 2.5c computer program. Management efforts that can be carried out in this district are reducing groundwater use through saving water use and increasing water use from local water companies. Simulation results show that the combination of these two methods will slow down the time the safe yield will be exceeded, from 2039 to 2049.

Keywords: groundwater, peri-urban area, Bantul Regency

Temporal Variation of Water Suitability for Paddy Irrigation Needs at Karst Springs Influenced by Allogenic Recharge in Gunungsewu Karst Area, Indonesia

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Irrigation, a critical element in farming, can fulfill crop water needs and increase agricultural productivity during the dry season, provided that the two necessary factors are met, namely water supply and water quality. Water quality is a principal factor in assessing whether or not a water body is usable as a source of irrigation. Excess or lack of elements in irrigation water may affect irrigated crops and soil. For maximum harvests, studies scrutinizing the suitability of water supply for irrigation become necessary. Beton Spring has a large discharge, which the people of Ponjong District, Gunungkidul Regency, rely on for their irrigation and fish farming practices. Uniquely, this karst spring receives allogenic recharges from outside the karst area. This research was intended to assess the suitability of water quality of Beton Spring for temporal irrigation purposes by Sodium analysis (Na%), Sodium Adsorption Ratio (SAR), USSL, and Wilcox. The elements observed in the analysis were Ca^{2+} , Na^+ , Mg^{2+} , K^+ and electrical conductivity. Based on the overall analysis results of the water quality series—Sodium analysis (the water samples were classified as Excellent), SAR (Excellent), USSL (moderate to good), and Wilcox (Excellent to Good), Beton Spring produces good-quality water that is suitable for irrigation.

Supplementation Alfalfa (*Medicago Sativa L.*) in Commercial Feed On Physic and Chemical Quality Meat of Hybrid Duck

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The aimed of this study was to determine the effect of suplementation level of alfafa (*Medicago sativa L.*) on hybrid duck's meat quality with basal diet commercial feed. This study used in vivo technique on 108 hybrid ducks. The research consisted of 3 treatments and 6 replications, each replication consisted of 6 ducks. The treatments were P1 = commercial feed + 0% fresh alfafa, P2 = commercial feed + 5% alfafa, P3 = commercial feed + 10% fresh alfafa. Alfalfa was calculated in dry matter based but offered in the form as fed. Feed and water was offered ad libitum. The variables measured include product appereance, carcass quality, physic and chemical hybrid duck's meat. One way Completely randomized design was used in this research. All data collected was analized with Statistical Package for Sosial Science version 22. Data with significant differences were further tested with Duncan's new Multiple Range Test. Data resulted significant differences ($P<0,05$) on water content pH, water holding capasity, and coking loss of the meat among treatment, but not for crude protein, extract ether, and tenderness ($P>0,05$). Based on the data resulted, it can be concluded that commercial feed with 5% alalfa suplementation (P2) was the best treatment to the physic and chemical quality meat of hybrid duck.

Keywords: Hybrid Duck, Commercial Feed, Alfalfa, Physic Meat, Chemical Meat

The Effect of Alfalfa (*Medicago sativa L.*) on Different Basal Feeds for Hybrid Duck Performance

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The aim of this research was to determine effect of Supplementation of Alfalfa (*Medicago sativa L.*) on different basal feeds for hybrid duck performance. This research was conducted by in vivo method with 120 MA (Mojosari x Alabio) of hybrid ducks type. The method was being used in this research include 4 treatments and 6 repetitions with 5 ducks each repetition. The treatment consisteds of P1 = Commercial feed 100%, P2 = Alternative feed 100%, P3 = Commercial Feed 90% + supplementation of fresh alfalfa 10% and P4 = Alternative feed 90% + supplementation of fresh alfalfa 10%. Feed and water was offered Ad libitum. The Observed variables were feed consumption, body weight gain and feed conversion ratio (FCR). The data was analyzed by the Program of Statistical Package for Social Science (SPSS) version 22. Duncan's multiple range test (DMRT) analyzed was implanted for significant differences data. The results showed that 10% alfalfa supplementation in commercial feeds and alternative feeds have significant lower/higher ($P < 0.05$) value of feed consumption, weight gain and FCR value. Based on these results it can be concluded that commercial feed without alfalfa supplementation was the most optimal treatment of other treatment feeds for hybrid duck performance.

Keywords: Alfalfa, Commercial Feed, Alternative Feed, Performance, Hybrid Duck

Minimizing carbon loss through integrated water resource management on peatland utilization in Pulau Burung, Riau, Indonesia

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Sustainable utilization of peatland is required for balancing production and conservation efforts. On peatland, one of the main components to examine sustainability is understanding the carbon balance. This research was conducted in Pulau Burung, Riau, Indonesia, which has a long history of peatland utilization for agriculture. The sets of utilized data included historical data of water management on peatland represented by water table and subsidence rate, next to carbon density of peat soil. The results showed the function of integrated water resource management made the yearly average water table depth is 48 and 49 cm in 2018 and 2019, respectively. The range water table is between 31 – 72 cm due to season variability and crop requirement. Consequently, the rate of annual subsidence is averaging at 1.7 cm with cumulative subsidence in 32 years is 54.1 cm. Since the water never drained since the establishment, the subsidence rate of the first five years is averaging only at 3.3 cm year⁻¹. Low subsidence rates minimize annual carbon loss during the peatland utilization around 30 – 200 Mg CO₂ ha⁻¹ year⁻¹. In 32 years, the water management in peatland utilization in Pulau Burung has prevented 2,000 – 4,925 Mg CO₂ ha⁻¹ loss compared to other cultivated areas in peatland. Further, this paper discusses the practice that resulted in low emission of coconut agriculture in Pulau Burung as one of sustainability dimensions, which support the other sustainability aspects, that is the thriving local livelihood.

Spatial Distribution of Slums and It's Association with Disaster Vulnerability in Yogyakarta City

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Slums commonly distributed in susceptible environment or in location that occupied by low economic household, especially in urban areas. Empirically, in Indonesia, the data about distribution and total area of slums is quite hard to be acquired, since slums indicators is not standardized yet. This study aimed to (1) identify the distribution of slums in Yogyakarta City, based on multi-sources data; and (2) elaborate the linkage between slums location and disaster vulnerability in research area. This research uses a mixed methods, i.e utilization of secondary data, survey method, and GIS mapping. Analysis units of this research are "Kelurahan", where all "Kelurahan" which have slums are chosen as members of population (census technique). Indepth interview conducted in order to collect disaster vulnerability data in each "Kelurahan". Informant that chosen as representative person in each "Kelurahan" are "Lurah" or "Secretary of Lurah". All of the data are analyzed by qualitative and quantitative descriptive method. Conclusion of this study are: (1) Slums in Yogyakarta City distributed mainly along three main rivers, and (2) There are very closed association between slums area and disaster vulnerable zones.

Field Measurement of Ground Temperatures in Bandung: Devices and the Results of Measurement

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Ground cooling is considered to be one of the passive cooling strategies in buildings although its application is rarely found in Indonesia. Effectiveness of this strategy depend on the ground temperature profiles. Meanwhile, comprehensive data of ground temperature as a basis of design for ground cooling are still rarely found in Indonesia. This research aims to develop the measurement devices for collecting ground temperatures data and to investigate the ground temperatures in different depths (i.e., 1m, 2m, ..., 9m). For measurement, an instrumentation system was developed with the main component of Arduino Mega 2560 as microcontroller. T-type thermocouples with diameter of 0,5mm mounted in the metal cones were used as the temperature sensor and placed at the different depths. The field measurement was conducted from August to November 2019 in Bandung, West Java, Indonesia. This study demonstrated that the developed instrument system had good performance both in measuring and data acquisition. Model equation was developed to predict the ground temperature at certain depth regardless ground materials and humidity level. The results indicated that the ground temperature significantly lower to 5m-depth. However, the reduction of the temperature after 5m was not significant; the deeper the ground, the temperature changes are negligible.

Keywords: microcontroller, ground cooling, data acquisition, temperature sensor, ground temperature

Hydrological Exploration in Karst Suaran, Berau, East Kalimantan- Indonesia

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Sangkulirang-Mangkalihat is the karst region's identity located on the Mangkalihat Peninsula, on the east side of Kalimantan island. Suaran Karst is a type of karst labyrinth, the typology of karst formed by dissolution in pathways fault, and the fault is more intensive in comparison with other regions. The hydrology expedition in the karst region of Suaran has several objectives, including conducting hydrological observations both briefly and periodically. The discovery of the hydrological and hydrogeological characteristics of the karst region. The various hydrological features found in the Suaran karst region are essential parameters that indicate the uniqueness and importance of the Suaran karst region. The results of the exploration of the karst region of Suaran, found 41 hydrological formations, including springs, pocket valleys, and doline.

Various ICT-based Applications and their Uses to Support Smart City Implementation in the Regency of Blora

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Smart city constitutes a city concept that is based on Information and Communication Technology (ICT). One of the implementations of the smart city concept is by making use of ICT- based applications in providing public services in order that they are more effective and efficient. The Regency of Blora is one of the Indonesian regencies belonging to the 100-Smart-City Movement. Various applications have been used to support the realization of the Regency of Blora as a smart city. They are, among others, Sedot a Mas, PSC 119, and e-retribution. Some of the local society members have been making use of the applications to deserve public services. The uses of ICT-based applications in supporting the implementation of the concept of smart city in the Regency of Blora need to be evaluated. This is an important point to do as a way of finding out both the successes and obstructions in using the ICT- based applications. The research result show that the existing applications have been well used. However, to support the uses of ICT-based applications in an optimum level, it is necessary to make it easy to access internet, to socialize the existence of applications, and to obtain aspiration from local people for the policy of applying the applications.

Keywords: Applications, ICT, Smart City, Implementation, Regency

Assessment of Groundwater Pollution Risk Potential Using DRASTIC Model in Yogyakarta City, Indonesia

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Assessment of groundwater pollution risk is purposed to be of particular value for environmental management programs development, this research estimated and calculated of groundwater pollution risk potential in Yogyakarta City using DRASTIC Model, DRASTIC parameters developed as Depth to water (D), net Recharge (R), Aquifer media (A), Soil media (S), Topography (T), Impact of vadose zone (I), and Hydraulic conductivity (C), the weights and ratings assigned in this research were similar to the typical ratings suggested in the original Methode. The result final assessment that groundwater pollution risk potential are classifies 4,27% of the area as having very low, 15,12% of the area as having low, 20,17 % as having moderate, 43,10% as having high, and 17,34% as having very high. The model was validated using E. Coli parameters as a represent of pollution risk where the results having exceeds 85% of total samples that a value exceeds from the standard of quality > 0 MPN/100 ml. However, this research is a preliminary to be continued in the further research.

Estimated Rate of Karst Aquifer Development by MRC Analysis and Flood Hydrograph Components at Guntur Springs, Gunungsewu Karst Area, Indonesia

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Understanding the stage of karst aquifer development (karstification) is of vital importance because this parameter can reflect the character of flow system release, from which relevant management patterns are derived. Master Recession Curve (MRC) construction is considered ideal for identifying at which stage karstification works because MRC relies on recession curves as its primary input. Recession curves are the most stable component of flow hydrographs in representing aquifer characteristics. The study focused on springs located in a karst hydrogeological subsystem, namely, Guntur Spring in the Panggang Hydrogeological Subsystem (Gunungsewu Karst Area). It was designed to determine (1) the flow characteristics and (2) the degree of karst aquifer development at Guntur Spring. It utilized a one-year flow hydrograph with a 30-minute logging interval as the main data. The flood hydrograph showed that a fissure system dominated the flow characteristics. Moreover, the MRC construction results indicated that the karstification level at Guntur Spring was 5.0, confirming the dominant fissure system and also signs of the recent development of conduit flows.

Chlorophyll-a Variability During Positive IOD - The East Season Period in 2019 in Padang Sea, Indonesia

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This study aimed to identify the effect of the positive Indian Ocean Dipole (IOD) phenomenon on the spatial, temporal distribution of chlorophyll-a concentrations in the East Season in Padang Sea in 2019. The method used in this research was the Kriging analysis method applied in oceanographic parameter satellite imagery extraction point data. By applying the method, we produced the maps of the spatial distribution variation of chlorophyll-a content and Sea Surface Temperature (SST). The data of IOD events in 2019 showed the occurrence of a strong positive IOD phenomenon that caused anomaly in the Sea Surface Temperature (SST) in Padang Sea. The interpretation of Aqua-Modis level 2 satellite image data showed that the sea surface temperature during the East Season was relatively cold, which was in the minimum temperature ranging from 18.5-22°C with a normal temperature condition of 28-29°C. The minimum chlorophyll-a concentration in the East Season was 0.252 mg/m³; while the maximum value reached 18.5 mg/m³. The distribution value of chlorophyll-a concentration was 1.028 mg/m³. The RMSe Cross Validation value obtained was 0.504 for SST and 0.363 for chlorophyll-a with a mean SST of -0.0005 and mean chlorophyll-a of -0.0039.

Occurrence of Rare Earth Element and Yttrium (REY) in Tanjung Formation Coking Coal From Sekako Area, Central Kalimantan

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Inorganic geochemistry of coal become a point of interest on coal study, especially relating with the occurrence of rare earth element. Tanjung Formation is one of coking coal bearing deposits in Barito Basin, Central Kalimantan. The aims of this study to determine the occurrence of Rare Earth Element and Yttrium (REY) especially in term of concentration and enrichment type in coal seam A and B of Tanjung Formation in Sekako Area, Central Kalimantan. A number of 10 coal samples were collected from both seams. Inductively Coupled Plasma-Atomic Spectroscopy (ICP-AES) analysis was conducted to determine the REY in coal. Based on this study, coal seam A and B generally have very low concentration of REY elements deposits. The REY elements of coal seam A and B in the study area are typically characterized with M and H-type enrichment, which might be caused by the mafic basalt rocks in the surroundings.

Keywords: REE, Yttrium coking coal, Tanjung Formation, Kalimantan

Keys of Sustainable Community Based Waste Management (Lesson Learnt from Yogyakarta City)

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In Indonesia, through Community Based Sanitation Program called Sanimas, which is coordinated by the Ministry of Public Works and Public Housing in collaboration with local governments and communities, establishes KSM (Community Self-Help Group) for Communal Liquid Waste Management Installations. The purpose of this study is to examine the factors that cause the sustainability of community-based liquid waste management. This research uses mixed methods, that is by analyzing quantitative data from the SKM (Community Satisfaction Survey) 2019 on the Implementation of Infrastructure Services in Yogyakarta City and then validated with primary data collected from semi-structured interviews with the head of KSM from the three well-managed Communal IPALs. Instead of the active participation of the community, the result shows in the case of Yogyakarta City, the key of Communal IPAL management sustainability is still more on the role and commitment of KSM or community leaders rather than the active participation of the community.

Keywords: waste management, liquid waste, community based, IPAL, KSM

Study of Environmental Management Based on Peri-Karst Community Interaction Pattern (Case Study : Long Lanuk Village, Sangkulirang-Mangkalihat Karst Area, East Kalimantan)

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Peri-Karst is an area located on the outside of karst formations but still the habitat of troglobxene and stygobxene. Long Lanuk village located on Peri-Karst zone of the Sangkulirang-Mangkalihat Karst area. The exploration of the natural resources in Long Lanuk village trigger changes in the pattern of community interaction. Community interaction pattern changes that occurred was a threat to the sustainability of the karst system that must be protected its existence. The research aims to discover the factors that affect the sustainability of the environment caused by the interaction of behavioral pattern of Peri-Karst community; (2) analyze the level of sustainability of the Peri-Karst on society and (3) formulate management strategies related to the sustainability of Peri-Karst livelihood in the Karst area of Sangkulirang-Mangkalihat, East Kalimantan. The level of sustainability is analyzed using the method of Multi-Dimensional Scaling which are categorized into four (4) dimensions, i.e. the dimension of environmental, economy, social and culture. The results of research regarding the level of sustainability of the Peri-Karst community in Long Lanuk Village based on the method of Multi-Dimensional Scaling shows: on the environmental dimension of attributes that have a high sensitivity value was the level of disruption of the industry has a value of 1,85. On the Economic Dimension, the attribute that has high sensitivity was the nest of the Swallow has a value of 2,4. The Attribute of Social Dimension which has high sensitivity was the potential for social conflict has a value of 2,3. The attribute of the cultural dimension that has a value of high sensitivity was the opportunity to make crafts has a value of 1,95. Environmental management strategies that can be applied to the Peri-Karst community in Long Lanuk village at each dimension that has high sensitivity. Management plan on each dimension is done based on the results of the social mapping interviews method refers to the policy of the Karst area management for the sustainability of community system interaction in Sangkulirang-Mangkalihat Karst area can be maintained.

Keyword : Peri-Karst, Multi Dimensional Scaling, Pattern of Community Interaction

Effect of earthquake on concrete gravity dam stability based on numerical simulation

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Concrete gravity dam structures span navigable waterways that are considered as very high-risk structures for earthquake shaking as such, they must be designed to resist the vibrations. However, these earthquake shaking are fundamentally dynamic in nature and a static analysis procedure may not be adequate for designing hydraulic structures like Dam. The entire modelling is based on US-Army Engineering Manuals. The earthquake effect is studied consider the damage control based on SEE performance objectives level in three sets of ground motion acceleration time history, the numerical simulation modelling used reservoir add mass hydrodynamic and linear time-history analysis to assess earthquake performance of critical overflow gravity dam section. The results of linear time history analysis are compared with the EM 1110-2-6051 and EM 1110-2-6053 performance acceptance criteria for gravity dams. This study indicated that the dam would suffer significant cracking along the base for all the selected earthquake Modified acceleration time histories (ground motion) that have been scaling to target spectra SEE level and should be assessed on the basis of nonlinear time-history analysis.

Control of aquifer weathering degree to the groundwater chemical composition in Wates Coastal Aquifer, Yogyakarta, Indonesia

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The studied coastal aquifer has been encountered a complex hydrochemical evolution. Interesting aspect is the occurrence of groundwater facies with different water chemistries in close proximity to each other. Water salinity is reported from local parts away from shore. This research was conducted for assessment of aquifer weathering and its control on groundwater chemistry. An investigation of major ions in 27 water samples was performed with geostatistics, graphical method, mineral saturation index and mass balance transport to identify the groundwater evolution. Geochemical analysis of sediments was made of 8 samples, to estimate the weathering degree using chemical index of alteration and chemical index of weathering. Silicate dissolution was promoted by low weathering, which was reflected in low ions dominated by calcium and bicarbonate in fresh water. It leaded to fine sands. Silts were dominant under moderate weathering. Sodium and calcium were higher than fresh water. Bicarbonate was still highest concentration. Main water was the mixed type which was indicated by moderate ions. Clays were formed by high weathering. Water salinity with highest dissolved solids was caused by halite dissolution and calcium adsorption on clays. Overall, groundwater chemistry in the study area is locally characterized by prevailing lithology in grouping patterns.

Keywords: Aquifer weathering; Coastal aquifer; Halite; Silicate dissolution; Water salinazition

The Influence of Adolescent Characteristics toward The Knowledge about Generation Planning in Sub-Village of Family Planning

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Adolescent knowledge is the optimizing capital of the condition of demographic dividend in Indonesia which will be culminated in 2035. Adolescent behavior such as early marriage, premarital sex, and drug abuse pushed the National Population and Family Planning Commissions's to implement the Generation Planning "Generasi Berencana (GenRe)" Program for preparing teen family life. This research aims to determine the influence of adolescent characteristics on knowledge about GenRe in the Sub-village of Family Planning Ngeprong. The primary data collection method is a census which the unit of analysis are the adolescent individual in Ngeprong. Data from the adolescent census are processed by multiple linear regression test. The results showed that adolescent characteristics proved that the significane influences the knowledge about GenRe with a contribution of 50,5%. The last education of adolescent characteristics ($Beta = 0,435$; $p <0,01$) is stronger in influencing the knowledge about GenRe than gender variable ($Beta = 0,147$; $p <0,01$) and work experience variable ($Beta = -0,195$; $p <0,01$). This research proves the hypothesis that the education and work experience characteristics affect the knowledge.

Keywords: influence; adolescent; characteristics; knowledge; Family Planning

Demographic Transition and Population Ageing in Yogyakarta

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The aim of this research were to explain the demographic transition and the population ageing in the Special Region of Yogyakarta (DIY). This study used previous demographic and profiles of the elderly data in DIY. These data collected from the Central Bureau of Statistics Indonesia (BPS) and other relevant institutions, and then analyzed by descriptive analysis. The results showed The Special Region of Yogyakarta's demographic transition is in its final stages. This is due to the population ageing in this region; which indicated by high percentage of elderly population. Population ageing in DIY has been happening since 1990. In 1990, the percentage of the elderly population was 11,3% and became 14,37% in 2019.

Keywords: Demographic Transition; Population Ageing; Elderly Population; Yogyakarta; Indonesia

Geomorphology and Iron Sand Potential at Coastal Sediment Morphology, Kebumen Regency

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Geomorphology is a landform that extends on the surface of the earth as a result of interactions between endogenous and exogenous processes. Landform classification based on morphometry, morphogenesis, and morphoarengement. Kebumen has attractive geological diversity. The potential of iron sand spread out as beach sand deposits. This research conducted to map landforms, including south coast region and analyze the distribution of iron sand sediment. The study used DEMNAS image analysis, a 1: 20,000 scale with Arc-GIS software. Variables analysis includes elevation, aspect, roughness, hill shade, river pattern, and hill roughness accompanied by a field survey. Resistivity survey on old beach deposits morphology (2 locations) and young beach deposits (2 locations) to obtain data on the potential of iron sand. Measurement using OYO Model 2, McOHM Resistivimeter, Schlumberger configuration, and geophysical modelling using Res-2Din software. The landform in Kebumen consists of 33 units as structural, denudational, dissolving, fluvial, and coastal landforms. The Coastal Sediment landscape consists of 3 units, in the form of young coastal sediment, old coastal sediment, and fluvio marine sediment. The potential of iron sand is founded in young coastal sediment (M5) is about 764,77 Ha, and old coastal sediment (M4) about 590,84 Ha. Mineral compositions are olivine, pyroxene, hornblende, biotite, and impurities as quartz, plagioclase, orthoclase, rutile and calcite minerals. Coastal sand sediment in the Old Sediment is found 30-60 m depth with overburden up to 4 m. The potential of beach sand about 406,686,300 m³ similar with 1,037,050,065 tons, total Fe estimated about 629,696,799 tons.

Key words : Kebumen, geomorphology, coastal sand deposit, iron sand, potential

Farm worker households in Wonorejo Village, Baluran National Park: socio-demographic characteristics and economic assets

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Wonorejo is one of the village near Baluran National Park, East Java that dominated by farm workers. The total farm workers in Wonorejo Village up to 45% by 2018. We know that farm workers are vulnerable groups which have high risk in poverty. But, these groups actually exist in the village. The purpose of this study is to describe socio-demographic characteristics and economic assets of farm worker households in Wonorejo Village, Baluran National Park, East Java. We used primary data with households survey and descriptive quantitative method of analysis. According to social characteristics it is known that the most of household heads of farm workers in Wonorejo Village did not finish primary school (46%) and only 65% of farm workers were all members in healthy condition. According to demographic characteristics, most of farm worker households were headed by male and the number of family members was quite diverse, the average age of farm workers more than 64 years. The result also showed that savings were the one of farm workers strategy for survival.

Keywords: Farm worker households, socio-demographic characteristics, economic assets, survival strategy

Quality Assessment of Road Network to Seplawan Cave in Donorejo Village, Central Java

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Infrastructure plays an important role in the tourism sector as a provider of facilities to provide facilities to tourist sites. The study area is in the Donorejo village, Central Java. Donorejo village has one of the most famous caves in Central Java, namely Goa Seplawan. The study was conducted with in-depth interviews with local residents and tourist visitors, as well as measurements and direct examination of the paths that are on site. Quality assessment of road conditions is carried out qualitatively. The assessment is based on the experience and standardization of each respondent which is then re-matched with the results of the study at the location and the Road Condition Index Matrix (RCI). There are three main paths to Seplawan Cave, namely through Hamlet Rejosari, Denansri, and Katerban. The main road passes through Hamlet Rejosari in good condition, but very steep. On the other hand, Denansri and Katerban hamlets have poor conditions. Road improvements have increasing the number of visitors to Goa Seplawan. In 2018 there were 9,889 and in 2019 became 13,882. This number shows that road construction has an impact on increasing the number of visitors at tourism sites in the Donorejo village.

Keywords: Road Infrastructure; Goa Seplawan; Road Quality; Tourism Sector; Road Condition Index

Vegetation covers change and its impact on Barchan dune morphology in Parangtritis coast, Indonesia

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Barchan dune is a peculiar type of dune that forms in wind corridors at the Inner Zone of Parangtritis Sand Dune. Their existence is increasingly threatened by land-use changes, especially vegetation coverage. This research illustrates the dynamics of vegetation cover change at the Inner Zone with the NDVI value approach using Sentinel-2 imagery. We also conduct field surveys to determine the actual condition of barchan dunes and compare it to previous morphology data. We only used the slip face height as a parameter of the barchan morphometric. The result showed that the vegetation coverage changed annually in different parts of the Inner Zone from 2015 until 2019. This vegetation covers controlled by restoration program in 2015 and 2016. The vegetation density on the transport zone more significantly affected the morphology of barchan than vegetation density which grow on the barchan body. Based on field data, mostly barchan dunes (10 barchans) experienced a decrease of slip face height than increased slip face height (4 barchans). All of the decreased barchans located in the middle of the Inner zone. The most decreased slip face height as low as 29,3 meters.

Keywords: Barchan; Sand dunes; Vegetation covers; NDVI; Slip face

Structural mitigation measures for flood reduction in urban area: A case study of Ciliwung watershed

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Flooding is an obstacle for water infrastructure which installed in a river system in Ciliwung,

West Java, Indonesia. The climate change triggers unpredictable rainfall which occurs in the watershed, therefore the vulnerability of river and other infrastructures are alarming. The rehabilitation and maintenance strategies are needed to make water infrastructures in the river system obtain lower damage. The research aims to simulate the 2-D HEC-RAS modelling of river system and stability. The result produces the water level of the river even in 1000-year discharge flood. Also, the research proposes the earth embankment dam for flood reduction in the watershed. The dam is designed according to the ideal condition. The simulation of HEC-RAS shows that the river experiences flooding in a certain condition. Besides, the research concludes that designed dam could overcome the flooding problem and suitable strategy for water infrastructure maintenance towards flooding impacts. Further investigation towards soil data for designed dam should be further analyzed to obtain better and comprehensive understanding.

Keywords: water infrastructure maintenance strategy; numerical modelling of river system; flood reduction; embankment dam; slope stability of dam

Trends of Significant Wave Height and Sea Level in the Southern Water of the Special Region of Yogyakarta

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Coastal zone is very vulnerable to the impacts of climate change. The increase of sea wave and sea level rise threaten coastal zone. The purpose of this study is to determine trends of significant wave height and sea level in the southern waters of the special region of Yogyakarta. The data used consists of daily significant wave height from 2010-2018, weekly absolute dynamics topography from 2005-2018 and daily surface wind from 2010-2018. Trends of significant wave height and sea level were analyzed by using linear regression. The results showed that significant wave height during the east season until the second transition season was higher than the west season and the first transition season. Vice versa, sea level during the east season until the second transition season was lower than the west season and the first transition season. Trends of significant wave height has increased of 0.63 cm/year, meanwhile sea level rise reached 0.82 cm/years.

Keywords: trends, significant wave height, sea level, climate change, coastal zone

Speleogenetic Process of Suaran Block, Karst of Sangkulirang - Mangkalihat, East Kalimantan

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Karst of Sangkulirang Mangkalihat is one of the greatest karst areas in Indonesia and has hundreds of caves. Some of those caves are located at Suaran Block, one of the main karst block at this karst. This paper aims to study the speleogenesis process, as the fundamental process on karst landscape and cave development in that area. Speleogenetic process can be examined from the shape of the cave passage using uniformitarianism approach. That principle creates speleomorphology as the study of cave passage form and the factors that affect it. The examination of the cave passages uses cave maps to see the form and direction of them. As the result, caves at Suaran Block are formed mainly driven by geological structures such as fault- fissures and bedding plane which is indicated by linear form of the cave passage and water flow which shows sinusoidal form of the cave passage. Some caves are shaped by the combination of geological structure and water flows make them have mixed-induced speleogenesis.

Keywords: Speleogenesis; Karst; Sangkulirang-Mangkalihat; Geological Structure; Speleomorphology

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Laboratory study on the use of natural zeolite from Gunungkidul, Indonesia for Cu, Pb, Zn and Cd immobilization in soil

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An experiment of the immobilization of heavy metals Pb, Cu, Zn, and Cd in contaminated soil by using the natural zeolite was performed in the laboratory. The natural zeolite was obtained from Gunungkidul, Yogyakarta, Indonesia. Artificially contaminated levels on 100, 300 and 500 mg/kg were prepared and then mixed with three different dosages of 5%, 10% and 20% of the natural zeolite. The result revealed that the addition of natural zeolite effect on reducing the heavy metal in the contaminated soil. The addition 5% dosage of the natural zeolite was sufficient to reduce the concentration of Pb, Cu and Zn from 500 mg/kg to the maximum permissible of concentration level. Finally, the natural zeolite immobilized the heavy metals in the contaminated soil by following in order: $\text{Pb}^{2+} > \text{Cu}^{2+} > \text{Zn}^{2+} > \text{Cd}^{2+}$.

Keywords: natural zeolite; heavy metal; soil; Gunungkidul; immobilization

Characteristic of Multi-ethnic Settlement in Indonesia, A Case Study:

Kampung 3-4 Ulu Laut Settlement on Musi Riverbank in Palembang City

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The plurality found at Kampung 3-4 Ulu Laut settlement on Musi Riverbank in Palembang city is one example of a case that can represent multi-ethnic settlement in Indonesia. The settlement consists of various kinds of ethnic, including native Palembang ethnic, Palembang Cirebon ethnic, Palembang Chinese ethnic, and migrant ethnics from areas outside of Palembang city. The existence of various multi-ethnic groups has influenced several physical sites of settlement, economic activities, social-cultural activities, and the basic values of life in settlement. This research aims to explore the empirical evidence at Kampung 3-4 Ulu Laut, so the characteristics of the settlement can be identified. The research method used is a case study research method that focuses on individual representation of a group, organization, situation, event or phenomenon in a natural context. Data is collected through a variety of data collection techniques, including documents, archival records, in-depth interviews, direct observation, and physical devices. The results showed that there were cultural variations between ethnic groups, both from the physical side of settlement, economic activities, social-cultural activities, and the basic values of life, which indirectly became a characteristic for settlement of Kampung 3-4 Ulu Laut on Musi Riverbank in Palembang city.

Keywords: Settlement; Multi-ethnic; River Bank; Ethnic; Urban Settlement

Analytical Hierarchy Process for Regional Development Priority in Donorejo, Central Java

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Donorejo is one of the villages in Purworejo Regency, Central Java, Indonesia. This village is a unique place and famous for its tourism site, namely Goa Seplawan. Nevertheless, this tourist attraction has not provided significant income for local revenue, as the poverty rate in Donorejo is still quite high. The Office of Community Empowerment, Villages, Population and Civil Registry of Central Java stated that only 1,630 residents of Donorejo were categorized as prosperous in their economy. It indicated that almost 50% of the population in Donorejo has not been economically prosperous and the development of Donorejo has not implemented optimally. To find out the proper development strategy, the Analytical Hierarchy Process was used as a method based on stakeholder assessment in the Donorejo. The used priorities were based on four aspects, namely human resource development, regional promotion, development of supporting infrastructure, and public services. The obtained results indicated that development of supporting infrastructure is a priority for the development of Donorejo. This outcome can be used as a reference to optimize the village development.

Keywords: AHP; Development; Priority; Infrastructure; Stakeholder

Land Resource Analysis in Jakarta Special Province, Indonesia

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The increasing number of Jakarta Special Province residents further increased the amount of land required for daily usages. In order to maintain and improve the economy, agricultural land-use continued to be converted into non-agricultural land-use. The reduced amount of agricultural land-use was able to increase the population pressure on said land, surpassing the land carrying capability. Analyzing the remaining land resources of Jakarta Special Province aimed to understand the changes in land-use, land carrying capability, the scale of land resources, and to determine the population pressure of the residents of Jakarta Special Province. The methods used in this analysis was to use secondary data, presented in the form of tables, graphs, and maps, as well as quantitative and qualitative descriptive analysis. In general, Jakarta Special Province had experienced a conversion of agricultural land-use into non-agricultural land-use (e.g. residential and industrial) between the year 2010 to 2018. The number of residents had exceeded the carrying capacity of Jakarta's land. This resulted from a growing need for non-agricultural land as well as the amount of population pressure, causing the unmet settlement needs.

Keywords: Carrying Capability; Jakarta Special Province; Land; Population Pressure; Resources

Housing rehabilitation and reconstruction in Central Sulawesi post-2018 earthquake

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The 2018 Palu Earthquake had damaged many community houses. The post-earthquake settlements program is the construction of temporary shelter and permanent house. The paper discusses to evaluate the development and propose rehabilitation and reconstruction applied in Central Sulawesi. All data were obtained by questionnaire, interviews, and field observations. The data is analyzed in a result framework for the shelter evaluation and a comparison to other post-earthquake programs for permanent house development. The research found the temporary shelter is occupied by only 52% because of impractical mobilization, living cost assistance absence, uncomfortable conditions, lack of clean water, and several refugees have reconstructed their houses. A low satisfaction rate is caused by the inadequate indoor condition, small capacity, and lack of privacy. This rate makes the temporary shelter is less effective. Regarding the permanent house development, the construction of relocated and satellite houses use modular houses, while the house reconstruction program authorizes the community to choose the preferred house model. The result is concerned to be different in occupancy and satisfaction level, in which the house reconstruction program will be more accepted. Since the temporary shelter and permanent house development requires relocated sites, land provision has slowed down the pre-construction stage.

Keywords: proposed methods, occupancy rate, satisfaction rate, relocated house, house reconstruction

Vulnerability Assessment of Residential Buildings to Tidal Flood Hazards in Sriwulan Village, Sayung Sub-District, Demak Regency

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Tidal floods are among the destructive hazards to coastal settlements. In December of 2017, extreme tidal floods impacted 3,500 houses in Sriwulan Village, Sayung Sub-District, Demak Regency. This research was intended to (1) asses the vulnerability levels of the residential buildings and (2) analyze the most influencing factors. The assessment was based on the scenarios built with a 150cm-high tidal flood, as observed during the 2017 event and projected for the subsequent five years (2022). The Analytical Hierarchy Process (AHP) and Spatial Multi-Criteria Evaluation (SMCE) were used in four scenarios, namely, hazard, physical, environmental, and economic. The equal scenario was also developed as a comparison to the first four scenarios to achieve the second objective. Based on the physical, environmental, and equal scenarios, 22 houses distributed throughout most of the areas of Nyangkringan Sub-village fell into the category of highly vulnerable. The most determinants of the vulnerability are related to the physical and environmental parameters. The former includes the design flood elevation, building maintenance, and building materials, while the latter consists of the source of tidal floods and their preventive measures, distance to water bodies, and accessibility.

Keywords: Vulnerability; Residential Building; Tidal Flood; Spatial Multi Criteria Evaluation (SMCE);
Sayung

How Important Risk Analysis of Plastic Pollution in Coastal Area? Case Study in Masohi, Central Maluku

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Human pressure on the coastal and aquatic surrounding ecosystem in Indonesia, through plastic waste, is increasing, considering that 60 % of the approximately 250 million people live in the coastal areas. Plastic waste originating from human activities has become a massive problem in almost all the small island and coastal regions, especially in the eastern part of Indonesia. This condition is caused by poor waste management and a lack of public awareness in disposing of waste in its place, including in an area known as its marine biodiversities and marine tourism spots like Masohi in Central Maluku. Also, the composition of waste is dominated by plastic waste that cannot be decomposed in a short period, continue circulated on the ocean currents, and will be deposited in coastal areas. Furthermore, some plastic waste will break down into micro-plastics that pollute not only the environment but also marine biota, which are often consumed by humans. This situation profoundly affects the sustainability and function of aqua- ecosystem services in coastal areas. Therefore, a comprehensive policy and regulation, and interdisciplinary study for analyzing vulnerable coastal ecosystem, and mitigating the potential risk of plastic pollution in Masohi, Central Maluku are essential to be conducted.

Keywords: plastic pollution; risk analysis; coastal area; Masohi; Maluku

Improving normalization method of higher-order neural network in the forecasting of oil production

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One of the challenges in the oil industry is to predict well production in the absence of frequent flow measurement. Many researches have been done to develop production forecasting in the petroleum area. One of the machine learning approach using higher-order neural network (HONN) have been introduced in the previous study. In this study, research focus on normalization impact to the HONN model, specifically for univariate time-series dataset. Normalization is key aspect in the pre-processing stage, moreover in neural network model.

Keywords: oil production forecast, time-series, higher-order neural network, normalization

Urban Resilience to Floods in Parts of Makassar, Indonesia

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Makassar – the largest and fastest growing area in eastern Indonesia – experienced significant number of damages and losses due to recurrent floods. In early 2019, the flood disaster exposed the urbanized area and inundated 1,658 houses and caused 9,328 impacted population. These figures imply that Makassar needs to create concerted efforts to improve its currently low resilience to floods. This study was designed to assess the urban resilience to floods in Makassar to provide the government with reference for evaluation and identify the most contributing factors to the resilience. In this context, resilience was assessed in four urban systems, namely physical, social, economic, and institutional, in every unit of analysis, i.e., flood-affected districts. The research data included building density, green open space, population density, the number of economically disadvantaged households, community's subsistence funds, and the availability of early warning systems and disaster emergency stations. The physical, social, economic, institutional, and equal scenarios of resilience were modeled using the Spatial Multi-Criteria Evaluation (SMCE). The results showed that the districts in Makassar were moderately resilient to floods and that the resilience of each urban system shaped the overall resilience. Tamalate and Rappocini sub districts had the lowest resilience values, whereas Manggala was estimated as the most highly resilient district in several scenarios.

Keywords: resilience; urban; flood; multi-criteria; indonesia

Effects of heavy rainfall on the slope stability – A case study on Imogiri Cemetery: the Graveyard Complex of Mataram Royal Kings

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Rainfall is the most common cause of landslides in Indonesia. On March 17, 2019, a landslide occurred in the Imogiri Cemetery, Mataram Royal Kings Graveyard Complex. It was expected to have been triggered by heavy rainfall of 148 mm/day intensity. This research aims to determine the effect of rainfall on the slope stability on the landslide at the Imogiri Cemetery. The study was carried out by slope stability modelling using Geostudio software. Rainfall information and soil characteristics data obtained from testing soil samples in the Soil Mechanics Laboratory, Civil and Environmental Engineering, Universitas Gadjah Mada, were used as input on the software. The output of the analysis is the factor of safety (FS) value, defined as the ratio of the shear strength to the shear stress. Without the rains, the FS value is about 2.44, which means the slope stability is stable. After heavy rainfall, the FS value decreased to 1.209 at the end of the simulation, which indicates happen the slope instability. Based on the simulation, the FS value depends on the volume of water content and hydraulic conductivity of the soil. Result of this study shows that heavy rainfall can trigger slope instability in the Imogiri Cemetery.

Keywords: Landslide; slope stability; Geostudio software; trigger; rainfall

Sustaining Subsistence Culture in Mamar Agroforestry Management in West Timor, is It Possible?

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A subsistence culture which has moral values related to the protection of ancestral territories and the environment, must be maintained in the management of Mamar agroforestry. On the other hand, subsistence culture is often seen as a counter-modernization culture because it is not commercially oriented. This paper aims to provide an overview of the subsistence culture and its relationship to the preservation of Mamar agroforestry and the potential stresses it faces, as well as quantify the opportunities for sustaining a subsistence culture in today's West Timorese society. The method used is literature study using Google Scholar and other relevant literature. As it is known, the demands of life necessities and lifestyles, global climate change, and government policies are the pressing factors for land conversion, including in Mamar. On the other hand, a culture of subsistence tends to maintain moral values in cultivating land that preserves nature, thereby reducing pressure for Mamar land conversion. The conclusion obtained is that a subsistence culture needs to be maintained and become a locomotive for maintaining the sustainability of development as a whole, by reducing the causes of vulnerability in society. Economic and social interests can be integrated due to compliance with strong social structures.

Key words: subsistence culture, sustainable development, environmental pressure, mamar agroforestry, west timor

Q Methodology to Determine Distinguishing and Consensus Factors (A Case Study of University Students' Ecoliteracy on Disaster Risk Reduction)

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Q methodology is to measure the diversity of human subjectivity, such as perspective, mindset, preferences, opinions, and attitudes. It is one of the approaches applied in mixed methods research. This paper is part of a preliminary study that aims to examine the application of Q methodology. Fourteen undergraduate students from the Faculty of Geography, Gadjah Mada University, participated in this study. Data collected with Q sorting techniques using the Q-Sortware, and analyzed with Principal Component Analysis using KADE desktop. Both are software used specifically in Q methodology research. The method implementation aims to determine the distinguishing factors and consensus of students' ecoliteracy components on disaster risk reduction. The research showed that Q-Sortware tends to facilitate researchers in collecting data. However, it is quite complicated and less practical for participants. Meanwhile, the KADE desktop has an attractive interface with a tutorial that makes it easy to use. By analyzing the case study, the result showed that the students' ecoliteracy component is represented by five distinguishing factors and two consensus statements, with cumulative variations explained by 68%. This study is, however, limited by the performance of quantitative procedures without in-depth qualitative data interpretation.

Keywords: Q methodology, distinguishing factors, consensus, ecoliteracy, disaster risk reduction

Contribution of Waste Bank in Reducing Greenhouse Gas Emissions in Bandung Regency

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Households with all their activities produce waste which can be a source of GHG emissions if not managed properly. Reducing waste from its source is one of the ways to reduce GHG emissions. In Bandung Regency, one of the ways to reduce household waste is by running the Waste Bank program. Research is needed to find out how much the reduction of GHG emissions from waste management in the Waste Bank. This study used a combination of quantitative and qualitative methods with descriptive analysis including IPCC method to estimate GHG emission reductions from waste management and in-depth interview with the operators in one of the Master Waste Banks (Bank Sampah Induk) in Bandung Regency, Y Waste Bank. The results showed that the potential GHG emission reductions from Y Waste Bank reached 0.016 Gg CH₄ or equivalent to 401.273 tons of CO₂eq, reducing GHG emissions from total household waste in Bandung Regency by 0.0007%. Program and technology innovations and also assistance for customers or fostered groups are expected to be able to increase the quantity of waste managed at the Y Waste Bank up to the household level so that it can give higher contribution in reducing GHG emissions in Bandung Regency.

Keywords: waste bank; greenhouse gas; emissions; mitigation; climate change

Hummocky Terrain of the Kalibabak Debris Avalanche Deposit, Lombok Island, Indonesia

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The debris avalanche deposit (DAD) coverage can drastically modify the surrounding landscape of volcanoes. DAD can be distinguished by hummocky irregular surface, jigsaw fissure, and mixing horse-shoe shape. Due to its particular shape of a hummock, the topography can be easily identified using DEM (Digital Elevation Model) and satellite imagery. The aim of this study is to characterize hummocky terrain in Lombok Island, which is located in the Kalibabak formation on the Geological map through the geomorphic approach. Hummocky terrain in this study are analyzed using DEM data from DEMNAS (DEM Nasional: 0.27-arcsecond resolution). Our study of this DAD encompasses seven variables, namely H/L ratio, numbers hummocks, distance to source, slope, area (size), relative height, topographic section, and hummock-spreading shape. A minimum of 756 hills derived from this DEM are considered as hummocks from this DAD, which extends ~18 km (NS) and ~25 km (WE) in the central part of Lombok Island. With an area of ~200 km² and a volume estimated around 8.8 km³, the Kalibabak DAD is more than three times larger than the one of the Mount St-Helens in 1980. The morphology of hummocky terrain is bounded by a sudden change of slope, which is indicated by a river confluence. Average hummock size is 2.7 ha and average distance between each hummock is 150-300 meters. The hummocks are characterized by steep slopes (25-45%) at the boundary to colluvium plain (debris deposit), which makes them easy to identify using DEM. Hummocks spreading distribution forms a conical-like shape with a H/L ratio of 0.13. The spreading distribution shape, the H/L and V/L ratios are useful as an input for reconstructing the mechanism of debris avalanche emplacement.

Keywords: debris avalanche; hummock; geomorphometry; volcanic debris-avalanche deposit; volcano

Earthquake vulnerability mapping in the at-risk Opak fault, Sengon village, Central Java, Indonesia

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This study aims to perform vulnerability assessment in a detailed scale at villages adjacent to Opak fault, Central Java. The study took place in Sengon Village, Prambanan District, Klaten Regency. Sengon is located near Opak fault zone and experienced tremendous disaster in 2006. The method for vulnerability assessment in earthquake hazard used in this study involves three criteria, i.e. physical, social, and economic with various indicators within. The mapping unit are hamlet units, which more detailed than village unit. The result of physical vulnerability assessment in Sengon village was dominated by a medium level of vulnerability. Sengon village has clustered settlement characteristics and this is a type of rural village in Indonesia. The advantage of clustered settlements is that there is a large evacuation site in this case paddy fields. The socio-economic vulnerability indicates that the majority of Sengon village are informal workers. This will have a big impact if an earthquake occurs because there will be many people lose their income. The total vulnerability assessment shows that all levels of vulnerability are distributed similarly. The advantage of this study is helpful to determine the action for reducing vulnerability especially in the at-risk of earthquake hazard.

Keywords: earthquake hazard; disaster mitigation; vulnerability assessment; vulnerability mapping; risk reduction

Economic valuation of blue lagoon tourism village widodomartani sleman

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Blue Lagoon Tourism Village is one of the developing tourism villages in Sleman Regency. Blue Lagoon Tourism Village has great potential to become an advanced tourism village when viewed from the aspect of attraction, accessibility, facilities, and ancillary services (4A). Research objectives are to calculate the economic valuation using the travel cost method and calculate bequest value of the Blue Lagoon Tourism Village. This research conducted by sequential explanatory technique that uses quantitative and qualitative methods in sequence. Assessment of the economic value of tourism activities in the Blue Lagoon analyzed using the Individual Travel Cost Method (ITCM). Multiple linear regression tests were also conducted to obtain the value of regression function. Otherwise calculation of bequest value is carried out using the contingency valuation method (CVM) in the form of willingness to pay (WTP). Potential economic value of Blue Lagoon Tourism Village is Rp. 6,019,052,924 per year, while actual economic income is Rp. 1,802,827,450 or 23.05% of economic potential. Bequest value of Blue Lagoon is Rp. 610,521,783 per year with 6.45 hectare of area, so bequest value based on area is Rp. 94,650,758.

Keywords: economic valuation; bequest value; multiple regression linear; tourism; individual travel cost

Agriculture Sector Workers and Rice Production in Riau Province in 2010-2018

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Absorption of labor in the agricultural sector in Riau Province in 2019 was around 31.9%, down from the previous year which reached 55.3%. The agricultural sector has a high contribution to GDP (in economic terms) in Riau Province. The results of rice production from agricultural activities can affect vulnerability to food security in a province. The research objective is to examine the employment of agricultural sector workers and rice production in Riau Province in 2010-2018. The data used are institutional data. The method used in this research is descriptive with quantitative data support. Generally in Riau Province, regencies classified as high in human resources (labor) sector A are Indragiri Hilir Regency and Rokan Hilir Regency which produce large amounts of rice production. Regencies that are classified as high in the number of workers are Kampar and Rokan Hulu, but rice production is still relatively low, due to not optimal productivity.

Keywords : Agriculture, Labor, Production, Spatial, Distribution

Financial and Ecological Compensation Based on Willingness to Accept in Sand Mining of Progo River Downstream

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Sand mining which occurs massively along the Progo River causes environmental degradation and infrastructure damage. Financial and ecological compensation funds will be used to compensate for the losses suffered by the community and efforts to conserve the environment. The purpose of this research is to estimate the value of compensation to be willing to accept or willingness to accept (WTA) by the community affected by sand mining in Banaran and Poncosari villages, also the spatial variations in WTA in Banaran and Poncosari villages. We established an ecological compensation accounting system based on respondents' willingness to accept (WTA) with Contingent Valuation Method (CVM). The results shows respondents in Banaran Village has the highest average WTA value of IDR 271,142 per month. Meanwhile, the average value of WTA in Poncosari Village is IDR 186,818 per month. This value illustrates how people extremely feel disadvantaged by the degradation in the quality of the environment that occurs in their residence. WTA value obtained is influenced by the subjectivity of respondents in assessing environmental conditions and can be influenced by income and some economic characteristics. With this compensation, environmental balance is expected to be maintained without neglecting the utilization of natural resources.

Keywords: Willingness to Accept (WTA); Contingent Valuation Method (CVM); Ecological Compensation; Sand Mining; Environmental Conservation

Impact and Economic Value of Agricultural Land Conversion in Sub-urban of Bantul Regency

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Increasing the number of populations in urban areas results in increasing the need for shelter and food, while the land area is limited. This has led to a conversion of agricultural land to non-agricultural land, especially in sub-urban areas that directly adjacent to urban areas. This study aimed to identify the impact of agricultural land conversion, and also to estimate the economic value of paddy land loss in sub-urban of Bantul Regency. Data were collected through structured interviews, institutional data, and literature reviews. These data were analyzed in a quantitative descriptive. Most of the paddy fields are converted for home and housing, partially used for economic activities that have higher land rent such as shops, boarding houses, and restaurants. The perceived impact is increasing air temperature, air pollution, also reduced employment opportunities and income from agricultural sector. The total economic value of the direct use obtained from the existence of agricultural land in Bantul sub-urban is IDR 96,806,832/ha/year. It includes the value of rice production of IDR 53,934,540/ha/year, the value of employment opportunities is IDR 17,126,688/ha/year, and the value of agricultural income is IDR 25,745,604/ha/year.

Keywords: Agricultural Land Conversion; Economic Value; Sub-urban; Land use; Economical Impact

Local residents' sense of autonomy towards marine-based adventure tourism development in Ambon

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Marine-based adventure tourism is one of the fastest growing areas within the world's largest industry. Regardless the increasing awareness of the economic and environmental significance of adventure marine-based tourism, it is only in recent years that a substantial body of research has developed but mostly still focuses only in the area of the visitors. Meanwhile, the local residents as an important factor who take role in the establishment of adventure marine-based tourism development has little been studied. Therefore, the local residents' sense of autonomy in developing the marine-based adventure tourism in Ambon was examined by means of qualitative interview study. Data has been collected through semi-structured interviews and field observations. Furthermore, the data has been analysed by inductive analysis. Series of focus group discussions and participatory GIS have been done in order to enrich the data collection process. The findings of this study which are three major emergent themes, serve as a basis for the local residents to develop marine-based adventure tourism in a sustainable approach. Their sense of autonomy along with the stakeholders in developing the marine-based adventure tourism will result in more benefits for the visitors as well as the local economy development.

Keywords: marine-based adventure tourism, local community, participation, Ambon.

Seismic Multi-attribute Analysis for Petrophysics Reservoir Prediction with Probabilistic Neural Network in "FA" Field

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Oil and gas reserves are increasingly difficult to find due to more complex geological conditions. Therefore a better method is needed to overcome these complex geological conditions. In this study, the petrophysics analysis by using the multi-attribute and the Probabilistic Neural Network (PNN) used to make reservoir distribution model on seismic horizontal slice. Multi-attribute method and Probabilistic Neural Network (PNN) can search for correlation between seismic attributes and the data sought, for the prediction of property values from surrounding rocks. The distribution of porosity data with a correlation value of 0.52 was generated, water saturation with a correlation value of 0.73, and shale content with a correlation value of 0.58. Where the combination of petrophysics parameters and acoustic impedance (AI) data of inversion results can be a clue to identify reservoir distribution. From the porosity and water saturation data, hydrocarbon dispersion can be made, wherein this study values were obtained between 0.01 - 0.03. This "FA" field has a reservoir between wells F-06, FA-05, FA-15, and FA-18 and spreads westward from wells FA-05, FA-15 & FA-18. This thing prove that Multi-attribute and neural network analysis can be used to determine predictions of petrophysics parameters and reservoir characterization.

Keywords: Probabilistic Neural Network; Multi-attribute; Water Saturation; Porosity; Shale Content

Mathematical Simulation of Forest Fire Front Influence on Wood-Based Building Using One-Dimensional Model of Heat Transfer

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The purpose of the present paper is to mathematical simulation of heat transfer in enclosures of wood-based building when exposed to thermal radiation from forest fire front. One-dimensional mathematical model is used. Mathematically, heat transfer in building enclosures is described by system of non-stationary equations of heat conduction with corresponding initial and boundary conditions. It is suggested to use several scenarios of forest fire impact. Temperature distribution on wall depth is obtained for different scenarios of forest fire impact on building enclosures.

Keywords: heat transfer; forest fire; mathematical simulation; wood; building

Water Quality Index and Pollution Loading Capacity of Setu Babakan, Jakarta-Indonesia

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Setu Babakan in the City of Jakarta Selatan contributes economically as a water tourist attraction. With its location in an urban area, growing human activities in its surroundings pose threats of contamination and reduction to its water quality. This research set out to analyze the water quality based on the Class II water quality standard issued in the Governmental Regulation No. 82 of 2001, determine the water quality index, and assess the pollution loading capacity of Setu Babakan. It drew on primary data collected by sampling water at four points in the inlet, middle, and outlet. The parameters observed were temperature, TDS, TSS, pH, nitrate, phosphate, detergent, BOD, and COD, using the CCME method to determine the water quality index and the Regulation of the Minister of Environment No. 28 of 2009 to examine the pollutant loading capacity. The results showed that (1) the pH, TSS, BOD, COD, phosphate, and detergents levels had exceeded the water quality standards, (2) the water quality index of Setu Babakan was categorized as marginal to fair, and (3) this body of water could no longer carry pollutant loads that contributed to TSS, BOD, and COD accumulation.

Keywords: Water Quality; Water Quality Index; CCME; Pollution Loading Capacity; Setu Babakan

Study of Groundwater Vulnerability to Contamination Using The DRANTHVP Method in Wates Groundwater Basin, Indonesia

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Wates Groundwater Basin in Kulon Progo Regency, the Special Region of Yogyakarta, covers an area of 152.67 sq.m. With human occupations continuously growing in the regency, the groundwater in this basin is subject to change. This research was intended to identify the spatial distribution of groundwater vulnerability of Wates Groundwater Basin using the DRANTHVP method, which factors in Depth to Water Table (D), Recharge (R), Aquifer Thickness (A), Nitrate Attenuation Intensity (N), Topography (T), Groundwater Velocity (V), and Pollutant Input Intensity (P). The data were analyzed quantitatively using a weighted tiered approach—the rating was based on to what degree each of these factors contributes to the calculated vulnerability, then overlaid to produce a groundwater vulnerability map. From the analysis, the index values were clustered into three classes of groundwater vulnerability: low 4.48-6.35, medium 6.35-7.39, and high 7.39-7.97. A large proportion of the basin had medium groundwater vulnerability (109.16 sq.m), and less than half of it had low (39.63 sq.m) and high groundwater vulnerability (3.88 sq.m); these severity levels vary depending on the hydrogeological characteristics and land use of a study area.

Keywords: Groundwater; Vulnerability; Contamination; DRANTHVP; Wates Groundwater Basin

Water Quality Analysis of the PDAM Drinking Water Distribution Network at the Baron-Ngobaran Management Unit, Gunungkidul Regency – Indonesia

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Baron and Ngobaran Underground Rivers are two sources of water on the southern coast of Gunungkidul Regency, Indonesia. A state-owned water utility company (PDAM) is currently distributing raw water for drinking from these underground rivers to Tanjungsari, Saptosari, Paliyan, Panggang, and Purwosari. In addition to quantity, processing raw water for this purpose needs to consider water quality. Therefore, this study was designed to assess the quality of raw water along the PDAM service lines, starting from a common source through pipelines and, finally, to connected customer property lines, and to analyze its Water Quality Index (WQI). During the field survey, the water quality was measured directly at several points selected by the purposive sampling method and indirectly in the laboratory. These measurements observed physical (temperature and TDS), chemical (pH, NO_3^- , Cl^- , CaCO_3 , Fe total, Pb), and biological properties (total coliform) and compared them with the requirements for drinking water quality published in the Regulation of the Minister of Health No. 492/MENKES/PER/IV/2010. The results showed that except for total coliform, all water quality parameters of Baron and Ngobaran Underground Rivers met the standards. Also, the detected water quality from the sources to customers' taps formed a spatial variation. Based on the WQI analysis results, excessively high total coliform levels on all samples made the raw water biologically unsuitable for direct consumption. Therefore, boiling before use is highly suggested as it can remove coliform bacteria in the water.

Keywords: Water Quality; Underground River; PDAM; Drinking Water; Water Quality Index

Total Maximum Daily Loads of Beton Reservoir, Gunungkidul Regency, Indonesia During the Rainy Season

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A total maximum daily load (TMDL) is an integrated mechanism to maintain water body to meet the water quality standards of its designated uses. This research was intended to determine the TMDL of Beton Reservoir, a structure built to regulate the water discharge of Beton karst spring in Gunungkidul, Indonesia, especially during the rainy season. The TMDL calculation referred to the Regulation of the Minister of State for Environment No. 28 of 2009 on TMDLs of Lakes and/or Reservoirs that required a calculation of morphological and hydrological characteristics, and water quality to meet Class II standard issued in the Regulation of the Governor of the Special Region of Yogyakarta No. 20 of 2008. The results showed that Beton Reservoir had a total volume of 22,586.83 m³, a surface area of 18,673.12 m², and a depth of averagely 1.21 m and released water at a rate of 0.48 m³/s. From the perspective of quality, the TSS and DO of its water had exceeded the standards, whereas the other parameters: temperature, TDS, pH, BOD, COD, total PO₄, and NO₃ were within their allowable presence in the water. Based on TMDLs for TSS, DO, BOD, COD, total PO₄, and NO₃, the Beton Reservoir can no longer accommodate TSS and NO₃ while continuing to meet the standards for these pollutants. High levels of TSS and NO₃ are attributable to the agricultural activities taking place on the catchment and the flow concentration typical of karst regions.

Keywords: TMDL; Beton reservoir; Reservoir morphology; Pollutant; Ponjong-Gunungkidul

Relationship Analysis of Vegetation Structural Properties and the Aboveground Carbon Stock of Mangrove Forest

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Mangrove forests have important ecological functions as a controller of environmental quality in coastal areas and absorber of atmospheric carbon. The mangrove ecosystem has a unique vegetation structure which form vegetation zonation that consists of different forest stands characteristics and tree species. This study aims to analyze the relationship between vegetation structural properties and the estimated aboveground carbon (AGC) stock of mangrove forest in Bedul mangrove, Banyuwangi, East Java, Indonesia. The study was conducted by field observation at some purposively selected sample locations. Field measurement was aimed to collect data about mangrove tree diameter at breast height (DBH), species, tree height, and fractional canopy cover. Mangrove biomass was indirectly calculated by allometric method based on mangrove species to estimate AGC in mangrove stands. The highest total AGC found in this study was 114.09 tons/ha at Rhizophora mucronata dominated forest, while the lowest total AGC was 12.86 tons/ha with Ceriops tagal as the dominant species. The AGC estimation in mangrove stands correlated positively with DBH and tree height. However, the biomass content and AGC are affected by the number of mangrove stands. The difference in the number of stands affect the amount of carbon content at each sample point.

Keywords: Above-ground carbon; mangroves; structural properties; relationship; Bedul

Quantification of Agricultural Land Balance Sheet of Purworejo District in 2009 and 2018

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Some districts in Central Java have problems regarding the shrinkage of agricultural land area and a high decrease in the number of farm households. The increase in population and economic development is one reason for the increased demand for land to convert agricultural land. The faster rate of land use change can affect the conditions of domestic food availability in an area, so it is important to quantify the area of agricultural land to monitor changes in land area. This research aims to calculate changes in agricultural land area through the balance of agricultural land resources. This research was conducted with quantitative methods and analyzed descriptively and spatially. Agricultural land is calculated using the land resource balance through a skronto table in 2009 and 2018. The results show that a decrease in area is more dominant than an increase in land area. The largest decrease in total land area occurred in tegal/farm area of 21.12 percent and paddy field area of 3.43 percent of the previous area. Spatially, changes of land area influenced by land conversion with two factors, namely physical condition and accessibility of the area.

Keywords: Agriculture Land; Land Conversion; Resources Balance Sheet; Skronto Table; Purworejo District

A climatological study of typhoons over the Philippine Area of Responsibility from 1989-2018

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The Philippines is in the Western North Pacific region, where it is a recipient of several weather disturbances such as tropical cyclones. This study aims to determine trends and periodicities of typhoons (TY) within the Philippine Area of Responsibility (PAR), and the rainfall they brought in a 30-year period (1989–2018) for future forecast and disaster risk mitigation efforts of these TY. These TYs are raised when TC's sustained winds are 118 kph and above. Frequency analysis of TY is done to determine the trends and periodicities in terms of the yearly total occurrence, number of TY that made landfall, distribution of TY classification, and their seasonal variation. The results showed that with PAR the yearly total occurrence of TY seems to have an approximately 12-year periodicity where maximum occurrence was observed around the years 1994, 2004, and 2014 while minimum occurrence was observed in years 1989, 1999, and 2010. Also, track data shows that only 32% of these TY made a landfall within PAR. Out of the three regions in the Philippines, Luzon Island is the region where most of the severe typhoons made landfall at 80%. Moreover, TYs occurred mostly during September to November where the transition period between the northeast monsoon and south west monsoon usually occurs. Also, rainfall during which these TYs have occurred were obtained from five synoptic stations across the Philippines. It showed from 1989 to 1998, the total yearly rainfall brought by these TYs ranged from 804 mm to 1912 mm. But from 1999 to 2018, these TYs brought more rain where their total yearly rainfall ranged from 2844 mm to 4941 mm.

Keywords: typhoon; Philippines; typhoon track; rainfall; climatology

Spatial Distribution of Agricultural Land Carrying Capacity in Purworejo Regency

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The increasing population in Purworejo Regency has a negative impact on the availability of agricultural land. As a result, available agricultural land is decreasing it's carrying capacity, in producing food for the population. Based on these problems, the study was carried out to analyze the spatial temporally distribution trends of the carrying capacity of agricultural land in the Purworejo Regency area from 2009-2018. The study used secondary data 2009-20018 and analyzed descriptively qualitatively. Spatially the results of the study found that there were variations in the spatial distribution patterns of the carrying capacity of agricultural land in Purworejo Regency from 2009-2018, while judging by the trend, there was a tendency for the carrying capacity of agricultural land in each sub-district, the trend of which increased, decreased and some remained. The results of this study also found that the carrying capacity of agricultural land in each sub-district in Purworejo Regency was between $1 \leq 2.46$. If the trend of decreasing the carrying capacity of agricultural land is allowed to continue, the ability of the sub-district to produce food will decrease, so that the availability of local food will decrease. For this reason, it is natural for the Purworejo Regency Government to adopt a policy to control agricultural land so that the sub-districts that become food storage can be maintained.

Keywords: Agricultural Land, Paddy Field, Carrying Capacity, Population and Social-Economic.

Assessment of Groundwater Resources Potential Using Geoelectrical Method and Slug Test in Tegal District, Central Java Province, Indonesia

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Water resources are essential to support everyone in the world, and one of its sources is groundwater. Many areas in Indonesia rely on groundwater to meet their daily needs due to the lack of surface water resources. However, not all-districts have detail information about groundwater resources such as in Tegal District, Central Java Province, Indonesia. Land use planning without the support of information on water resources will cause many problems. Therefore, this study aims to assess groundwater resources in Tegal District using the geoelectrical method and slug test. The research was conducted by geoelectrical survey in 8 locations, measuring groundwater level from the nearest point, and two slug tests. The result of the survey shows that five types of materials in the area are clay, silt, sand, breccia, and lava. The sand layer is an aquifer, and it consists of two layers. The sand layer has a permeability of 6.68 m/day. However, the clay has a permeability of 1.46×10^{-3} m/day. The moderate potential of groundwater resources with transmissivity value of more than 50 m²/day lies in the middle of the district.

Keywords: Geoelectrical survey; Slug test; Aquifer; Permeability; Transmissivity

Application of the Compact City Concept in Condongcatur Educational Area

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The existence of university can be a new growth center area that causes affect to increased

carrying capacity areas such as residential area and trigger development of commercial and service areas to support educational activities. Development uncontrolled area will give problems to the surrounding area. In the Kaliurang km.5 street corridor, precisely in Caturtunggal Village, Yogyakarta experienced regional development that is because there are two campuses such as Gadjah Mada University and Yogyakarta State University which have high student attractiveness. This causes a problem impact to traffic in main street, land use change in green open space, and high building density. The concept of a compact city is a concept sustainable development one of the carious sustainable development approaches to solve this problem by considering environmental, economic, and environment aspects. This study aims to examine the characteristics of compact cities in the region Kaliurang km.5 street, as well as providing direction for regional development in realizing it sustainable areas with qualitative descriptive analysis technique.

Keywords: Compact City; Sustainable City; Education Area; Corridor; Yogyakarta

Population Characteristics and Distribution Patterns of Slum Areas in Palembang City: Getis Ord Gi* Analysis

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The paper aims to describe the population characteristics and the distribution patterns of slums in Palembang City. The research employs a quantitative method with 382 respondents. The data are analyzed using cross-tabulation of IBM SPSS 23 to know the population characteristics. Meanwhile, the distribution patterns of slums are analyzed by observing the sample distribution through the proportional random sampling technique. It is carried out by calculating the number of buildings of each area and noting the coordinates of each sample using GPS essentials application. The data are recorded and inserted into the sample spots on the map, which were then analyzed using the High-Low Clustering Report of Getis Ord General Gi*, to see the distribution pattern, especially the cold spot and hot spot, through ArcMap 103 program. The research found that non-migrant married Moslems dominate the population of Palembang city, with the average occupation is labor or manual worker. The slum distribution forms a low cluster pattern, meaning that it has a low value. The value is due to the government's effort to manage the city and the development of the market sector, limiting the slum distribution. Getis Ord Gi* analysis revealed that the slum area in the city center and within a dense population is a cold spot (low cluster), while those far from the city center yet are still crowded are hot spots (high cluster).

Keywords: Population Characteristics; Distribution Patterns; Slum Areas; Palembang City; Getis Ord Gi*





LIFE SCIENCES, MATERIALS, AND APPLIED CHEMISTRY SYMPOSIUM

The use of 1 H-NMR spectroscopy coupled with chemometrics for authentication of Curcuma xanthorrhiza adulterated with Curcuma aeruginosa

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Curcuma xanthorrhiza rhizome is known to have several pharmacological activities and it is potential to be adulterated with other species having lower price such as Curcuma aeruginosa to gain more economic benefit. The objective of this study was to develop 1 H-NMR spectroscopy combined with chemometrics of principal component analysis (PCA), partial least square-discriminant analysis (PLS-DA), and orthogonal projections to latent structures-discriminant analysis (OPLS-DA) for authentication of C. xanthorrhiza. PCA could be used for differentiation between pure and adulterated C. xanthorrhiza. Chemometrics of PLS-DA showed clear and better separation between authentic and adulterated samples. The obtained R_{2X} was 0.975, R_{2Y} was 0.993, and Q₂ (cum) was 0.986. OPLS-DA using two principal components and one orthogonal variabel provided complete separation between authentic and adulterated samples better than using PCA and PLS-DA. The model has a good of fit indicated by high value of R_{2X} (0.939) and R_{2Y} (0.932) and a good predictivity indicated by its Q₂ value (0.925). It can be concluded that combination of 1 H-NMR spectroscopy and chemometrics of PCA, PLS-DA, and OPLS-DA could be used for authentication of C. xanthorrhiza adulterated with C. aeruginosa with OPLS-DA showed the best classification.

Keywords: Authentication, Chemometrics, 1 H-NMR, Curcuma xanthorrhiza

Effect of Ni on Dielectric Properties of Mn-NiFe₂O₄ Magnetic Nanoparticles

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Mn 1-x Ni x Fe 2 O 4 nanoparticles were synthesized using co-precipitation method with various x = 0.3-0.8. This samples were characterized by X-ray diffraction (XRD) and computerized impedance spectroscopy. X-ray diffraction analysis of samples show the cubic spinel structure with a various particles size of 3.6, 5.8, 7.2, 13.4, 18.7 and 19.7 nm. The crystalline size of the sample was found to decrease with the increase of Ni 2+ ions. The dielectric properties of all samples were measured at frequencies 10 - 10 3 kHz. The dielectric permittivity (real and imaginary) decreased with frequency up to 200 kHz. The highest real dielectric permittivity (ϵ') was 343.3 and the imaginary dielectric permittivity (ϵ'') was 440.5 for nickel x = 0.5 at frequency 10 kHz. The maximum impedance (Z) was 211.0 kOhm for Ni 2+ x= 0.3. Furthermore, the dielectric permittivity of the Mn 1-x Ni x Fe 2 O 4 nanoparticles were dependent on the frequency. This type of behaviour can be explained by the Maxwell-Wagner model.

Keywords: Dielectric properties, magnetic nanoparticles, Mn-NiFe₂O₄ ferrites.

The Effect of Ag Molarity of Core-shell Fe₃O₄ @Ag Nanoparticles for Sensitivity Enhancement of Surface Plasmon Resonance (SPR) - Based Biosensor

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The objective for this research is advance affectability of Surface Plasmon Resonance (SPR) biosensor utilizing core-shell Fe₃O₄@Ag nanoparticles (Fe₃O₄@Ag NPs) with a variation of Ag molarity (20, 40, 60, 80, 100) mM. Fe₃O₄@Ag NPs were synthesized by the aqueous solution method. The characterization by utilizing X-ray Diffractometer (XRD) depicts that the crystal structure of Fe₃O₄ compares to the cubic inverse spinel structure and based on Transmission Electron Microscopy (TEM) estimation, the particle size average of Fe₃O₄@Ag NPs is 14.45 nm. The magnetic properties of Fe₃O₄@Ag NPs were evaluated by Vibrating Sample Magnetometer (VSM), the result appears that the more molarity of Ag increases, the more remanent magnetization (Mr), saturation magnetization (Ms), and coercivity field (Hc) diminishes. In this research, a Fe₃O₄@Ag NPs, a spherical nanoparticle consisting of a spherical Fe₃O₄ core covered by an Ag shell, was used as an active material to enhance the signal detection of SPR, with a wavelength of 632.8 nm in the Kretschmann configuration. The system consists of a four-layer material, i.e., prism/Au/Fe₃O₄@Ag NPs/air. The results show that the SPR angle shifted to the larger angle of incident light by using Fe₃O₄@Ag NPs. However, the effect of Ag molarity appears that the more molarity of Ag extends, the lower angle of SPR shifts. The addition of a core-shell in the conventional SPR-based biosensor leads to the enhancement of the SPR biosensor sensitivity if the fractional volume of core-shell is large.

Keywords: Surface Plasmon Resonance (SPR), Ag Molarity, core-shell Fe₃O₄@Ag, sensitivity.

The Effect of Chitosan Concentration on Disintegration Time of Amoxicillin Tablet

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The most often prescribed antibiotics by dentists to patients is Amoxicillin. It is usually in the form of capsules and tablets which are hard to swallow, especially for geriatric and pediatric patients. Orally disintegrating tablet (ODT) with the capability to disintegrate inside oral cavity without the need of water required disintegrant agent in its formulation. In this study, chitosan as the product of deacetylation of chitin which originated from exoskeleton of crustacean shells was considered as suitable disintegrant because its swelling characteristic. The aim of this research was to study the effect of chitosan concentration on disintegration time of Amoxicillin tablet. Seventy tablets were made with direct compression method. Five formulas of 250 mg Amoxicillin with chitosan concentration of 2%, 5%, 8%, 11%, and 14% were prepared, with two control groups, i.e. the group of sodium starch glycolate as disintegrant at concentration of 5% as positive control and the group without adding disintegrant into the formula for negative control. Each tablet were tested for their disintegration time using disintegration tester (Erweka). The data of disintegration time of each tablets were recorded and analyzed using non-parametric hypotheses test of Kruskal Wallis. The result of Kruskal Wallis's test showed significant difference of chitosan concentrations on disintegration time of Amoxicillin tablet ($p < 0.05$). The shortest disintegration time was found at 11% concentration of chitosan. Higher concentration of chitosan (14%) increased the disintegration time of Amoxicillin tablet due to gel-like formation that prolonged tablet disintegration. It was concluded that different concentration of chitosan can affect the disintegration time of Amoxicillin tablet. Further studies were recommended to provide best candidate of ODT for Amoxicillin.

Keywords: Amoxicillin, chitosan, disintegration time, orally disintegrating tablet

Magnetic Nanoparticle Detection Using Wheatstone Bridge Giant Magnetoresistance (GMR) Sensor with Double CoFeB Spin-Valve Thin Films

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The Wheatstone bridge-giant magnetoresistance (GMR) sensor was developed for a potential biomolecular detection. The GMR sensor with double spin valves was chosen as [Ta (2nm)/IrMn (10nm)/CoFe (3nm)/Cu (2,2nm)/CoFeB (10nm)/Ta (5nm)] spin-valve structure. The spin valve was fabricated using DC Magnetic Sputtering method. The Fe₃O₄ magnetic nanoparticles was synthesized by co-precipitation method as a magnetic label. The magnetic properties of the Fe₃O₄ nanoparticles measured are the saturation magnetization (Ms) of 77.7 emu/g, remanence magnetization (Mr) of 7.7 emu/g, and coercivity (Hc) of 49 Oe. The X-ray diffraction pattern showed the inverse cubic spinel structure with the average crystal size of about 20.1 nm. The output voltage of the GMR sensor with the single spin valve was increased with the increase of the Fe₃O₄ concentration from 1.72 mV to 3.89 mV. The output voltage at the concentration 0 mg/mL, 1 mg/ml, 5mg/ml, 10 mg/ml, 15 mg/ml, and 20 mg/ml ware 0.0029 mV, 0.0034 mV, 0.0030 mV, 0.0060 mV, 0.0055 mV, and 0.0052 mV.

Keyword: Giant Magnetoresistance (GMR), Magnetic Nanoparticle

Dielectric Elastomer Actuator for Linier Actuator Like Deformable Muscle

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Dielectric elastomer actuator (DEA) is a compact device consist of stretchable electrodes and elastomers. This device is energy efficient in performance and holds great promise in the development of soft actuators like muscle. DEAs performance relies significantly on the mechanical properties of its elastomers. This present study focuses on evaluating the soft material made of Sylgard 184 as the elastomers for DEAs. Sylgard 184 is a silicone elastomer that comes with two main parts (elastomers and its curing agent). A specific mixing ratio between elastomers and curing agent is important to produce solid and reliable silicone elastomer. The recommended ratio for the elastomer solution was 10 parts for the elastomers and 1 part for curing agent (10:1). Producing softer elastomers was possible by reducing the curing agent, however, the performance of the material was unknown. We performed series of cyclic tensile test to understand the mechanical characteristic of the elastomer made of Sylgard 184. The result shows that reducing the curing agent did not have a significant effect on its cyclic performance. Furthermore, the use of a 30:1 ratio in the application of DEAs and deformable linear actuator indicates stable performance for both devices.

Keywords: dielectric elastomer, tensile test, PDMS, silicone.

Characterization of Tuna Skin Gelatin Edible Films with Various Plasticizers-Essential Oils and Their Effect on Beef Appearance

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Edible film is a safely consumed thin layer packaging. This study aimed to determine characteristics of tuna skin gelatin edible films containing glycerol or sorbitol plasticizers with turmeric or eucalyptus essential oils (EOs) and their effect on the beef appearance. This research was prepared with extraction of tuna skin gelatin using H₂SO₄ , NaOH and C₆H₈O₇ . Then, edible films were formed by mixing 3% (w/v) tuna skin gelatin, glycerol or sorbitol plasticizer, Tween-20, and turmeric or eucalyptus EO in 0.5%; 1%; and 1.5% (v/v). The results showed that the addition of EOs caused a significant decrease in transmittance, transparency, water vapor permeability and solubility but increase the thickness, tensile strength, elongation at break, and antioxidant activity ($p < 0.05$). Sorbitol film had better physical properties than glicerol. Edible films containing 1.5% EO had moderate to strong (9.33-18.83mm) inhibition for Escherichia coli and Staphylococcus aureus. Fourier transforms infrared (FTIR) spectra on edible film containing EOs have high amplitude at 2924.09-2931.80 wavenumbers. This edible films applied on beef can maintain the texture and color of up to day-3. Thus, the addition of turmeric and eucalyptus EO can improve physical properties, antioxidant activity and antibacterial activity of edible films which can be applied to beef.

Keywords: edible film, tuna skin gelatin, turmeric essential oil, eucalyptus essential oil, sorbitol, glycerol, beef

Characterization of Tuna (*Thunnus albacares*) Skin Gelatin Edible Film Incorporated with Clove and Ginger Essential Oils and Different Surfactants

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Tuna skin gelatin edible film needs to be modified by adding hydrophobic materials and surfactants, to improve their physical and functional properties. The objectives were to determine the physical properties, antioxidant activity and antimicrobial of tuna skin gelatin edible film were incorporated with ginger, clove essential oils, and surfactants. The stage 1) the extraction of gelatin from the tuna fish skin, 2) making edible films: ginger-tween edible film (GTF), ginger-soy lecithin edible film(GSF), clove-tween 20 edible films(CTF), and clove-soy lecithin edible film(CSF). The results showed an increase of $*L$, $*b$ values, the highest value on GTF. CTF and CSF have higher tensile strength compared to GTF, GSF, and control, but not significantly different for elongation at break for all samples. Water vapor permeability was not significantly different amongst all edible films. Solubility decrease when clove essential oil incorporated, in comparison with GTF, GSF, and control. Fourier transform infrared spectroscopy analyses spectra indicated that edible film added with essential oil clove exhibited higher hydrophobicity than the control edible film. CTF showed the highest DPPH radical scavenging activities and the highest antimicrobial inhibitory activity. Therefore clove essential oil and both surfactants could affect the physical and functional properties of resulting edible films.

Keyword: Edible film, Gelatin, Tuna skin, Essential oils, Surfactants

Preparation of Potassium Permanganate Confined in Porous Carbon Synthesized from Palm Kernel Shell and Its Application for Hydrogen Sulfide Removal

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The goal of this study is to investigate the efficacy of potassium permanganate ($KMnO_4$) confined in porous carbon for hydrogen sulfide removal. As porous support, carbon was prepared by carbonization process of abundantly biomass source of palm kernel shell (named KATKS). The surface of porous carbon was first modified using hydrogen peroxide oxidation. The confinement process was carried out by impregnation process. $KMnO_4$ contents in porous carbon were varied i.e. 5%, 10% and 20% w/w ($KMnO_4$ -%/KATKS-Ox). Materials were characterized by N 2 -sorption analysis and SEM-EDX. The results showed that KATKS possesses high surface area of ca. 700 m²/g. Due to impregnation of $KMnO_4$, the specific surface area of $KMnO_4$ -%/KATKS-Ox decreased to ca. 450 m²/g. SEM-EDX revealed a successful confinement process which elements of K, Mn, and O were displayed and dispersed on carbon surface. In the hydrogen sulfide (H_2S) oxidation testing, $KMnO_4$ - 20%/KATKS-Ox showed the highest performance of H_2S removal compared to other materials due to high amount of $KMnO_4$. $KMnO_4$ -20%/KATKS-Ox could reduce until 98.7% of H_2S . This is remarkably higher than only using bulk $KMnO_4$ (without confinement) which showed activity of ca. 70% reduction.

Keywords: Oxidation, hydrogen sulfide, nano-confinement, potassium permanganate, porous carbon

Adsorption of Silver (I) on Dithizone-Immobilized Coal Fly Ash

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Adsorption of Ag (I) on dithizone-immobilized coal fly ash (Dtz-CFA) from P.T. Madukismo Factory, Yogyakarta, Indonesia has been investigated. Immobilization of dithizone on activated coal fly ash (Act-CFA) was done by stirring the mixture of two precursors in toluene medium at 50 °C for 4 h. Parameters influencing adsorption of Ag(I) such as pH of solution, adsorbent mass, contact time and initial concentration of Ag(I) ions were optimized. FT-IR and XRD characterizations show that the surface of fly ash has successfully immobilized by dithizone. The optimum conditions for Ag (I) adsorption are reached at pH 6, adsorbent mass of 0.02 mg, contact time of 45 min and initial concentration of 100 mg.g⁻¹. The ability of Dtz-CFA to adsorb Ag (I) metal ions significantly increases as compared to that of Act-CFA. Kinetic and isotherm adsorption studies suggest that adsorption of Ag (I) using both Act-CFA and Dtz-CFA follows a second-order pseudo reaction and Langmuir isotherm model, respectively. These results indicate that Dtz-CFA may be used as prospective adsorbent for removing Ag (I) ion.'

Keywords: adsorption; silver; immobilization; dithizone

Characteristics of Tuna Fish Skin Gelatin Enriched with Red Ginger (*Zingiber officinale* var *rubrum*)

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Gelatin is the result of hydrolysis of collagen derived from bone and animal skin and can be used as food additives. However, gelatin from fish skins usually still have a strong fish odour, so in this study the addition of natural ingredients in the form of red ginger. The purpose of this study was to determine the effect of acid type and extraction temperature on the characteristics of tuna skin gelatin and the effect of enriched red ginger on the physicochemical and functional properties of tuna skin gelatin. This research was divided into two stages, the first stage consisted of 2 factors: acid type (acetic acid and lactic acid) and extraction temperature (60°C; 70°C; 80°C) while the second stage research was to compare gelatin without the addition of red ginger (Control), gelatin + red ginger (GRG), and bovine gelatin (BG). The analysis showed that gelatin with acetic acid treatment and extraction temperature of 60°C had the best yield, viscosity of gel strength and had a yellowish white color. Whereas the next step showed that GRG had a pH value, ash content, foaming capacity at concentrations of 0.3% and 0.5%, foaming stability and the highest antioxidant ($p < 0.05$).

Keywords: Gelatin; Tuna Fish Skin; Extraction Temperature; Pre-treatment; Red ginger

Stainless steel/hydroxyl functionalized graphene electrode for electrochemical oxidation of methyl orange

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Graphene and its related compounds are among the emerging materials to be studied for many applications, especially for the electrochemical process. We prepared a stainless steel/hydroxyl functionalized graphene (SS/G-OH) electrode by anodic electrodeposition method. The G-OH dispersion is realized with a voltage of 30 V for electrodeposition variation time 1, 3, and 5 min with 316L stainless steel as an anode and cathode. The obtained SS/G-OH electrode was characterized by XRD, SEM-EDX, and FTIR. The G-OH modified SS electrode shows higher electrocatalytic ability than that of the bare SS electrode. The best electrodeposition time is 3 min. The electrochemical degradation of 20 ppm methyl orange (MO) by using the SS/G-OH electrode with an applied current of 1.5 A showed a concentration reduction of >99% after 30 min of reaction. The GC data suggest that MO was mainly degraded to CO₂ and H₂O. This graphene-based electrode could be of choice for the electrochemical degradation of industrial dyes.

Keywords: Stainless steel, Graphene oxide, electrochemical oxidation, dye.

Characterization of Physical, Chemical and Functional of Tuna (*Thunnus albacares*) Skin Gelatin enriched with Cinnamon Powder

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Gelatin prepared from tuna skin (GTS) for application in food industries requires improvement of its functional properties. With the addition of spices, the functional properties of gelatin could be improved. This study aimed to determine the effect of the addition of cinnamon powder (CM) on the characteristics of GTS. The pre-treatment process was developed prior to the addition of CM to GTS. The best pre-treatment could achieve a GTS with a yield of $15.91 \pm 0.91\%$, gel strength 356.95 ± 0.24 g Bloom, and viscosity 21.53 ± 4.57 cPs. The resulting GTS was then added by cinnamon with a concentration of 20%. The highest gel strength and viscosity were GTS 345.97 ± 0.19 g bloom and 24.13 ± 2.96 c Ps. The highest value of Water Holding Capacity (WHC) is obtained at GTSC $238.56 \pm 20.83\%$. The highest value of Oil Holding Capacity (OHC) is in the CG sample of $209.03 \pm 6.52\%$. The addition of cinnamon 20% (GTSC) has a significant effect on viscosity and produces the highest antioxidant ($15.01 \pm 2.8\%$).

Keywords : Fish skin, Gelatin, pretreatment, Physicochemical, Fungsional propreties

Surface-Modified Carbon Synthesized from Palm Kernel Shell for Electric Double-Layer Capacitor Applications

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This research was conducted to study changes in functional groups after oxidation of porous carbon synthesized from palm kernel shell and their effects on the performance of material for electric double-layer capacitor (EDLC). Porous carbon was prepared by pyrolysis of palm kernel shell at temperature of 800 °C and steam activation. Surface modification was conducted by oxidation porous carbon using hydrogen peroxide (H_2O_2). Properties of material were characterized using N₂-sorption analysis, scanning electron microscopy (SEM), and Fourier transform infrared spectroscopy (FTIR) analysis. Measurement of biomass based porous carbon as an electrode for EDLC was carried out using cyclic voltammetry and galvanostatic charge-discharge methods. The test was conducted using three-electrode system, with carbon as the working electrode, Ag/AgCl as the reference electrode, Pt as the auxiliary electrode. Electrolyte used was 1 M H_2SO_4 solution. The results showed that oxidation of porous carbon using H_2O_2 lowers the specific surface area but increasing oxygen functional groups in the carbon surface. The results on testing the performance of EDLC, surface-modified carbon showed better EDLC performance of 5-7 times higher compared to carbon before oxidation.

Keywords: cyclic voltammetry, galvanostatic charge-discharge, EDLC, porous carbon, oxidation

Conversion of Nyamplung Oil (*Calophyllum inophyllum* Linn) Into Liquid Fuel by a Hydrocracking Process Using a Bimetallic Based Catalyst Namely NiMo/y-Al₂O₃

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Energy demand in Indonesia continues to increase from year to year. This happened in all sectors including industrial, transportation, commercial and household sectors. The transportation sector is one of the biggest sectors in consuming energy compared to other sectors that still depend on fossil fuels [1]. This is an increase in the consumption of fuel oil (BBM) at this time, both gasoline (gasoline), kerosene (kerosene) and diesel (diesel oil), along with a decrease in the production of national petroleum exploration activities, encouraging efforts to search for alternative fuels as a substitute for supply petroleum-based energy. This research develops the hydrocracking process of nyamplung oil (*Calophyllum inophyllum* L.) into liquid hydrocarbon fuel (biofuel) using a NiMo/y-Al₂O₃ bimetallic catalyst. This research has a general purpose of studying the effect of ratio impregnated on y-Al₂O₃. Studied the effect of % loading of Ni and Mo metal that impregnated on y-Al₂O₃ catalyst and the effect of reaction temperature in catalytic hydrocracking process of nyamplung oil (*Calophyllum inophyllum* L.) seed oil against the yield value that produced in a batch reactor. At the NiMo/y-Al₂O₃ catalyst with 15% loading. The XRD (X-Ray Diffraction) diffractogram showed the identical peaks from y-Al₂O₃, Ni metal, and M_oO₂ metal oxide. This indicated that Ni and Mo metals impregnation didn't change the crystallinity structure of y-Al₂O₃. The obtained catalysts were used in the catalytic activity test through hydrocracking process of the nyamplung oil seed oil and the obtained products were analyzed using GCMS (Gas Chromatography-Mass Spectrophotometry) to determine the hydrocarbon content of the product, in the hydrocracking test, the best of gasoil yield was obtained on the use of NiMo/y-Al₂O₃ catalyst with 15% loading% and ratio (2:1) i.e 86,8% on temperature 300 0 C and the best of gasoline with yield 18,4%. And for the highest conversion, the catalyst was NiMo/y-Al₂O₃ loading 15% with a ratio (2: 1) at 300 0 C at 86,8% and n-paraffin selectivity at 49%.

Keywords: hydrocracking, nyamplung seed oil, biofuel, Ni-Mo metal transition y-Al₂O₃ catalyst.

APPLICATION OF NATURAL AROMATASE BLOCKER TOWARDS THE LEVEL OF TESTOSTERONE IN ROOSTER LAYER [*Gallus gallus gallus* (Linn., 1758)]

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Aromatase blockers are agents that can inhibit the action of the aromatase enzyme so that Testosterone will not be converted to estradiol. Thus, the level of Testosterone in the blood is maintained high. The purpose of this study was to evaluate the effects of Natural Aromatase Blocker (NAB) on the level of Testosterone in serum and evaluate the effectiveness of chemical Testosterone. This study used 100 Days Old Chick (DOC) of Layer chicken that divided randomly into 4 treatment groups namely P0 (control), P1 (Zinc Sulfate 0.018 mg / 40 g BW), P2 (powdered clam shells (*Anadara granosa*) 0.036 mg / 40 g BW as NAB), and P3 (testosterone 0.1 ml). Before doing the experiments, comb measurements were done, blood sampling was carried out through the brachial vein for analysis of testosterone levels and testicular weight was done after necropsy. The study design used a Completely Randomized Design (CRD) and data were analyzed using analysis of variance (ANOVA) with SPSS software version 15. The results of this study showed that there were significant differences ($P < 0.05$) on the variable testosterone level, testicular weight, also the length and height of comb. We can conclude that the administration of NAB during the initial growth period can increase the level of Testosterone and the provision of chemical Testosterone continuously can increase Testosterone levels but significantly reduce the testicular weight.

Keywords: layer chicken, Natural Aromatase Blocker, testosterone, comb

PERFORMANCE OF Ni-Cu/HZSM-5 CATALYST IN HYDROCRACKING PROCESS TO PRODUCE BIOFUEL FROM CERBERA MANGHAS OIL

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The Ni-Cu/HZSM-5 catalyst with various metal loading and metal ratio was prepared by incipient wetness impregnation. The catalysts were characterized by XRD, BET, and SEM-EDX. Surface area, pore diameter, and pore volume of catalysts decreased with the increasing of metals loading. The hydrocracking process was conducted under initial hydrogen pressure in a batch reactor equipped with a mechanical stirrer. The reaction was carried out at a temperature of 375 °C for 2 h. Depending on the experimental condition, the reaction pressure changed between 10 bar and 15 bar. Several parameters were used to evaluate biofuel produced, including oxygen removal, hydrocarbon composition and gasoline/kerosene/diesel yields. Biofuel was analyzed by gas chromatography-mass spectrometry (GC-MS). The composition of hydrocarbon compounds in liquid products was similar to the compounds in the gasoil sold in unit of Pertamina Gas Stations, namely pentadecane, hexadecane, heptadecane, octadecane, and nonadecane with different amounts for each biofuel produced at different reaction temperatures. However, isoparaffin compounds were not formed at all operating conditions. Pentadecane (n-C15) and heptadecane (n-C17) were the most abundant composition in gasoil when Ni-Cu/HZSM-5 catalyst was used. Cerbera Manghas oil can be recommended as the source of non-edible vegetable oil to produce gasoil as an environmentally friendly transportation fuel.

Keywords: hydrocracking, biofuel, Cerbera manghas oil, Ni-Cu/HZSM5 catalyst

Cheap Cellulase Production By Microbial Utilization of Coffee Pulp Waste

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Coffee pulp biomass waste can easily be found anywhere in the Indonesia area considering this country is the fourth world's largest coffee exporter. The utilization of coffee pulp is very limited and even now is categorized as a source of pollutants in water bodies and soils as well. In contrast, coffee pulp waste is very potential because 63% of the main compound is cellulose. Microbial utilization of this waste for enzymes production purpose especially cellulase is a breakthrough that may lead to reduce production costs. Initial investigations showed that *Aspergillus* sp. VTM1 through solid fermentation (SSF) can produce cellulases. Optimal cellulose can be produced when 10g coffee pulp with 10% moisture is inoculated using 10⁸ spores per ml of *Aspergillus* sp. VTM1 in 48 hours at 30°C. Hydrolysis of 1% carboxymethyl cellulose (CMC) substrate in 50mM acetate buffer pH 5 by this cellulase showed that the enzyme produced activity up to 1.18 U/ml. The optimum pH of the enzyme was 5 and stable at 3-3, 5 and 4-7, 0. The success of the first step of this investigation will be a cheap way in producing cellulases. The production process, optimization, and cellulase properties will be explained in this paper.

Keywords: Production, Cellulase, *Aspergillus* sp. VTM1, Coffee pulp, Solid-state fermentation

Efficiency of Cellulase Production Using Coffee Pulp Waste under Solid State Fermentation by Aspergillus sp. VT12

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Activities in the production of coffee beans cause abundant coffee pulp wastes in many areas in Indonesia which can be an environmental problem. In contrast, this a huge agricultural waste can potentially be used through microbial utilization because of its cellulose polysaccharides content up to 63%. The fungus, known as cellulase producer *Aspergillus* sp. VT12 under solid state fermentation (SSF) using coffee pulp based has been isolated. Investigation showed that optimum cellulase production by this isolate when SSF of 10 g coffee pulp, inoculated with 10⁸ spores/ml, incubated at 30°C for 120 hours was done. Cellulase activity reached 1,8 U/ml based on reducing sugar released assayed at 37°C for 96 hours against 0,5% carboxymethyl cellulose (CMC) substrate in acetate buffer 20 mM pH 5. This cellulase stable at pH range i.e. pH 3-8 and optimum at pH 7. In this preliminary study of microbial utilisation of coffee pulp is a cheap-way to produce cellulase and may efficiently because without any nutrion either mineral added in medium during production.

Keywords: cellulase, production, coffee pulp, solid state fermentation, *Aspergillus* sp. VT12.

Evaluation of Functional Feed in Total Mixed Ration (TMR) with High Protein Content and Anthelmintic Agents Towards Performance and Anti- Parasitic Effect in Sheep

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Haemonchus contortus is gastrointestinal nematodes naturally bloodsucking the host and causing haemonchosis. To date, the prevention and treatment of haemonchosis rely on chemically anti-parasitic drug. However, resistant towards chemically anti-parasitic drug have been found in many previous studies. Therefore, study on evaluation of total mixed ration (TMR) containing high protein content and forage with condensed tannin (CT) that have bio-anthelmintic potential should be justified further. The study aims to evaluating performance and its anti-parasitic effect towards *H. contortus* infection in sheep in TMR form. Twenty sheep (\pm 1 year old) with average body weight 20 kg had been randomly categorized into 5 treatments (n=4): T.1: Pennisetum purpureum cv. Mott 761.50 g DM; T.2: Pennisetum purpureum cv. Mott 609.20 g DM+Artocarpus heterophyllus 284.13 g DM; T.3: Pennisetum purpureum cv. Mott 609.20 g DM+soybean meal (SBM) 65 g DM; T.4: Pennisetum purpureum cv. Mott 609.20 g DM+Artocarpus heterophyllus 162.36 g DM+SBM 65.00 g DM; T.5: Pennisetum purpureum cv. Mott 609.20 g DM+Artocarpus heterophyllus 284.14 g DM+SBM 65.00 g DM. The diet was provided in TMR at 08:00 and 16:00, while water was provided ad libitum. The results showed that TMR feeding with high protein content and anthelmintic agents (TMR PTAA) reduced faecal egg counts by improving dry matter (DM), organic matter (OM), crude protein (CP), extract ether (EE), crude fiber (CF), nitrogen free-extract (NFE) consumption and digestibility ($P < 0.05$). It can be concluded that TMR PTAA had positive effects in improving sheep performance and have bioanthelmintics potentiality to alternate commercial anti-parasitic drugs.

Keywords: anti-parasitic, bio-anthelmintic, condensed tannin, forage, Haemonchus contortus, total mixed ration.

Review: The Effect of Protected Lemuru Fish Oil in Total Mixed Ration Towards Productivity Performance and Meat Fatty Acid Profile of Thin-Tailed Sheep

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Sheep is one of small ruminant producing red meat in Indonesia. Sheep meat contains higher saturated fatty acid compared to non-ruminant meat products. Meat consumption with high saturated fatty acid should be limited due to higher risk to atherosclerosis (blood vein constriction) causing coronary heart disease. Strategy to reduce saturated fatty acid in the sheep meat should be conducted by increasing unsaturated fatty acid content in sheep meat. Accelerating unsaturated fatty acids can be done by feed supplementation containing unsaturated fatty acid. It can be done by protecting unsaturated fatty acids to avoid biohydrogenation process in the rumen. Lemuru fish oil can be utilized as unsaturated fatty acid source. Supplementation of protected lemuru fish oil in total mixed ration (TMR) is considered improve treatment effectivity, due to sheep is unable to choose certain feedstuffs and instead ingesting the whole diets so that the consumed diet had balance nutrient. Supplementation of protected fat is suggested to not modify rumen fermentation, improving sheep performance, and increasing unsaturated fatty acid content of sheep meat. This review provides previous research studies with protected fat supplementation in sheep diet.

Keywords: Feed fat protection, sheep performance, meat fatty acid profile, total mixed ration

Study of the Effect of Total Mixed Ration Feeding with High Protein Content and Anthelmintic Agent (TMR PTAA) Towards Performance of Thin-Tailed Sheep

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Feeding sheep in the form of total mixed ration with high protein content and anthelmintic agent (TMR PTAA) is one of strategy to ensure daily nutrient requirement. The study aims to identify the effect of feeding TMR PTAA towards performance of thin-tailed sheep. The study used twenty thin-tailed sheep with average body weight 20 kg (1 year old). Complete randomized design was used and sheep were allocated into five different treatment groups: T.1: Pennisetum purpureum cv. Mott 761.50 gram DM; T.2: Pennisetum purpureum cv. Mott 609.20 gram DM+Artocarpus heterophyllus 284.13 gram DM; T.3: Pennisetum purpureum cv. Mott 609.20 gram DM+soybean meal (SBM) 65 gram DM; T.4: Pennisetum purpureum cv. Mott 609.20 gram DM+Artocarpus heterophyllus 162.36 gram DM+SBM 65.00 gram DM; T.5: Pennisetum purpureum cv. Mott 609.20 gram DM+Artocarpus heterophyllus 284.14 gram DM+SBM 65.00 gram DM. Each treatment had four replications (n=4). The diet was provided in total mixed ration (TMR) and given two times a day 08:00 and 16:00. Water was provided ad libitum. The results showed that feeding TMR PTAA improved dry matter (DM), organic matter (OM), crude protein (CP), crude fiber), extract ether (EE) consumption and digestibility ($P < 0.05$). Average daily gain was not affected although it had tendency that treatment groups had higher ADG compared to control. It can be concluded that TMR PTAA had positive effect towards thin-tailed sheep performance.

Keywords: total mixed ration, performance, thin-tailed sheep

ACTIVITY OF Ni-NH 2 /MESOPOROUS SILICA MATERIAL AS BIFUNCTIONAL CATALYST FOR HYDROCRACKING OF USED COOKING OIL

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Synthesis of Ni-NH 2 /mesoporous silica bifunctional catalyst for conversion of used cooking oil into biofuel was carried out. The impregnation of Ni into the MS8 with specific surface area of 666.6 m²/g, volume pore of 0.46 cm³/g, and diameter pore of 4.9 nm was done by wet impregnation method. The functionalization of NH 2 into the MS8 and Ni/MS8 was done by the grafting method. The catalytic activity test in used cooking oil hydrocracking was done by thermal (without catalyst), catalyst physical mixture of Ni/MS8 and NH 2/MS8, and Ni-NH 2/MS8 bifunctional catalyst. The results showed that the Ni/MS8 catalysts with acidity values of 12.804 mmol/g was successfully modified with amine groups to produce Ni-NH 2/MS8 bifunctional catalysts. This catalyst is used in the hydrocracking process of used cooking oil to produce the highest liquid product of 92.85 wt. % with selectivity of gasoline and diesel fractions of 4.04 and 63.35 wt. % respectively.

Keywords: Biofuel, Gelatin, Mesoporous silica, Ni-NH 2 , Sidoarjo mud

Modification Level of Polyethylene Glycol on In Vitro Gas Production of Feedstuffs

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This study aimed to determine the chemical composition and gas production based on fermentation in the rumen of nine types of forage tropical feed commonly used, named mahogany (*Swietenia mahagoni* L. Jacq.), tayuman (*Bauhinia purpurea*), bamboo (*Bambusa arundinaceae*), canary (*Canarium indicum* L.), tea (*Camellia sinensis*), ketapang (*Terminalia catappa* L.), lamtoro (*Leucaena leucocephala*), tehtehan (*Duranta repens*), and turi (*Sesbania grandiflora*). Measurement of gas production in vitro was carried out at 7 observation points (2, 4, 8, 16, 36, 48, 72). Tannin activity was measured using measurements of gas production divided into three groups with modified levels of polyethylene glycol (PEG), ie samples without PEG (P1); sample + PEG in the amount of 200 mgDM (P2); and PEG + samples of tannins contained in each forage based on literature studies (P3). The chemical composition showed that crude protein (CP) from each forage ranges from 5.75 - 22.37% where the lowest CP value was mahogany leaves (*S. mahagoni* L. Jacq.) and the highest CP was turi leaves (*S. grandiflora*). The crude fiber (CF) ranged from 5.30 - 20.93%. The total content of tannin varied between 0.20 - 13.80%, with the lowest total tannin was turi (*S. grandiflora*) leaves and the highest was mahogany leaves (*S. mahagoni* L. Jacq.). The most optimal measurement of gas production was in the sample given PEG of 200mg/kg with a significant difference ($P < 0.05$). From the result we found that the higher of the tannin content, was the lower of gas produced. The addition of PEG was proven to be able to optimize the digestibility value seen from the higher gas production when added to PEG.

Keywords: evaluation, forage, tropical-feedstuffs, tannin, gas-production, polyethylene-glycol

Characterization of Active Packaging based Chitosan added with Bamboo (*Bambosa* sp.) Leaf Extract (*Bambosa* Sp) and Application in Fresh Meat Production

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Black Bamboo Leaf is widely used as a food packaging material because it has a wide size and is not easily torn compared to other bamboo leaves. At present, many traditional packaging has been abandoned by the community, so it is necessary to develop active packaging that has the advantages of synthetic packaging. This study aims to determine the total phenolic levels, total flavonoids and antioxidant activity of Bamboo leaves (*Bambosa* sp.). Bamboo leaf dry powder (*Bambosa* sp.) Was extracted by maceration process using 70% v / v ethanol-water. The extract is then concentrated with a rotary evaporator. The total phenolic essay was determined by the Folin-Chicolteau reagent method using gallic acid as a reference. AlCl₃ reagents are used to analyze flavonoid content by comparing it to quercetin. The antioxidant activity of the extract was determined by free radical testing using DPPH radical (2, 2-diphenyl- 1-picrillhidrazil). Phytochemical screening of Bamboo leaves (*Bambosa* sp.) Indicates the presence of flavonoids, tannins, and polyphenols. Total phenolic content of ethanol extracts of Bamboo (*Bambosa* sp.) Leaves at 157,426 mg Gallic Acid Extract (GAE) / g and total flavonoid content at 19,406 mg equivalent to quercetin (QE) / g extract. Antioxidant activity by DPPH method obtained IC₅₀ ethanol extract of Bamboo leaves (*Bambosa* sp.) Of 46.8672 µg / mL, and IC₅₀ value of BHT was 9.5454 µg / mL. Based on these results, Bamboo leaf (*Bambosa* sp.) Has the potential to be developed as an antioxidant and antimicrobial to prevent microbes in meat caused by oxidative lipids. Bamboo Leaf film thickness ranges from 0.036 to 0.11 mm and the color of the film shows a deep yellow color along with the addition of Bamboo Leaf extract. The FTIR spectrum of the Bamboo Leaf Extract film showed relatively similar profiles in all film formulations. SEM photo images show smoother and more homogeneous results when added with Bamboo Leaf Extract and Chitosan at concentrations of 10% and 30%.

Keywords: antioxidant; Bambu (*Bambosa* sp.) leaves; DPPH.

Chemical Quality and Digestibility Silage in *Pennisetum purpuphooides* and *Pennisetum purpureum* Gamma Supplemented of Molasses with Different Levels

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This research was conducted to determine the chemical quality and digestibility of silage varieties of *Pennisetum purpuphooides* and *Pennisetum purpureum* gamma supplemented with molasses at different levels. The study was designed using a completely randomized design (CRD) 2 x 3 factorial pattern. The first factor was *Pennisetum* varieties consisting of *P. purpuphooides* and *P. purpureum* gamma radiation and the second factor was the level of supplementation consisting of molasses consisting of 0%, 3% and 6 %, 5 replications each. The selected variable is the chemical characteristics of silage are pH, dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), crude fat and non-nitrogen free extract (NNFE), total digestible nutrient (TDN), NH 3 (ammonia) and lactic acid silage. *Pennisetum purpureum* gamma and 6% molasses supplementation produce silage with good chemical quality. The increase in the level of suppuration of molasses is inversely proportional to the pH, crude fiber and NH 3 silage ($P < 0.05$). Varieties markedly decreased curing pH, NH3, crude fiber and crude fat silage concentration ($P < 0.05$). The content of lactic acid, DM, CP, crude fiber, TDN and NNFE significantly increased linearly with an increase in the level of molasses supplementation ($P < 0.05$) and also significantly decreased CF and crude fat levels ($P < 0.05$) but not significantly different from the OM content ($P > 0.05$). Varieties that showed changes in some parameters of the proposed chemical composition towards decreasing crude fiber and crude fat ($P < 0.05$) but significantly increased on the composition of DM, OM, CP and NNFE ($P < 0.05$). Besides molasses supplementation at the 6% level and *P. purpureum* gamma varieties and their combinations are improvements that produce the best chemical quality and digestibility of silage.

Keywords: Digestibility, molasses, *Pennisetum purpureum*, silage, supplementation

Utilization of Coffee Pulp as Substrate for Pectinase Production by Aspergillus sp. VTM5 Through Solid State

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Coffee pulp is an agro-industrial waste that has an abundant presence in Indonesia, up to 244.800 tons in 2018. Up to 6,5% from coffee pulp's dry weight is pectin. So that, the coffee pulp has potential as substrate for pectinase production. This study aims to acknowledge the utilization of coffee pulp for pectinase production using solid state fermentation method by *Aspergillus* sp. VTM5. Spore suspensions of *Aspergillus* sp. VTM5 with 10 8 spore/ml density are inoculated to coffee pulp substrate and incubated for 0 to 168 hours at 30°C. Crude pectinase is harvested every day for 7 days and the enzyme activity is tested using Somogyi-Nelson method. The crude enzyme hydrolyze 0,5% pectin in acetate buffer pH 5 20 mM. The reducing sugar concentrations after 24, 48, 72, and 96 hours of incubations are 8,648 µg/ml, 78,774 µg/ml, 85,849 µg/ml, and 57,704 µg/ml, respectively. This enzyme has a stable pH range at 3-5 and optimum at pH 4,5. This results indicate that coffee pulp can be utilized as a substrate for pectinase production using solid state fermentation method by *Aspergillus* sp. VTM5. Purification of pectin content in coffee pulp and purification of the enzyme are needed to improve enzyme activity.

Keywords: Utilization, pectinase, *Aspergillus* sp. VTM5, solid state fermentation, coffee pulp

Upgrading Methane Purity in Biogas Plant Gamping by using Carbon-Based Molecular Sieve

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Biogas is considered as a promising renewable energy. Therefore, in order to achieve high quality of energy, a biogas upgrading steps at the upstream of its final utilization is required. One of the most important steps is CO₂ removal which has a significant impact on improving the biogas properties for energy applications. In this study, separation of CO₂ from biogas (consisting of CO₂ /CH₄: 63/37 vol %) in a packed-bed of Palm Kernel Shell (PKS)-based porous carbon was performed. The separation-regeneration cycle were carried out at atmospheric pressure, isothermal conditions (30 °C), and different feed flowrates (25, 50, and 100 mL·min⁻¹). The study showed that CO₂ was successfully separated from biogas which produced CH₄ with high purity (> 98 vol %). On the other hand, the separation behavior of gases on porous carbon were influenced by feed flowrate where the high separation capacity was achieved at low feed flowrate.

Keywords: Adsorption Kinetics, Biogas upgrading, Porous carbon, Pressure swing adsorption

Preliminary Investigation of Cellulase Producer Candidate Isolate VT11 Using Coffee Pulp Waste Under Solid State Fermentation

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Isolate VT11 is a fungal cellulolytic from vermicomposting oil palm empty fruit bunch (OPEFB). Isolate VT11 have cellulolytic activity index of 1.0 on 1% CMC, but this isolate has never been used in the production of cellulase from coffee pulp waste. Coffee pulp has highest cellulose content (63%) so that it can be used as a substrate for cellulase production by fungal cellulolytic under solid state fermentation (SSF). The aim of this study is to know potential of isolate VT11 to produce cellulase using coffee pulp waste under solid state fermentation. Celullase production were done by inoculating isolate VT11 in 10 g coffee pulp under SSF. The result was showed that the highest enzyme activity produced by isolate VT11 was 1,857 U/ml after 96 hours incubation at 30°C. Based the result, it is suggested that the isolate VT11 can be used cellulose production using coffee pulp waste as substrate agro-industrial residues. Further investigation such as identification of isolate VT11, purification and characterization of cellulase produced by isolate VT11 were needed.

Keywords: Isolate VT11, Cellulase Producer, Coffee Pulp, Solid State Fermentation

The Effect of Sorghum Varieties on Digestibility and Nitrogen Balance of Complete Feed in Goat

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This research tries to study the variation of sorghum on digestibility and nitrogen balance. This study lasted for 8 months, located in the Agrotechnology Innovation Center, Universitas Gadjah Mada, Kalitirto, Berbah, Sleman, Yogyakarta. Twelve female Bligon goats with an average body weight of 24.80 ± 2.74 kg were divided into 3 groups of treatments with 4 replications, following a Complete Random Design (CRD) one way pattern, T1 = complete feed based on fresh of Pennisetum purpureum as a control, T2 = complete feed based on silage of sorghum BMR and T3 = complete feed based on silage of sorghum super-2. The variables observed were nutrient feed intake, nutrient digestibility and nitrogen balance. The results were analyzed using analysis of variance and significant differences between mean were analyzed with Duncan's New Multiple Range Tests (DMRT). The result showed that feeding complete feed of sorghum BMR silage on Bligon goats reduced nutrient feed intake ($P < 0.05$) compared to complete feed of sorghum super-2 silage however nutrient digestibility and nitrogen balance were comparable between the both sorghum varieties ($P > 0.05$). Therefore we can conclude that sorghum BMR was better than sorghum super-2.

Keywords: Complete feed, digestibility, nitrogen balance, silage, sorghum varieties

Effects of The Molar Ratio of Acetic Acid to UFA and Steering Velocity in The Tung Oil Epoxidation

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Epoxidation of the unsaturated fatty acids (UFA) in Tung oil provides a very interesting opportunity in the research and development of advanced materials. Tung oil is one of non-edible vegetable oils and the epoxidized Tung oil (ETO) also provides benefits in terms of renewable and eco-friendly. This research evaluated the influences of the molar ratio of acetic acid to UFA and stirring velocity in the epoxidation process of Tung oil. Epoxidation was carried out in batch reactor using peroxyacetic acid produced in-situ with sulfuric acid as a catalyst. This reaction was run at a temperature of 60°C and the catalyst concentration of 1.5% (w) for 6 hours, with a periodic 30- minutes sampling time interval. The performed analysis on the samples were iodine value (IV), conversion to oxirane, selectivity, and FTIR spectrometry. The results showed that both the molar ratio of acetic acid to UFA and stirring velocity had a direct proportional to the conversion to oxirane, and inversely proportional to the IV. While the two process variables did not show a definite result that can be interpreted to the selectivity (very fluctuated). The highest conversion (about 57.43%) and the lowest IV (8.3898 g I 2 /100 g) were obtained at 1:1 ratio for the reaction times of 150 and 240 minutes, respectively.

Keywords: Epoxidation, Tung oil, the molar ratio of acetic acid to UFA, stirring velocity, conversion to oxirane.

Morphological and Biochemical Characteristic of Endosymbion Cellulolytic Bacteria from Gut of Hypothenemus hampei Ferr. and Its Enzyme Activity

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Hypothenemus hampei Ferr. is one of the most destruction pest in coffee berry. To control this pest by synthetic insecticide is harmful and damage for environment. A strategy to control *H. hampei* is by studying its life cycle. The egg stage until adult of *H. hampei* lives inside coffee beans and utilize polysaccharides of coffee beans as source of its metabolism. The result of investigation showed that in gut of *H. hampei* was found cellulolytic bacteria Isolate 10 (ISH 10) which is suspected as endosymbiont bacteria that helps in the digestive process and metabolism of *H. hampei*. Morphological characters of ISH10 colony are circular, flat elevation, edge of entire colony, and the cell shape is rod. ISH 10 was gram positive bacteria which gave positive results in catalase and negative for oxidase test. In addition, ISH 10 is able to ferment some sugars media test such as glucose, sucrose, fructose and mannitol. ISH10 produced positive reaction in simmon citrate and urease test, and ISH 10 unable to reduce nitrate. Based on results, ISH 10 similar to genus *Brochothrix*. ISH 10 can also produce cellulase with the highest activity of the crude enzyme 0,031 U/ml only in 72 hours of incubation at 30 °C against 0,5% CMC in 20 mM acetate buffer pH 5. Further characterization of this cellulase is needed so that it can interfere the digestion of *H. hampei* through endosymbiont cellulolytic bacteria by using inhibitor or environmental factor of its cellulose enzyme.

Keywords: morphological, biochemical, cellulolytic bacteria, *Hypothenemus hampei* Ferr., endosymbiont

Ulva lactuca as Alternative Ferromagcalciforte Sustenance

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Functional foods containing minerals, nutrients, as well as other active ingredients, are essential to support physiological functions. The Chlorophyta macroalga *Ulva lactuca* ("sea lettuce") is a popular natural food source due to its abundance in intertidal zones across Indonesia. To further examine its efficacy to the human physiology, analysis of proximate composition (carbohydrate, protein, fat, crude fibre, ash, and moisture content), macronutrient (Na, P, Ca, K, and Mg), micronutrient (Fe, Mn, Cu, Zn, Co, and Cr), heavy metal (Pb, Hg, and Cd), and fatty acid contents need to be done. Results showed that the highest composition of macromolecule is carbohydrate; macronutrients and micronutrients with the highest values are Mg and Fe respectively, with Ca also showing a high concentration; Pb and Hg contents are considered safe, but the Cd content exceeds the safety limit regulated by BPOM 2008; and the fatty acids contained include methyl octadecenoate and the unsaturated fatty acid lenolelaidic methyl ester. Mg, Ca, and Fe each have important roles in the body's systems, i.e. metabolic processes, growth and development, and activation of enzymes. Presence of these elements suggests *U. lactuca*'s potential in maintaining the body's physiological functions, however the relatively high content of Cd must be noted.

Keywords: algae, Chlorophyta, functional foods, minerals, *Ulva lactuca*.

Pectinase Production by Using Coffee Pulp Substrate as Carbon and Nitrogen Source

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About thirty five percent of coffee pulp waste is pectin and may potential as a source to be used in bioprocessing industry, for example can be used as substrate to produce pectinase from microorganism under solid state fermentation (SSF). In this investigation, an isolate fungus VTM4 with density 10⁷ spore/mL was grown under SSF at 30 °C based on coffee pulp as medium, and after 24 hours incubation initial pectinase activity was detected. The activity of pectinase based on reducing sugar released by crude pectinase against 0,5% alkali extract pectin substrate in 20 mM buffer acetate pH 5. The highest reduction sugar of crude enzyme produced by isolate VTM4 was 223,34 µg/mL after 72 hours incubation at 30°C. The optimum pH was 4 with the maximum enzyme activity 0,747 U/mL. While pectinase was stable at pH value of 4 -8 and maintained nearly 100% relative activity enzyme in a pH range 4-5.5. This study prove that isolate VT M4 utilize coffee pulp as carbon and nitrogen source to produce pectinase. Further research identification of VTM4, purification and characterization of the enzyme to improve pectinase activity were needed.

Keywords: Coffee pulp, Optimization of pH, Pectinase, pH stability, Production, Solid State Fermentation.

THE EFFECT OF SORGUM VARIETIES (*Sorghum bicolor* (L.) Moench) AND PROTEIN LEVELS ON CHEMICAL COMPOSITION AND IN VITRO DIGESTIBILITY OF FERMENTED COMPLETE FEED

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This research imed to determine the effect of sorghum varieties and protein levels on chemical composition and in vitro digestibility of fermented complete feed. With a complete random design of 2 x 3 factorial patterns, two varieties sorghum forage namely BMR and Super-2 were used to formula complete feed with 3 different protein levels, 8; 9.5; and 11%. Complete feed was fermented for 3 days, each of them were with 3 replications. Fermented complete feed samples were analyzed for chemical composition including dry matter (DM) content, organic matter (OM), crude fiber (CF), crude protein (CP), and in vitro digestibility including dry matter, organic material and crude protein. This research was located at the Agrotechnology Innovation Center (PIAT) of Universitas Gadjah Mada, Tanjungtirto Street, Kalitirto, Berbah, Sleman, Yogyakarta. Fermented complete feed of BMR variety has better chemical compotition and digestibility value of crude protein compared to Super-2 variety, but it give the same result to digestibility of dry matter and organic matter. Fermented complete feed at 11% CP level has the best chemical composition and digestibility value. The 11% of CP was the best level to formula sorghum forage fermented complete feed.

Keywords : chemical composition,fermented complete feed, in vitro digestibility,protein levels, sorgum varieties

The Effect of Biogas Purification using Biochar from Biogas Waste on Biogas Combustion

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This research aims to investigate capability of combination of adsorbents, biochar from biogas waste and zeolite, to increase calorific value of biogas. There are six treatment of adsorbents, 0% volume of biochar and 100% volume of zeolite; 25% volume of biochar and 75% volume of zeolite; 50% volume of bicohar and 50% volume of zeolite; 75% volume of biochar and 25% volume of zeolite; 100% volume of biochar and 0% volume of zeolite. First, biogas waste was converted to be biochar by pyrolysis. Then biogas was purified using these biochar and analyzed its calorific value before and after purification. Calorific value test was conducted by combustion of water using biogas. The results showed that biogas purification affected on final temperature of water combustion significantly. The highest final temperature was performed by biogas purification using 75% volume of biochar and 25% volume of zeolite. Biogas purification was not affected on calorific value significantly. Conclusion of this study is biogas purification affected on temperature change of combustion but didn't affected on calorific value of biogas.

Keywords: biogas, calorific, biogas waste, biochar.

In Silico Prediction of Betulinic Acid Derivatives' Cytotoxicity: Relationship between Topological Descriptors and CC₅₀ value

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Besides the improvement of activities, the effort to reduce the toxicity of drug candidates has become an important aspect of drug discovery and design. Cytotoxicity is an indicator of how strong a compound to disrupt the normal cells. Modeling of the relationship between structure and cytotoxicity has helped in the process of designing safer new drug compounds. In this study, modeling was carried out between the structures of 29 betulinic acid derivatives with their cytotoxicity. The modeling is done by using multiple linear regression (MLR) techniques. In the model, an equation is obtained by involving five descriptors as follows

$$pCC_{50} = 77.43 + (-4.134 \times TDB2e) + (-0.136 \times TDB9s) + (-0.481 \times RDF50m) + (0.266 \times RDF140m) + (0.231 \times RDF10s)$$

and has statistical parameters as r² training of 0.776; F cal /F tab of 4.503; r² test of 0.985; r² m of 0.971. The five descriptors involved in the equation are TDB2e (3D topological distance-based autocorrelation-lag 2/weighted by Sanderson electronegativities), TDB9s (3D topological distance-based autocorrelation-lag 9/weighted by I-state), RDF50m (Radial distribution function-050/weighted by relative mass), RDF140m (Radial distribution function-140/weighted by relative mass), and RDF10s (Radial distribution function-010/weighted by relative I-state). The equation could be used to design the new betulinic acid derivatives with lower predicted cytotoxicities regarding the coefficients of the descriptors. In this case, the new substituent is chosen in order to lower the value of RDF140m and RDF10s, while also to make the value of TDB23, TDB9s, and RDF50m getting higher, so the CC₅₀ value will be risen up (the compound become less toxic to the normal cell).

Keywords: Betulinic acid, cytotoxicity, modeling, topological descriptor

Appropriate Adsorbent for Astaxanthin Purification

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This study used low-pressure column chromatography (LPCC) for its cheapness and easiness to use on a great scale to purify astaxanthin. To get the optimum effectiveness and accuracy of this purification process, proper adsorbents were needed. Silica gel and aluminum oxide, in batches, have been tested. Standard astaxanthin dissolved in acetone was adsorbed using these two adsorbents, respectively, followed by the measurement of its concentration in both solutions. The experimental data was then simulated using mathematical models proposed for adsorption isotherms. The models of Henry and Langmuir, for this purpose, have been proven as the proper ones. It was concluded that aluminum oxide is better than silica gel due to its higher adsorption rates, namely 0.3930 dm/min in the Henry model and 0.3927 dm/min in the Langmuir model, and its adsorption capacity, which is 57 times higher than that of silica gel.

Keywords: Chromatography, Isotherm adsorption, Adsorbent capacity, adsorption rate

Adsorption of Methylene Blue Dye Using Biosorbents Based on Humic Acid Cross-Linked Cellulose

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The adsorption of methylene blue dye using biosorbents based on humic acid cross-linked cellulose had been done. The adsorbent HA/Cel-Epi was characterized using FTIR, XRD, and SEM spectroscopy. The results of characterization using FTIR indicated that adsorbents HA/Cel-Epi had active functional groups among others -OH, -C=O, and -COOH. XRD result confirmed that diffraction peaks on the area of 2θ around 11.83; 20.27; 21.90; and 28.28°. SEM results showed that the adsorbent surface had irregular shape pores size. The optimized condition interaction of HA/Cel-Epi MB occurred in the pH range of 6-8, with a solution concentration of 250 mg L⁻¹, and a contact time of 120 minutes. The adsorption of MB by HA/Cel-Epi followed pseudo-second-order kinetics model and Freundlich isotherms with the adsorption capacities of MB at 324.43 mg g⁻¹. The desorption study showed that the solution of ethanol 60% was the most effective solution for desorption MB.

Keywords: Adsorption, Humic acid, Cellulose, Cross-linked, Methylene Blue.

Immobilization of Humic Acid in Cellulose by Crosslink Method for Cr(III) Adsorption from Aqueous Solution

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Biosorption using humic acid is an alternative that can be used to remove contaminants such as heavy metals in aqueous. In this study, humic acid was immobilized in cellulose to reduce its solubility at higher pH so it was stable at various pH. Immobilization was carried out by the crosslink method using epichlorohydrin to obtain stable adsorben (HA-C) at various pH. Adsorption studied were carried out to evaluate the optimum pH for adsorbtion, contact time and optimum adsorbate concentration. Desorption studies were also conducted to determine interaction between adsorben and adsorbate. Stability in some ph ranges for HA-C reaches 95% above at various pH. Adsorption Cr(III) was carried out at pH 5 as the optimum pH. The optimum contact time at 120 minutes with the optimum comncntration was 150 ppm. Experiment data were fitted in sorption isoterm and kinetic models to describe sorption process. The sorption in this study was followed the Freundlich isotherm models ($R^2 = 0.9388$) and kinetics models followed the pseudo-second-order kinetics ($R^2 = 0.990$). In desorption study majority is dissolved in HONH₂ HCl solvent so that the type of adsorbtion interaction is hydrogen interaction.

Keyword: Humic Acid, Cellulose, Crosslink, Adsorption, Cr (III)

SYNTHESIS OF MONO-KETONE CURCUMIN ANALOGUES FROM BENZYLOXY-BENZALDEHYDE AND THEIR ACTIVITY ASSAY AS INHIBITOR OF α -AMYLASE ENZYME

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Synthesis, characterization and biological evaluation of mono-ketone curcumin analogues as inhibitor of α -amylase enzyme have been conducted. This research was initiated by synthesizing 3-benzylbenzaldehyde from hydroxybenzaldehyde using benzyl chloride, potassium iodide and potassium carbonate in dimethyl formamide under reflux condition for an hour. Synthesis of monoketone curcumin analogues was performed through Claisen-Schmidt reaction by refluxing 3-benzylbenzaldehyde with acetone (analogue A), cyclopentanone (analogue B) and cyclohexanone (analogue C) using potassium hydroxide 5% catalyst for an hour. The structures of the products were elucidated by FTIR, MS/MS, 1 H-NMR and 13 C-NMR. Mono- ketone curcumin analogues were evaluated for their activity assay towards inhibition of α -amylase enzyme. The inhibition type of mono-ketone curcumin analogues was also investigated. The inhibition results of monoketone curcumin analogues were compared to acarbose as positive control. The results showed that 3-benzylbenzaldehyde and mono-ketone curcumin analogues (A, B and C) were yielded of 89,7; 97,4; and 94,6% respectively as white, orange and yellow solid. The inhibition of α -amylase enzyme indicated that the highest inhibition of mono-ketone curcumin analogues (A, B and C) and acarbose were 99.16; 99.8; 99.78 and 99.49 % at the concentration 1; 1; 0.5; 1 mM respectively. The type inhibition of mono-ketone curcumin analogues (A, B and C) and acarbose were considered as uncompetitive inhibitor.

Keywords: curcumin analogues, inhibition test, α -amylase.

The Effectiveness of Ultrasound Wave for Enhancing Extraction of Proanthocyanidins from Red Sorghum Grain using Green Solvent

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The extraction of functional compound from intact red sorghum grains using green solvent is enhanced using ultrasound wave (UW). The ultrasound assisted extraction (UAE) is conducted in 60, 70 and 80% of amplitude transmitted from ultrasonic probe. The effect of each amplitude is evaluated from the concentration of total phenolic (TP) and proanthocyanidin (PA) in solvent during the process. A simple mechanistic model is applied to describe the ultrasound mechanism in accelerating the process. The aim of this research is to evaluate the effect of amplitude to enhance the extraction, to determine the values of parameters involved in the model and to predict the concentration of TP and PA during UAE. Each amplitude applied in UAE enhances the extraction compared to the conventional method. The enhancement occurs by the propagation of UW in solvent that produce cavitation bubble that create destruction in the pericarp surface. The highest performance is observed in extraction using 80% of amplitude. The model which has been proven to work well can quantitatively shows the effect of amplitude in enhancing UAE, described by the changing of the distribution coefficient value. The model can also be applied to predict the concentration of TP and PA during UAE.

Keywords: ultrasound, enhancing, proanthocyanidin, phenolic, extraction, sorghum, green solvent

Synthesis of Chalcone Derivatives from 2,4-Dimethoxy Acetophenone and Their Activities as Antimalarial Agents

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Chalcone derivatives from 2,4-dimethoxyacetophenone were synthesized using *Claisen-Schmidt* condensation reaction. Synthesis of chalcone derivatives was conducted by reacting benzaldehyde, *p*-anisaldehyde, or veratraldehyde with 2,4-dimethoxyacetophenone in ethanol in the presence of NaOH as a catalyst to give chalcone 1-3, respectively. Structure elucidation of all products was performed using FTIR, GC-MS, ¹H, and ¹³C-NMR spectrometers. The synthesized products were tested for its activity as antimalarial compounds by heme polymerization inhibitory activity (HPIA) assay. The results showed that chalcone 1-3 had been successfully synthesized in 87.96, 86.70, and 85.68% yield, respectively, while the HPIA assay gave IC₅₀ of 11.00, 6.74, and 12.34 mM, respectively. It could be concluded that chalcone 2 has the highest activity and this activity is equivalent to that of chloroquine as a standard antimalarial drug (IC₅₀ 6.73 mM).

Keywords: 2,4-dimethoxyacetophenone, antimalaria, chalcone, HPIA assay

EFFECT OF THERMAL TREATMENT ON PHYSICO-CHEMICAL PROPERTIES OF WHITE MINERAL TRIOXIDE AGGREGATE SYNTHESIZED FROM LIME STONE PRECIPITATE CALCIUM CARBONATE

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This study reports preparation of white mineral trioxide aggregate (WMTA) using precipitate calcium carbonate (PCC) by sol-gel method at various thermal treatments 900, 1100, and 1300 °C. The composition of WMTA included PCC (55% CaO), C₆H₁₆O₃Si-TEOS (21% SiO₂), Al(NO₃)₃·9H₂O (2% Al₂O₃), and Bi₂O₃. WMTA 1100 with highest purity was proven by the presence of C₃S, C₃A, and α-Bi₂O₃ phase in X-ray diffraction patterns. Results show that based on the SEM image WMTA 1100 formed a smaller crystal agglomeration (6-8 µm) and FTIR analysis found Bi-O (BiO₃) vibration in Bi₂O₃ at 1100 and at 950 cm⁻¹, a characteristic of the β-C₂S phase. The radiopacity value of WMTA 1100 resembles ProRoot MTA, namely 6.86±0.36 millimeters of aluminum (mm Al). WMTA 1100 gives the highest compressive strength, smallest solubility, highest pH and calcium levels in comparison to WMTA 900 and WMTA 1300.

Keywords: Thermal Treatment, White Mineral Trioxide Aggregate, Precipitate Calcium Carbonate, In vitro.

Removal of Pb(II) Ion from Aqueous Solution Using Dithizone-Immobilized Natural Bentonite

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Removal of Pb(II) ion using activated and dithizone-immobilized natural bentonites has been carried out. Natural bentonite was activated by immersing and stirring the bentonites in 6M HCl solution. The dithizone-immobilized natural bentonite was prepared by mixing the bentonite and dithizone in toluene solvents at 50 °C for 6 hours and the immobilized adsorbents were characterized by FTIR and XRD. The dithizone immobilization is aimed to increase the capacity and selectivity of the adsorbent towards Pb(II) ions. Characterization results suggest that dithizone has been successfully immobilized on the surface of bentonites indicated by the emerge of new peaks of dithizone in the FTIR and XRD spectra. The optimum conditions for the adsorption of Pb(II) ion are at pH 5, 0.1 gram of adsorbent, initial concentration of 70 ppm and contact time of 60 minutes. Experimental results show that the adsorption of Pb(II) on both adsorbents follow pseudo second order kinetic models and it is best described by the Langmuir isotherm models with the adsorption capacities of 0.452 and 0.506 mg/g for activated and dithizone-immobilized natural bentonites, respectively. It also reveals that the adsorption energies of Pb(II) ion on activated and dithizone-immobilized natural bentonites are 26,361 and 29,593 kJ/mol, respectively.

Keywords: natural bentonite, immobilization, dithizone, adsorption, and Pb(II) ions.

Synthesis and Characterization of Chloro-Pyrazoline Derivatives and Its Potential as Antimalarial Agents

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Several derivatives of pyrazoline compounds have been reported to have high antimalarial activity due to the presence of nitrogen atoms in pyrazoline structures. In the present study, the synthesis of chloro-pyrazoline derivatives was carried out by cyclocondensation reaction of 4-chloro-(3',4'-dimethoxy)-chalcone with hydrazine derivatives, i.e., formyl hydrazine and chlorophenyl hydrazine to produce pyrazoline A and B. Characterization of all pyrazoline derivatives were conducted by FTIR, ^1H , and ^{13}C -NMR, and GC-MS spectrometers. The results showed that pyrazolines A and B were successfully synthesized in 87.09 and 67.64% yields, respectively. The *in vitro* antimalarial assay against *Plasmodium falciparum* 3D7 has been conducted and the result will be discussed in this forum.

Keywords: Chloro-pyrazoline, antimalaria, *Plasmodium falciparum* 3D7

Recovery of Au(III) from Gold Mining Rock with Silica/Chitosan Coated on Iron Sand Magnetic Material

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Abstract. In this study, adsorption as an environmental friendly technique has been applied for separation and recovery of gold (Au) from gold mining rock sample with iron sand magnetic material coated with silica/chitosan (MMSC). The works included preparation and characterization of adsorbent; gold leaching from the rock sample, and adsorption-desorption of Au(III) in leaching solution and calculation of recovery. The result showed that the leaching solution contained Au(III), Cu(II) and Zn(II) of 0.14, 16.0 and 181 mg/g, respectively. Adsorbent investigated was selective for Au(III) against Cu(II) and Zn(II) ions with the selectivity coefficient, $\alpha_{\text{Au/Cu}}$ of 7.71 ± 1.28 and $\alpha_{\text{Au/Zn}}$ of 29.48 ± 15.11 . The adsorption-desorption of metal ions in the rock sample solution obtained the recovery of 77.49 ± 0.96 , 0.21 ± 0.00 , and $0.04 \pm 0.01\%$ for Au(III), Cu(II) and Zn(II), respectively,

Keywords: adsorption, chitosan, silica, magnetic material, gold

Synthesis Studies of N-Acetyl Glyoxylamide using Unreactive Amines

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Synthesis of glyoxylamide has been carried out, starting from N-acetylisatin and methyl anthranilate as the starting material. The reaction was performed under reflux and inert nitrogen gaseous atmosphere for 48h in the presence of DIPEA in acetonitrile (ACN) solvent. However, that reaction has proven to be unsuccessful. Several strategies were performed to increase the ease of glyoxylamide syntheses, such as increasing the reactivity of the isatin ring and increasing the nucleophilicity of the amine. The methyl anthranilate derivatives, methyl-2-amino-5-methoxybenzoate and methyl-2-amino-4-methoxybenzoate have already been used and proven to be successful to ring open the N-acetylisatin and produced glyoxylamide 5 and 6 with a yield of 11.7 and 10.62%, respectively. While their hydrolysis has successfully produced glyoxylamide 7 and 8 with a yield of 52.00 and 41.60%, respectively.

Keywords: glyoxylamide, methyl anthranilate, N-acetylisatin, nucleophile

Synthesis of Chalcone Derivatives from 4-Aminoacetophenone and Its Activity as Antimalarial agents

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Resistance antimalarial drug chloroquine to the parasitic *P. falciparum* causes urgent need to develop effective and efficient new antimalarial drugs at affordable costs. One important natural compound that can be used as a new antimalaria is a 1,3-diphenyl-propenone, which is usually well-known as chalcone. The synthesis of chalcone A [(E)-1-(4-aminophenyl)-3-(3,4-dimethoxyphenyl) prop-2-en-1-one] and chalcone B [(E)-1-(4-aminophenyl)-3-(4-methoxyphenyl)prop-2-en-1-one] were conducted via Claisen-Schmidt condensation reaction of 4-amino acetophenone and benzaldehyde, i.e., veratraldehyde and anisaldehyde under stirring at room temperature in the presence of KOH 40% as a catalyst. The identification of chalcones was carried out by spectroscopic methods, i.e., IR, GC-MS, and ¹H-NMR, while the in vitro antimalarial assay was performed against *P. falciparum* 3D7 strain. The result showed that chalcone A and B were produced as yellowish solid in 68.6 and 60.5% yield, respectively. In addition, the antimalarial assay against *P. falciparum* 3D7 strain gave IC₅₀ of 7.33 μM for chalcone A and 71.03 μM for chalcone B.

Keywords: amino-chalcone, veratraldehyde, *P. falciparum*, antimalaria

Development of Soil Sample Preparation By means Acid Digestion in The Absence of Heating for Nickel Analysis

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The development of acids digestion method without heating has been done. This research was conducted by comparing the result of wet acids digestion method without heating by using Teflon method compared with international standard methods, namely US-EPA 3050b and ISO 14869-1 methods. Variations of acid or acid mixtures are performed which are sulfuric acid, a mixture of nitric acid with hydrochloric acid (aqua regia), and a mixture of nitric acid with sulfuric acid (sulfonitrate acid). The results of the digestion were analyzed using atomic absorption spectrophotometer (AAS). Method of validation was conducted by determination of precision value, acuration, limit of detection and limit of quantification, and linearity. Validation of teflon method has been done by comparing the results of teflon method with US-EPA 3050b and ISO 14869-1 with t-test and ANOVA for each variation of the same acid or mixtures of acids. Work accident risk analysis is also done qualitatively on the teflon method. Based on the precision test, all the acid digestion treatment for the soil samples (both single and mixed acids) produced low precision of Teflon method compared to US-EPA and ISO methods. In addition, t-test and ANOVA (F-test) showed that there is significant difference in the results of digestion of the teflon method with international standard method. The shaking time variation for the Teflon method produced significant result in nickel concentration.

Keywords: Acid digestion, atomic absorption spectrophotometer, validation, t-test, F-test.

Fabrication of Electrospun Multi-Walled Carbon Nanotube/TiO₂ Nanofiber

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Nanocomposites carbon nanotube (CNT)/TiO₂ nanofibers have been prepared by electrospinning. A mixed solution of titanium(IV) tetraisopropoxide (TTIP), polyvinyl pyrrolidone (PVP) and CNT were electrospun at 15 kV with 1 mL/h of flow rate and 10 cm for the distance between needle-tip and collector. The resulted fibers were calcined at 450 °C for 2 h to remove all the PVP. TiO₂ and CNT/TiO₂ nanofibers were characterized using X-ray Diffraction and SEM. The XRD analysis showed diffraction patterns for anatase TiO₂ with diameter of ~81 nm. As combined with CNT, the fiber diameter increased to be 200–400 nm. The composite fiber of CNT/TiO₂ demonstrated enhanced photocatalytic performance for methylene blue photodegradation (~70%) under UV-light irradiation for 2h compared to pristine TiO₂ nanofiber (~50%).

Keywords: Nanofiber, electrospinning, CNT, TiO₂, photocatalyst.

Slow-Release Composite of Iron (III) Based on Zeolite and Natural Polymers

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A slow-release iron (III) composite based on natural zeolite and natural polymer materials has been prepared by mixing natural zeolite suspension, chitosan or alginate solutions as natural polymers and iron (III) solutions. The resulting composite was then characterized using infrared spectrophotometer and X-ray diffraction. The resulting composite morphology was also examined with SEM and TEM. The slow-release process of iron (III) composites was assessed by testing the solubility of iron (III) from composites in a citric acid solution as a function of time. Infrared spectra of chitosan/zeolite-Fe and alginate/zeolite-Fe, show that the composites were composed of functional groups of chitosan, alginate and zeolite. Zeolite dealumination was observed by the shifting of the wavenumber from 1049 cm⁻¹ of the asymmetric stretching vibrations of the TO 4 (T= Si or Al) to the larger wavenumber of 1056 cm⁻¹. The XRD data also proved that mixing organic chitosan or alginate polymers with zeolite and iron (III) chloride solution resulting in zeolite dealumination. The SEM images of chitosan/zeolite-Fe and alginate/zeolite-Fe composites confirmed the closure of zeolite aggregation by cross-linking between chitosan-chitosan or alginate-alginate. The TEM analysis verified the presence of Fe aggregates in the chitosan, alginate, and zeolite matrices. The Fe (III) release of chitosan/zeolite-Fe composites has a higher rate than the zeolite-Fe. While, chitosan/zeolite-Fe composites has slower rate than chitosan-Fe composites, but higher than the zeolite-Fe composites. It is concluded that the presence of zeolite particles can reduce the release rate and increase the amount of Fe in the chitosan/zeolite-Fe composite. The same fact is also found in the alginate/zeolite-Fe composite.

Keywords: Slow-release composite, alginate, zeolite, chitosan

Enhanced wash-fastness of cotton fabric dyed with composite of chitosan-natural dyes extract of Ceriops tagal

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Chitosan coating on dyed cotton fabric by natural dye of tingi (Ceriops tagal) has been done to improve the wash-fastness. Fabric dyeing was done by dip-coating method in two ways, one pot (Op) and layer by layer (LbL). Specular-reflectance UV-Vis spectrophotometer was used to access the dyeing quality. Infrared spectrophotometer was performed to indicate the possible interaction between chitosan and the dyes on the dyed cotton fabrics. The leaching degree was determined by using sodium dodecyl sulphate (SDS) and natural surfactant (lerak) as the leaching agent. The results showed that LbL coating has shown better dye-coverage on the cotton fabrics compared to the Op coating. However, the wash fastness improvement on cotton fabric coated by chitosan/tingi (Op) showed better performance than that of the LbL, with a leaching degree of 6.2% on SDS leaching, and 4.1% on lerak's leaching. While, for LbL coating, the leaching degree was 20.1% on SDS, and 13.9% on lerak's leaching. Different type of the molecular interaction between the dye and chitosan from different coating technique may result in those different performance on leaching.

Keywords: Wash-fastness, cotton, natural dye, composite, chitosan, Ceriops tagal

THE UTILIZATION OF RICE HUSK SILICA AND CALCIUM CARBONATE WITH A LIMESTONE IN FORMING A TRIOXIDE AGGREGATE WHITE AND THE INFLUENCE MODIFICATION OF FUMED SILICA AND RICE HUSK ASH SILICA ON THE NATURE OF WMTA AS A ENDODONTIC MATERIAL

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White Mineral Trioxide Aggregate (WMTA) is the result of a combination of ingredients consisting entirely of SiO_2 , CaCO_3 , Al_2O_3 , and Bi_2O_3 which are widely used as cement for tooth restoration. SiO_2 can be extracted from rice husk ash, in rice husk, and there is about 15-20% of silica, or about 85-95% of silica found in rice husk ash from complete combustion. On the other hand, rice husks, in general, are still regarded as agricultural waste resulting from the rice milling process. In the rice milling process, around 20-30% of rice is obtained, and around 14-20% of ash is produced from burning rice husks. CaCO_3 can be synthesized from limestone and it contains about 95% of calcium carbonate. In this research, the researcher made WMTA from rice husk silica and CaCO_3 from limestone. This research was carried out in several stages of silica extraction from rice husk ash using the high-purity sol-gel method, then the synthesis of calcium carbonate with the carbonation method obtained precipitated calcium carbonate (PCC). Preparation of WMTA by reacting silica sonication + PCC + Al_2O_3 accompanied by stirring and heating 85 °C for 24 hours for homogenization, gelation, and maturation processes will be obtained by MTA's gel. The MTA gel dried and calcined 1000 °C for 3 hours to obtain a white powder, the final product was added Bi_2O_3 of 18% produced high-quality WMTA. The results of making WMTA and modification silica of rice husk ash and PCC from limestone were characterized using XRD, FTIR showed characters that had similarities with WMTA ProRoot and had better physical strength tensile strength test capabilities.

Keywords: WMTA, rice husk ash (RHA), limestone, silica, calcium carbonate, fumed silica.

Effect of Incorporation Platelet Rich Plasma into Synthetic Coral Scaffold toward Epithelial Thickness of Wound Healing

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Reepitelisasi tissue is a process in wound healing. The healing process of wounds needs to pass through a phase of inflammatory, proliferation, and remodeling. Tissue engineering is the technology services in the field of medicine that can be applied in wound healing, which takes 3 main requirement i.e., cells, the molecule signals, and scaffold. Scaffold as a place for the molecule signal and cells growth to formed new tissue. Platelet Rich Plasma (PRP) have 7 active Growth factor proteins secreted in the process of wound healing. Incorporation PRP on scaffolding Hidrogel CaCO₃ is expected to affect the process of wound healing. Method: this type of research is experimental study withpost test using Rattus Norvegicus. Divided into 4 groups, namely the PRP and scaffold (synthetic coral scaffold), scaffold only, Spongostan group. And control group using povidone iodine only. All groups were observed in 3 days, 7 days, and 14 days. Wound healing was measured by the thickness of epitel using the light microscope. Results: The average thickness epitel on day 3 has not been formed epithelial, 7th day obtained a mean thickness of the epithelium of the synthetic coral scaffold incorporated PRP groups is 0.195 mm, Scaffold only is 0,141 mm, Spongostan is 0.158 mm, control positif 0,101 mm. On the 14th day of the scaffold incorporated PRP group is 0.259 mm, Scaffold only is 0,171 mm, Spongostan is 0,182 mm, control group is 0.121 mm. Oneway Anova analized shows No. significant different ($p > 0.05$), but in average of epithelial thickness the Synthetic coral scaffold incorporated PRP has the highest of epithelial thickness. Conclusion: Synthetic coral scaffold incorporated by PRP has the highest ability for bone healing in terms of epithelial thickness. Incorporation of PRP on the synthetic coral scaffold increased the process of tissue regeneration.

Keywords: synthetic coral scaffold, wound healing, epithelium thickness, platelet rich plasma

Effect of Thin Film Thickness on The Electronic Properties of Wurtzite Structure (ZnO and GaN): Using by Density Functional Theory

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A computational study using Density Functional Theory (DFT) on the influence of thin-film thickness on the electronic properties non-polar wurtzite structure (ZnO and GaN) with free-electron analysis and symmetry group theory. The Rashba spin splitting phenomenon was identified in the case of bulk and surface thin film non-polar with layer variations from two until ten bilayers. This phenomenon occurs in the valence band maximum (VBM) around the Γ point. The results showed that the change in the symmetry group due to surface effects of. The symmetry group changes from C_{6v} (polar direction) to C_s (non-polar direction) where only one mirror symmetry on the x-axis. The direct wide-bandgap inpoint 0,830 eV (ZnO-wz) and 0,822 eV (GaN-wz). While non polar direction smaller than polar direction 0,289 eV (ZnO-wz) and 0,423 eV (GaN-wz). Through symmetry group analysis showed that the structure of wurtzite (ZnO and GaN) is anisotropic in which one Rashba parameter (α_2) in direction and three parameters (α_1 , α_2 , and α_3) indirection. Computational calculations and analysis through symmetry group theory are consistent. The results of the study confirmed that the phenomenon of Rashba spin splitting makes the wurtzite structure promising as optoelectronic devices.

Keywords: wurtzite, surface effects, Rashba spin splitting, thin film thickness

Hydrogen and Water Adsorption on Monolayer Hexagonal Boron Nitride (h-BN): the First-principles Calculations

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Hydrogen and water adsorption on the monolayer hexagonal boron nitride (h-BN) has been studied using the density functional theory (DFT). Two configurations of monovacancy were modeled, which are monovacancy at nitrogen site (V N) and monovacancy at boron site (V B) by removing N and B atoms from the h-BN sheet, respectively. A supercell consisting of 32 atoms were used to analyze adsorption of hydrogen and water (H 2 O) by calculating formation and adsorption energies. From the calculated energies, we found that the involved reactions are exothermic, meaning that hydrogen and water can be adsorbed on the h-BN sheet. In addition, system of hydrogen at V B site of h-BN is the most stable system with the lowest formation energy of 2.78 eV.

Keywords: h-BN monovacancy, hydrogen, water, formation and adsorption energy

Effect of Zeolite:Clay Ratios on the Formation of Zeolite-Clay-White Cement Composite Cylinder as an Encapsulant of Urea Fertilizer

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Zeolite-clay-white cement composite cylinders have been prepared for the encapsulant of urea powder. The composites were made by mixing natural zeolite, clay, and white cement at certain ratios using a home-made cylinder mold. All processes were done at room temperature. The composites were characterized using infrared (IR) spectroscopy and X-ray diffraction (XRD). Mechanical properties of the composites were evaluated through compressive strength and water absorption capacity test. The infrared spectra showed functional groups at 3448 and 1636 cm⁻¹ indicating the presence of calcium silicate hydrate as the main product of hydration and pozzolanic reactions in the composite. The XRD patterns also confirmed the presence of calcium silicate hydrate as tobermorite ($d = 3.34, 3.22, 2.75$, and 2.28 \AA) and jennite ($d = 4.50 \text{ \AA}$). Increasing the natural zeolite ratio in the composite decreased the compressive strength, but increased water absorption capacity. The composite cylinders are envisaged as the encapsulant of urea powder and act as a slow-release fertilizer.

Keywords: zeolite-clay composite, calcium silicate hydrate, slow-release urea fertilizer

Effect of Heat Input on Dilution, Hardness and Microstructure in DMW Stainless Steel and Carbon Steel

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The success of Dissimilar metal welding (DMW) is the optimum Heat-Input parameter producing a quality weld joint with optimal dilution, hardness values and intermetallic microstructure stability.. To measure the level of DMW quality, research has been carried out on the connection of the SS312-TP304 SA stainless steel and SA 53 gr B carbon steel using the GTAW process with Heat-Input (1866.6 to 2362.1) J / mm. Visual observations at the HAZ and all weldmetal locations found no welding defects. Observation of dilution area with three observations obtained optimal results was 35.35%. Observation of microstructural characterization in carbon steel base metal is pearlite ferrite, HAZ location is pearlite ferrite with ferrite webs, bainite growth, and filler metal dilution on carbon steel is columnar dendritic. Observation of microstructure characterization in stainless steel base metal is austenite, HAZ is austenite, and filler metal penetration in stainless steel is columnar dendritic. The characterization of all weldmetal is the columnar dendritic phase. Hardness of DWM carbon steel, allweld metal and stainless steel minimum 142Hv up to maximum 197Hv no martensitic phase growth. Dilution area 19,95 to 46,16%, hardness and microstructural characteristics of the results of this study can be used as WPS & PQR DMW fabrication process at carbon steel and stainless steel pipe welding connections.

Keywords: DMW, carbon steel and stainless steel, heat input, dilution, hardness value and microstructure characterization.

Experimental Study on the Roundness of Silica Sand from Sidrap: Improvement by means of Abrasion and Measurement using a Practical New Method

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Abstract. Improving roundness of a local silica sand was conducted by abrasion using a laboratory ball mill having a diameter of about 156 mm with steel grinding balls of 2800 g. Abrasion were conducted at a fixed speed of 30 rpm; with various sand loadings of 150, 200 and 250 g; and grinding time between 60, 105 and 120 min. Roundness was evaluated based on Wadel equation and topography of particle surface was measured by using a new practical method consisting of a build-in camera in mobile phone and common image processing application. Results of measurement using this new proposed method had been confirmed with roundness reported from two service laboratories. The abrasion could increase the roundness of Sidrap sand from 0.20 to an average of 0.31, while the measured roundness of Ottawa standard sand was about 0.46. Three types of mortar were prepared from Sidrap sands before and after abrasion, and Ottawa sand. Compressive strengths of mortar after aging of 28 days were 345, 375, and 333 MPa respectively.

Keywords: local silica sand, roundness, Wadel equation, compressive strength of mortar, particle shape classification, mobile phone camera

A PRELIMINARY STUDY ON THE SELECTIVE DETECTION OF HYPOCHLORITE BASED ON ANTIAGREGATION OF AUNPS

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A preliminary study on the selective detection of hypochlorite using gold nanoparticles (AuNPs) has been carried out. Gold nanoparticles have been synthesized using sodium citrate as capping and stabilizing agent simultaneously at room temperature with no stirring and pH adjustment. Development of hypochlorite detection methods is based on the ability of hypochlorite to oxidize L-cysteine that can aggregate AuNPs through the formation of S-Au bonds. The aggregated gold nanoparticles will change color from red for the original AuNPs to blue for the aggregated AuNPs. The presence of hypochlorite added to L-cysteine will oxidize the thiol group of L-cysteine thereby reducing the ability of L-cysteine to aggregate AuNPs. The higher the concentration of hypochlorite in L-cysteine, the more thiol groups are oxidized. Thus the presence of hypochlorite will act as anti-aggregation of L-cysteine-induced aggregation of AuNPs and therefore the color of solution is turned back to red from blue. This color change can be easily visualized by naked eye within 7 min. The existence of AuNPs, L-cysteine aggregated AuNPs, and AuNPs that have been used to detect hypochlorite have been seen using UV-Vis spectrophotometers and Transmission electron microscopy (TEM).

Keywords: Gold nanoparticles, Sodium citrate, L-cysteine, Hypochlorite, Detection

Synthesis of Methylcellulose using Dimethyl Carbonate with Conventional and Green Methods

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Synthesis of methylcellulose (MC) using dimethyl carbonate (DMC) with conventional dan green methods has been conducted. The cellulose used in this study was isolated from sago waste in 86.67% content. All the methylation products were analyzed using IR and ¹H-NMR spectrometers. The determination of cellulose content was done using TAPPI T-203 method, while the degree of substitution (DS) was based on the Zeisel Method. Conventional synthesis of MC was performed using Na₂HPO₄ (12:1), DMC, and NaCl 5% (w/v) (volume ratio = 10:10) at 90 °C. The reaction time was varied (2 to 5 hours); the optimum condition was reached for 3 hours and gave the DS of 1.028. Green synthesis of MC was conducted using Na₂HPO₄ (12:1), DMC, and NaCl 5% (w/v) (volume ratio = 10:10) by employing microwave and sonochemistry techniques. Synthesis MC with the microwave was carried out at the power of 400 W for 200 seconds and gave the DS of 1.036. Synthesis MC with sonochemistry (the variation time 1 to 3 hours) was conducted at the optimum time of 2 hours and gave the DS of 0.646. The volume of DMC was also varied (17.5; 20; 22.5; 25; and 30 mL), where the volume ratio of 1:24 gave the highest DS of 1.177.

Keywords: cellulose, dimethyl carbonate, microwave, sonochemistry

A Visible Light-Induced $\text{Fe}_3\text{O}_4/\text{ZnO-Cu}$ Nanocomposite and Its Photocatalytic Activities for Rhodamine B Photodegradation

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Synthesis of $\text{Fe}_3\text{O}_4/\text{ZnO-Cu}$ nanocomposite photocatalyst has been conducted. The synthesis was carried out using the co-precipitation method with the variation of Cu concentration and modification by Fe_3O_4 magnetic material. As synthesized photocatalyst were characterized using FTIR, XRD, TEM, and SR UV-Visible. Photocatalytic activities of samples were evaluated through Rhodamine B degradation under visible light irradiation. The results showed that sample with Fe/Zn-Cu 1% has smaller band gap energy of 2.88 eV and the highest photocatalytic activity than pure ZnO or Fe_3O_4 -modified ZnO (Fe/Zn-Cu 0%) under visible light. The percentage of Rhodamine B degradation was approximately 76.88% during 120 minutes of visible light illuminating. Moreover, the photocatalyst materials could be easily separated after photocatalysis which is due to magnetic property of Fe_3O_4 material. Therefore, Cu-doped ZnO with Fe_3O_4 modification has been be an efficient and effective visible light-induced photocatalyst in removing non-biodegradable Rhodamine B dyes.

Keywords: $\text{Fe}_3\text{O}_4/\text{ZnO-Cu}$ nanocomposite, Rhodamine B photodegradation, visible light.

Synthesis, Characterization and Biological Evaluation of Mono-Ketone Curcumin Analogues as Inhibitor of α -Glucosidase Enzyme

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Synthesis, characterization and biological evaluation of mono-ketone curcumin analogues as inhibitor of α -glucosidase enzyme have been conducted. This research was initiated by synthesizing 4-benzyloxy-3-methoxybenzaldehyde from vanillin using benzyl chloride, potassium iodide and potassium carbonate in dimethyl formamide under reflux condition for an hour. Synthesis of mono-ketone curcumin analogues was performed through Claisen-Schmidt reaction by refluxing 4-benzyloxy-3-methoxybenzaldehyde with acetone (analogue A) and cyclopentanone (analogue B) using potassium hydroxide 5% catalyst for an hour. The structures of the products were elucidated by FTIR, Direct Inlet-Mass Spectrometer, $^1\text{H-NMR}$ and $^{13}\text{C-NMR}$. Mono-ketone curcumin analogues were evaluated for their activity assay towards inhibition of α -glucosidase enzyme. The inhibition type of mono-ketone curcumin analogues was also investigated. The inhibition results of mono-ketone curcumin analogues were compared to quercetin as positive control. The results showed that 4-benzyloxy-3-methoxybenzaldehyde and mono-ketone curcumin analogues (A and B) were yielded of 90,4; 81,3; and 94,5% respectively as white and yellow solid. The inhibition of α -glucosidase enzyme indicated that the highest inhibition of mono-ketone curcumin analogues (A and B) and quercetin were 80,1; 89,7; and 81,4% at the concentration 1; 0,5; 1 mM respectively. The type inhibition of mono-ketone curcumin analogues (A and B) and quercetin were considered as uncompetitive inhibitor.

Keywords: 4-benzyloxy-3-methoxybenzaldehyde, α -glucosidase enzyme, benzylation, curcumin analogues

ADSORPTION Cd(II) ION USING α - CELLULOSE IMMOBILIZED OF HUMIC ACID WITH CROSSLINKER AGENT EPICHLOROHYDRIN

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An environment is said to be polluted if there have been changes in the environmental order so that it is no longer the same as its original form, as a result of the entry and inclusion of a foreign substance or object in the environmental order. Various cases of heavy metal pollution have been reported in both developed and developing countries, as well as adverse effects on the population living in the vicinity. Anthropogenic release of heavy metals, which is due to human activities such as industrial waste in line with the increasing number of factories so the higher the level of environmental pollution. This heavy metal pollution including cadmium metal. Generally, the contamination of cadmium in waters originates from the waste of the metal ore processing industry, the pesticide industry, the plastics industry and mining. Cadmium which accumulates in the body of living things has a long half-life and generally accumulates in the liver and kidneys. This study focuses on reducing levels of heavy metals in the environment with an adsorbent from natural products, namely palm oil empty fruit bunches and humic acid from peat soils. This research combines two adsorbents of natural products, namely by immobilizing cellulose and humic acid with the epichlorohydrin crosslinker agent. The purpose of this study was to determine the effect of the optimum dose of epichlorohydrin on cellulose and humic acid immobilization, determine the optimum pH, adsorption isotherm, cadmium metal adsorption kinetics (Cd) and determine the type of interaction between adsorbent and adsorbate. The results showed a link between cellulose and humic acid which was connected via epichlorohydrin from FT-IR results in certain wavenumbers, including OH vibration (3415cm^{-1}), stretching CH vibration (2903 cm^{-1}), NH bending vibration (1625 cm^{-1}), COO stretch vibration (1373 cm^{-1}) and CO stretch vibration (1058 cm^{-1}). For the optimum dose of epichlorohydrin obtained at 15 ml (1 recipe) with an adsorption capacity of 7.4705 mg/g. While the optimum pH was obtained at pH 6, the adsorption isotherm obtained the largest capacity at 200 ppm by following the Freundlich isotherm ($R^2 = 0.9512$).

Keywords : Cellulose, humic acid, epichlorohydrin, adsorbent, oil palm empty fruit bunches

The Effect of Glycerol on Alginate/Zeolite Membranes for Selectivity of CH 4 /CO 2 Gas

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Synthesis of alginate/zeolite membrane with the glycerol plasticizer for separation of CH 4 towards CO 2 has been carried out. This study aimed to investigate the effect of glycerol addition towards physical and mechanical properties of membrane on the permeability and selectivity of CH 4 /CO 2 . Membrane fabrication was done with mixing of alginate and activated zeolite in the aquabidest with glycerol addition as plasticizer with mass ratio of alginate:glycerol 1:0, 1:0.25, 1:0.5, 1:1 and stirring for 24 h and templeteing at room temperature. Membrane formed was tested with FTIR, XRD, SEM, Texture Analyzer and Permeation gas cell. Result showed that glycerol addition into alginate can decrease tensile strength and increase elongation value for about 20% on the mass ratio alginate:glycerol 1:1. Besides, gas permeation rate was also influence by the glycerol addition. The highest permeability of CH 4 was obtained with alginate:glycerol 1:0,25 and with permeation rate $1.03 \times 10^{-4} \text{ cm}^3 \text{ (STP)} \text{ cm}^{-2} \text{ det}^{-1} \text{ cmHg}^{-1}$. Meanwhile, the highest permeability of CO 2 was obtained with the mass ratio alginate:glycerol 1:0,5 with permeation rate about $1.19 \times 10^{-5} \text{ cm}^3 \text{ (STP)} \text{ cm}^{-2} \text{ det}^{-1} \text{ cmHg}^{-1}$. The highest selectivity indicated that separation of CH 4 /CO 2 occurred well about 49.2 for alginate:glycerol 1:1.

Keywords: membrane, alginate, zeolite, glycerol, gas permeation.

Effect of TiO x and TiO 2 Layer on the Photovoltaic Property of BiOI Films

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This study aims to investigate the impact of mesoporous and compact layer, like TiO 2 and TiO x on the photovoltaic performance of bismuth oxyiodide (BiOI) films. BiOI thin films were prepared using spin-coating method for 10 cycles onto FTO glass, FTO/TiO x , FTO/TiO 2 , and combination of FTO/TiO x -TiO 2 layer. Then, the resulted films were characterized on their optical, structural and photovoltaic properties. By adding the TiO x or TiO 2 layer into cell, it resulted in the shifting of absorbance to a longer wavelength. On the structural property analysis, Raman spectra showed an overlap peak among TiO x , TiO 2 and BiOI films. Moreover, solar cell was successfully developed using iodine electrolyte and Pt-counter electrode. By the photovoltaic analysis, it was known that the combination of those layer of metal oxide nanomaterials could give a slight improvement on the current density and open-circuit voltage of BiOI thin films. Therefore, the overall BiOI photovoltaic parameter enhanced.

Keywords: BiOI, optical property, SILAR, TiO 2 , TiO x , thin films

Ion exchange fraction of fish by-products protein as a food protein fortification ingredient

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Stunting is one of the nutritional problems in developing countries, and finding alternative affordable protein source to overcome the problem by means of fortification remains challenging. Mackerel fish by-products were extracted using acid (pH 2.5), base (pH 12.0), and surfactant (SDS 0.01%), then fractionated the protein using the cationic exchange-solid phase extraction (SPE). The yield of protein extraction using HCl (pH 2.5), NaOH (pH 13) and SDS 0.01% are 32.55%; 5.50%; 20.40%, respectively. Analysis of protein fraction, the product of SPE SCX fractionation, found fraction pH 6 and pH 7 of HCl extract and protein fraction pH 5, pH 7 and pH 8 of SDS protein extract meet criteria as protein fortification protein/enrichment on minimum requirement content of essential amino acid as well as chemical score of each essential amino acid. The extraction process determines the outcome of fractionation with SDS extraction gives a better result.

Keywords: protein extraction, fish, cation exchange fractionation, essential amino acids, protein fortification.

Understanding the Crystal Structure of a Heterometallic Metal-Organic Framework in Cadmium Imidazolate Framework-1 with Periodic DFT Study

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Determining the effect of mixed metal in metal-organic frameworks (MOFs) is vital to understand the crystal structure and its related properties. The tunability of MOFs provides an opportunity to develop functionalized materials with a specific task. Herein, cadmium imidazolate framework-1 (CdIF-1) as part of MOFs was investigated through a computational approach regarding its possibility for the formation of mixed metal CdIF-1. The studies were performed by replacing Cd²⁺ ions in the crystal structure of CdIF-1 with Zn²⁺ ions to obtain several possible configurations of heterometallic CdIF-1. The simulations were conducted using periodic DFT with the addition of dispersion correction scheme. Several aspects in the crystal structure were investigated such as the changing in the lattice parameters and unit cell volume, and the bond properties. Replacing several Cd²⁺ ions with Zn²⁺ would affect the crystal structure particularly lattice parameters and pore diameters. When all the Cd²⁺ ions were replaced with Zn²⁺ ions, a new crystal phase was obtained to give zeolitic imidazolate framework-8 (ZIF-8) material. This study provides an insight into the mechanism in which CdIF-1 is transformed into new crystal phase of ZIF-8.

Keywords: Metal-organic frameworks, mixed metal MOFs, CdIF, crystal structure, DFT

Reliable Evaluation of Photocatalytic Activities through Facile Spectrophotometric Analysis of Formaldehyde as Reaction Substrate and Product

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Facile reliable method to evaluate photocatalytic activity in heterogeneous system is proposed via spectrophotometric analysis of formaldehyde (HCHO) [1] to substitute conventional method that requires expensive and complicated instruments. There were 2 representatives of reaction systems that we used, i.e., methanol dehydrogenation assisted with platinum metal deposition and organic decomposition. Photocatalytic activity tests were evaluated by analyzing the HCHO production and HCHO consumption to substitute conventional method, i.e., hydrogen (H₂) and carbon dioxide (CO₂) evolution, respectively. The results showed that reliable evaluation of photocatalytic activity of several commercial titania could be conducted by those proposed methods. For methanol dehydrogenation, HCHO production analysis could reliably evaluate photocatalytic activity within 300 μmol of HCHO production, substituting H₂ evolution. Meanwhile, for organic decomposition, the result shows that the analysis of HCHO consumption was more reliable than CO₂-production analysis.

Keywords: photocatalytic activity, formaldehyde analysis, spectrophotometric analysis, methanol dehydrogenation and organic decomposition.

CTAB modified Bentonite as Slow Release Fertilizer

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Effect of CTAB concentration on synthesized CTAB modified bentonite and release of NPK has been studied. Besides, the release kinetic model was also determined. Characterizations of the modified bentonite were done using spectrophotometer FTIR (Fourier Transform Infra-Red), XRD (X-Ray Diffraction), and SEM (Scanning Electron Microscope). Amount of released NPK was analyzed using Spectrophotometer UV-Visible and AAS (Atomic Absorption Spectrometer). The release kinetics of NPK were matched with zeroth, first, second, pseudo-first, pseudo-second order, and Korsmeyer-Peppas kinetics models. The result of the study showed that CTAB modified bentonite have been successfully synthesized for NPK release. The CTAB concentration loaded in the modified bentonite affects the amount of NPK released out of bentonite and also could reduce the release of NPK. Among modified bentonite synthesized, CTAB (2 CEC) could reduce NPK release rate in water very well. The release kinetic of NPK followed pseudo-second order kinetics model, with the k value of N,P, and K were 0.0027, 0.0127, and 0.0169 mg day⁻¹, respectively.

Keywords: Bentonite, CTAB, NPK, slow release fertilizer

Degradation of Titan Yellow using ZnO/Ag Embaded with Fe 3 O 4 nanoparticles under Visible Light-Induced

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The Fe 3 O 4 /ZnO/Ag nanocomposite has been successfully synthesized, and the material is then applied as a photocatalyst to degrade titan yellow. Fe 3 O 4 was synthesized through sono-coprecipitation method using NH 4 OH as a precipitating agent. The Synthesized ZnO/Ag was performed via coprecipitation method using ethylene glycol, zinc acetate, and silver nitrate as a reagent. This study investigated several parameters, such as the effect of time reaction, equilibrium state, and material responsiveness under visible light. The XRD measurement indicated the presence of ZnO, Ag, and Fe 3 O 4 , whereas the TEM image displayed the photocatalyst had a nanosized particle with approximately 17 nm. Photocatalyst activity has shown the equilibrium process at 60 minutes. Reusability test showed that Fe 3 O 4 /ZnO/Ag nanocomposite could be used up to three times

Keywords: Magnetite, Zinc Oxide, Silver, titan yellow

Enhancement of Electroflotation Using Papaya Seeds (*Carica papaya*) as Biocoagulant for Laboratory Wastewater Treatment

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Enhancement process of electro-flotation was evaluated to treated chemical laboratory wastewater. Wastewater treatment using combination of the electro-flotation method with adding natural coagulant agent herein was called enhancement of the electro-flotation process. In this work the electro-flotation batch system using stainless steel as cathode and graphite as anode was evaluated in 21 V for 60 minutes. Natural coagulant addition used is tannin category papaya seeds floured with variation of dose 0.05; 0.10 and 0.20 g/500 mL. The effectiveness enhancement of Electro-flotation process was evaluated for decreasing Total Dissolve Solids (TDS), Electrical Conductivity (EC) and Turbidity. The chemical laboratory wastewater samples which have been diluted 10 times has initial condition have TDS, EC and turbidity respectively 337 mg/L; 0.5 ms/cm; and 42 NTU. The result showed that the enhancement of electro-flotation process reduced the TDS and EC and turbidity respectively as much as 31.1329% (241 mg/L), 32% (0,34 mS/cm) and 88.9286% (4.65 NTU) at dosage of coagulant 0.05 g/500 mL. Therefore, the enhancement of electro-flotation process reduced the environment contaminant in the chemical laboratory wastewater treatment.

Keywords: Biocoagulation, Papaya seed (*Carica papaya*), Chemical laboratory wastewater, Electro-flotation

Synthesis of Chitosan/Carrageenan Polyelectrolyte Complex and Its Utilization As Adsorbent for Humic Acid

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The preparation of chitosan/carrageenan film and the study of the adsorption and desorption of humic acid have been conducted. The characterizations of chitosan/carrageenan were observed by FTIR spectroscopy, SEM, swelling analysis, and pH stabilization. Adsorption capability test was performed by varying the chitosan and carrageenan composition ratios, contact times, pH, and the concentration of humic acid. Desorption capability test was performed by varying the concentration of NaOH. All treatments results in adsorption and desorption study were analyzed by using a UV-Visible spectrophotometer. The preparation film succeeded as shown in FTIR, the surface morphology of the film was changed before and after adsorption also after desorption as shown in SEM result. Swelling test results showed that film with the ratio at 70:30 had the highest swelling percent and film stability test results showed that film was stable at pH 4-10. Adsorption reached the optimum ratio at 70:30. Adsorption of humic acid using 0.03 g film mass reached the optimum at pH 5, 600 min of contact time and 450 mg L⁻¹ of concentration with 50.4 mg g⁻¹ adsorption capacity. Kinetics adsorption model followed the pseudo-second-order models. Isotherm model of humic acid adsorption followed Langmuir model with maximum adsorption capacity (q_m) value of 61.4 mg g⁻¹. Desorption study showed that desorption with 1.0 M NaOH has the highest desorption percent at 85.4%.

Keywords: humic acid, chitosan, carrageenan, adsorption, poly electrolyte complex.

Thermal Stability of Insulin at Acid Solution in the Absence and Presence of Zinc Ions by Small Angle X-ray Scattering

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The thermal stability of insulin in acid solution has been studied by small angle x-ray scattering.

Keywords: Insulin, thermal stability, aggregation, acid, zinc, SAXS.

Calculations of the $3n - J$ symbols by using algebraic recursive iteration

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We carry out calculations of the $3n - J$ symbols (for $n = 2, 3, 4, 5$). Firstly, the $6 - J$ symbol is evaluated by producing an algebraic recursive iteration, while the $9-J$, $12-J$, and $15-J$ symbols are calculated in term of the $6 - J$ symbol. We apply logarithmic expressions to the factorial multiplications to reduce the computational cost due to the overflow and underflow problems. The selection rules are also applied in the algorithm as constraint of the allowed quantum angular momenta.

Keywords: Angular momenta, $3n - J$ symbol, algebraic recursive iteration.

Integrated Bio-cycles Information System for Tropical Natural Resources Management

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Indonesia has blessings of abundant natural resources. Tropical natural resources have great potential resources but still have low economic, socio-cultural, and environmental values, because they are still under mismanagement that is not on natural-based management norms. Education for Sustainable development must be applied to respect human beings, other living beings, nature, and God. Destructive innovation 4.0 through the development of artificial intelligence, high technology, big data, cellular, and internet must also be developed in the management of natural resources. The use of the latest biotechnology in environmental and genetic engineering is essential. Intelligent integrated agricultural information system 4.0 through Integrated Bio-cycle Management (IBM) with natural norm-based management on land and biological resources can increase higher added value on the environment, economic, socio-cultural, and health aspects. IBM can produce gold crops and livelihoods, such as yellow gold (food, rice, corn), green gold (vegetables), brown gold (plantation wood), red gold (meat), white gold (milk, fish), black gold (organic fertilizer), transparent gold (water), gas gold (oxygen), blue gold (biogas, biomass energy, biofuels), king gold (herbal medicine), prosperity gold (tourism), deep gold (mystic). The development of an integrated agricultural information system is essential for the sustainable and productive management of tropical natural resources.

Keywords: bio-cycles, information system, resources management, tropical natural.

Sucrose and Lignosulfonate Acid: Which One is More Effective as a Concrete Setting Retarder?

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The goal of this study is to experimentally evaluate the performance of sucrose and lignosulfonate acid as a concrete retarder. The initial and final setting times of concrete are obtained for various dosages of those admixtures. Besides, the impact of those retarders to the compressive strength of concrete is also explored. A total of 13 (thirteen) mix samples are made, in a laboratory, by adding various dosages of those admixtures into the reference mixtures. Those samples are tested using a concrete mortar penetrometer and a compression-testing machine to obtain their setting times and compressive strengths. Sucrose addition with a dosage of 0.01%, 0.014%, and 0.019% (by weight of cement) increases the initial setting time by 102.67%, 117.54%, and 138.89% and extends the final setting time by 57.70%, 72.83%, and 99.47%. The addition of liquid lignosulfonate acid by 0.6% (by weight of cement) causes the initial setting time to grow by 68.77% from 4.46 to 7.52 hours. Similarly, the final setting time is prolonged by 51.65% from 7.27 to 11.02 hours. This study confirms that sucrose is more effective than lignosulfonate acid in term of retarding concrete setting. However, careful attention is needed when applying sucrose as a set retarder because applying larger than a critical dosage results in an adverse effect. Sucrose is also an effective strength reducer for concrete. The 28-day strength reduces by 10 to 25% due to adding sucrose as much as 0.019% (by weight of cement).

Keywords: sugar, sucrose, lignosulfonate, concrete setting time, penetration resistance, compressive strength.

Hydrodeoxygenation of Anisole and Benzaldehyde over Bifunctional CoMo/USY Catalyst

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Hydrodeoxygenation (HDO) of anisole and benzaldehyde over bifunctional zeolite USY (ultra stable Y) supported CoMo catalysts has been studied. Catalyst consisted of metals Co and Mo were loaded at three different sequences; Co loaded first (Co-Mo/USY), Mo loaded first (Mo- Co/USY), and simultaneously loaded (CoMo/USY). Experiments were conducted in flow reactor within temperature 350 °C for an hour. The oxygen-free products from HDO process that were successfully obtained were benzene and toluene compound. CoMo/USY catalysts exhibited the best catalytic activity of anisole towards the total production of aromatic hydrocarbons yield by 9.17%. It was also found that, Mo-Co/USY catalysts exhibited the best catalytic activity of benzaldehyde with aromatic hydrocarbons yield by 10.46% .

Keywords: Hydrodeoxygenation, Anisole, Benzaldehyde, CoMo/USY

Extraction behavior of trivalent rare earth metal ions with diphosphonic acid type extraction reagent

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Bis(phenyl hydrogen phosphonato)-1-hydroxy-4,6,6-trimethylheptane has been prepared to investigate extraction behavior of a series of trivalent rare earth metal ions. This diphosphonic acid extraction reagent exhibited high extraction ability to all ions examined, especially Sc ion. It did not exhibit apparent dependency in acid concentration, which corresponds to ion-exchange mechanism, probably due to extremely high extraction ability. Although the mutual separation of rare earths was difficult with this reagent, group separation of rare earths over divalent base metals can be accomplished. Compared with the extraction of base metals, it was found that this reagent with branched alkyl chain exhibited lower in extraction ability than diphosphonic acid with linear chain, bis(phenyl hydrogen phosphonato)-1-hydroxy-hexadecane.

Keywords: Diphosphonic acid, rare earth metal ions, extraction



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MECHANICAL AND INDUSTRIAL ENGINEERING SYMPOSIUM

Determination of Attributes Leveling Through Online Customer Reviews Using Natural Language Processing

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Failure rate of technology Products of Start-ups on the Online Crowdfunding Platform is quite high. One of the parameters of the failure is project quality signals of attributes. The Start-ups and the Crowdfunding Platform synergize providing campaign stimulus of project quality signals to attract backers who will give funding to the start-ups. The aims of study is determination of attributes of project quality signals. This study uses online customer reviews as a research data set to plot within 7 project quality signals attributes using Natural Language Processing (NLP). The sentiment analysis was used to classify pro-con review, the features extraction was employed to get structured-words, and TF-IDF was applied to find similarity. It was then analysed to gain response values as representative of attribute levels. Results show that response values lay of in the ranges of 0.0586 to 0.9752. The highest values of 0.9752 was campaign duration and followed by campaign description, information of backers, information of funding, video, main picture and the last was graphic design. It concludes that levelling of 7 attributes based on customer reviews could be developed by NLP method. In this, the campaign duration was the most important attribute compared to other attributes.

Keywords: online customer reviews, crowdfunding, startup, product, project quality signal, natural language processing.

Green Productivity Approach in Batik Industry

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Nowadays, Industries compete one to each other on many factors. When industries improve productivity, they may ignore the environmental effect. Green Productivity is a concept that can improve both productivity and environmental performance. Thus, this research was conducted in the batik industry namely Batik Ayu Arimbi. The Batik industry is known as one of the most polluting industries since it creates both liquid and solid waste. Most of them release the waste directly into nature without disposing it in a proper way. After the EPI index has been calculated, it is known that the environmental performance of this industry is far below the government standards. To tackle the issue, this research uses the green productivity approach. This approach results in 2 (two) alternatives solutions for Batik production which increased the productivity as well as the EPI index.

Keywords: Green Productivity, material balance, fishbone diagram, batik industry, EPI index.

Relief Mapping Assessment using Two-Echelon Vehicle Routing Problem with Drone

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This study considers the two-echelon vehicle routing problem using drones in the post-disaster situation. The problem takes into account using a collaboration between a drone with a ground vehicle to conduct an information gathering so-called mapping operation. Each ground vehicle is associated with a drone. The first echelon depicts the routes travelled from depot to stopover point and from a stopover point to another stopover point. The first echelon is travelled by a ground vehicle to extend the limitation of drone's range coverage to gather information. The second echelon is the assignment of the drone to the target point. A target point is an area being mapped or in this case that is affected by the disaster. The problem is modelled as an integer linear programming problem denoted as 2EVRP-MOD. It is assumed that drone can only be released from a stopover point. The mapping operation is associated with the amount of area being covered at each target area. The objective is to minimize the total mapping operation time. The entire mapping operation time is limited by the drone flying capacity limit. The model is tested on a real-case dataset in Bekasi, Indonesia. The computational results show that the model can effectively provide a solution for the 2EVRP-MOD.

Keywords: Two-Echelon Vehicle Routing Problem, Drone Mapping, Disaster Operations Management

Analysis of the Music Effect to the Worker of Leather Craft Industry

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XYZ was one of the agroindustry engaged in the field of leather craft. XYZ used music in the workspace to reduce worker's boredom. However, the effect of music by companies towards worker productivity was not identified. This research focus on the music's tempo and genre towards worker's pulse, sleepiness level, and worker productivity. The pulse criteria used as a reference for assessing the workload experienced by workers measured by a pulse oximeter. The worker's sleepiness level was used to determine the fatigue level of workers and measured with the Stanford Sleepiness Scale questionnaire. Worker productivity was calculated by the production output. The output was specifically the length of the stitched leather in centimeters (cm) divided by the input in the form of worker and time in a minute. The productivity unit was cm/person/minute. The research objective was to determine the best type of music for the optimal worker productivity, Statistical analysis were used using Welch's ANOVA method and Games-Howell test. The best treatments was indicated as the treatment of medium-tempo of dangdut music, fast-tempo of pop, and fast-tempo of dangdut.

Keywords: genre, music, productivity, heart rate, sleepiness, tempo

Review on Current Thermal Issue and Cooling Technology Development on Electric Vehicles Battery

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As one of the most prominent parts of an electric vehicle, Li-ion battery has been widely used as the main power source of the vehicle. However, this battery is very sensitive to the working temperature. Some thermal issues can occur when the temperature of the battery exceeds the maximum allowable working temperature of a battery. Thus, a proper battery thermal management system is required in order to support electric vehicle performance. In this paper, some problems which can occur during overheating are explained. Then, the current development of the battery thermal management system based on the cooling mechanism as well as the cooling mode is reviewed together with the merits and demerits of each model. Lastly, brief comparisons between the systems are explained as the conclusion of the most promising battery thermal management system in the future.

Keywords: battery, electric vehicle, cooling mechanism, thermal management

Strategy Designed toward Asset Management System Improvement

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Today, organizations face various severe challenges in maintaining their performance as well as providing value and benefit for their stakeholders. Especially for capital investment organizations. UPT. XYZ is a workshop unit under PT. ABC is responsible for performing locomotive maintenance. In regards to this special responsibility, UPT. XYZ has a high value of the asset within their organization. Therefore, an asset management maturity assessment is needed to determine the level of asset management maturity in the company. In this study, the ISO 55001: 2014 Self-Assessment Methodology Plus (SAM+) Tools is used to determine the level of maturity of the company's asset management in the 6 classes studied, and risk analysis is carried out in order to minimize the risk in asset management. From the results of this study, the overall results of the level of asset management amounted to 2.57 or in the category of development. Then in this study, a risk mitigation strategy is given for each root problem obtained from a root cause analysis using the Fault Tree Analysis of the 7 biggest risk events found and has a major effect on the benefit of asset management.

Keywords: Asset Management, Asset Management Maturity Assessment, Risk Management, Fault Tree Analysis

The Implementation of Risk Management Based on ISO 31000:2009 Framework at SME Bamboo Bantul, Yogyakarta

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In every large, medium, or small industrial business, there must be a risk that occurs in the business process. Poor relations and communication between buyers and suppliers of bamboo can result in the production of bamboo fabrications not working well, because raw materials are not available or the quality of stuff that is not good enough. The research conducted in bamboo SME (Small Medium Enterprise) aimed to handle risk. The proposed methods used ISO 31000:2009 to identify risks and SCOR methods to define improvement steps. This research successfully identified nine risks with three levels of categories, namely low, moderate, and high. The group of high-risk types has three members with risk code E1, E2, and E6. The group of medium types has three members with risk code E3, E4, and E5, E8, and E9. While from the low category, there is one risk with code E 7. According to Hight risk categories, we propose to improve the planning of raw materials, production schedule, and demand management.

Keywords: enterprise risk management, iso:31000, supply chain, scor, sme

SUPPLIER RELATIONSHIP PERFORMANCE MEASUREMENT MODEL: A CASE STUDY IN A SERVICE COMPANY

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The effectiveness of supply chain performance is strongly influenced by the close relationship between the company and its suppliers. A strong relationship between suppliers and buyers will have a positive impact, especially in achieving company targets. This relationship needs to be measured and monitored equally by the buyer and supplier. The supplier relationship performance measurement (SRPM) model is a model to measure the performance of relationships between companies and their suppliers, which is still rarely done, especially for the service industry. Therefore, in this study SRPM models and measurements for the service industry will be proposed. A case study conducted at one of the consulting companies in Indonesia. SRPM indicators are identified from literature studies and interviews with experts. From these results 18 valid SRPM model indicators were obtained and then SRPM measurements were carried out to find out which SRPM indicators needed improvement. Measurements were taken both at the company (buyer) and the supplier. From the measurement results it is found that the indicators of responsiveness and services have the highest value in the relationship between buyers and suppliers. The next research opportunity is how to improve the relationship between buyer supplier strategies in the SRPM model.

Keywords: supply chain management, key performance indicator, supplier relationship, performance measurement, supplier relationship management

Multi-Objective Location Routing Problem with Time Windows for Cost Minimization and Customer Service Level Maximization

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Distribution is a key factor for a company's profit as it directly impacts the overall supply chain cost. Location Routing Problem (LRP) is a well-known concept to reduce facility location and vehicle costs. Currently, the time aspect has been considered a lot in LRP to bring better service levels for a company as it shows how responsive a supply chain is. In completing service level objective, time windows have been used to measure whether the delivery is successful in the planned time or not. Moreover, LRP research has been advised to take on a multiple-objective approach, which are not available much. Therefore developing and testing a model with multiple objectives such as cost and service level is at most important. The model for this specific problem is designed and tested using exact goal programming method for small-case instance, i.e. 4 distribution centers and 8 retailers. This research has brought modeling of multi-objective location routing problem with time windows to minimize the total cost and maximize the service level (MOLRPTW-SL). It gives a set of solutions for deciding the right distribution center, vehicles, and routes depending on the scenario considered. The trade-off between cost and service level is also provided.

Keywords: location routing problem, multi-objective, time windows, service level, goal programming

Wear Behaviors of Cp-Ti and UHMWPE Artificial Lumbar Disc Designed with Various Center of Radius

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The center of radius (CoR) of the lumbar spinal disc unit is usually thought to be below the center of the natural disc. The purpose of this research is to determine the appropriateness of CoR design toward wear rate, wear scars, and surface roughness of artificial lumbar disc model. The wear behaviors of a ball-on-socket (UHMWPE-on-Cp-Ti) artificial lumbar disc were studied under dynamic load (50-150 N) for 1 MC (million cycles). The wear test was done under lateral/bending, flexion/extension, and axial rotation motion for different CoR (7.5, 9, 11, and 13 mm). The wear rates and surface roughness were measured, while the wear scars were observed. The CoR affected the wear behaviors of the artificial lumbar disc. The wear rate of the Cp-Ti socket increases from 0.812 ± 0.076 to $2.524 \pm 0.119 \text{ mm}^3/\text{MC}$; on the other hand, the surface roughness decreases from 0.512 ± 0.039 to $0.329 \pm 0.048 \mu\text{m}$. Both changes happened along with the increase of CoR from 7.5 to 13 mm. The wear mechanisms of the Cp-Ti socket for different CoR were similar. The dominant wear mechanisms were plowing/scratching and abrasive wear. Hence, the CoR 11 mm is recommended to be applied for a lumbar disc implant.

Keywords: Wear rate, Center of radius, Surface roughness, Artificial lumbar disc, Titanium

Novelty Does Matter: SLM is a Convenient Way Finding a Research Originality

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A good research is a research with a clear research novelty of research originality. However, finding the novelty or originality is one of the most challenging process in research in any field. Although there are many proposed models to assist researchers and scholars to determine research novelty-such as Systematic Literature Review, K-Chart, Card System, Decision Tree, Mind Mapping- most of the tools or models fail to fulfill the need of some researcher to effectively present the complex result of literature review. To deal with this obstacle, a new tool named SLM (Systematic Literature Mapping) is proposed in this article in order to visually present the result of a complex literature review in the form of a decision tree that leads to an effective and efficient literature review process. The newly proposed model combines SLR (Systematic Literature Review), an established-well-known tool for literature review with a model named K-Chart. To verify the proposed model, a case study is discussed to accompany the example of the application of this new tool. The case study is finding the research opportunity of the application of big data in the industry. The result shows that SLM is capable to serve its purpose in the process of literature review.

Keywords: Research novelty, Systematic Literature Review, K-Chart, Big Data, Systematic Literature Mapping

Green Supply Chain Performance Improvement Through Green SCOR in an Indonesian Paper Mill

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The environmental challenges that become a global issue encourages companies to be wise in running their supply chain. One of the industries required to manage the supply chain by considering environmental aspects or called green supply chain management (GSCM) is a paper mill. In Indonesia, this industry has significant increased revenues, especially in the export sector. This research is done in an Indonesian paper mill. Previous research shows that GSCM measurements in paper companies are still very limited. The Green SCOR method is very relevant because it has complex and fit criteria for supply chain context by considering environmental aspects. In this study, researchers used the integrated Green SCOR and analytic hierarchy process (AHP). AHP is used for weighting so that the results obtained were more accurate. The results show that the paper mill is in the marginal category, with a value of 41,47. Then out of 31 KPIs there are 12 KPIs that categorized as red. The red KPI shows their performance is not satisfactory so it needs improvement. The improvement program covers five activities, i.e. supplier selection and negotiation procedures, alternative fuel, eco label, provide fly ash storage and perform preventive maintenance.

Keywords: GSCM, SCOR, AHP, SCM Performance, Paper Mill

Implementation of Simple Throttling for Liquid Rocket Engine ECX1000H2-4

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Liquid rocket engine commonly uses a throttling system to control thrust in various condition depending on its mission. In this study, a simple throttling system has been conducted to the liquid rocket engine ECX1000H2-4 using on-off valves in order to prevent an explosion at the beginning of ignition due to excessive accumulation of unburned propellants and to understand the affected phenomenon of the combustion process. The throttling system uses 2 valves for fuel flow and 2 valves for oxidizer flow and has been tested in the firing test. The test results show that the slight explosion in the starting process of combustion can be suppressed. However, at the first step of throttling, the combustion chugged at approximately 33 Hz, which is growing from low amplitude to higher amplitude ranged between 14 to 23 bar.

Keywords: Liquid rocket engine, Simple throttling, Firing test, Nitric Acid, Kerosene, Pressure fed system

Performance Analysis of Liquid Rocket Attitude and Trajectory Estimation

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This paper presents a design analysis of rocket RCX1H-1 developed by LAPAN. The analysis will be conducted to analyze its behavior, including trajectory estimation and flight attitude prediction. RCX1H-1 uses a liquid rocket engine for the propulsion system to generate thrust to accomplish trajectory mission. The engine uses kerosene and nitric acid as its fuel and oxidizer, delivered by pressurized helium gas. Estimation of rocket trajectory will be governed by an ordinary differential equation from Newton- Euler law in the form of 6 degrees of freedom on Matlab/Simulink software. Missile DATCOM is used to predict the rocket's attitude in longitudinal mode and lateral- directional mode by defining the rocket body configuration and set the flight condition where the rocket will be flown. The results show that RCX1H-1 has stable characteristics both in longitudinal and lateral-directional modes even though the rocket has struggled in roll motion for the angle of attack greater than 4 degrees.

Keywords: liquid rocket, attitude, trajectory, stability, longitudinal, lateral-directional.

Value Stream Mapping and Critical Path Method for Waste Reduction: a case study of transformer production

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The concept of lean manufacturing is widely used to conduct a regular improvement, particularly to reduce waste in the system. Value stream mapping (VSM) is a tool of Lean manufacturing methods to identify and reduce waste. It describes the production system and the processing time by mapping the business process. This research aims to examine the wastes that occur in the current processes of CSP 50kVA transformers on Production Line 1 using VSM. Another method in terms of project management, namely the Critical Path Method (CPM) is employed using Microsoft Project software. It is utilized for project management scheduling to determine critical activities, critical path, and project completion time. Both CPM and VSM are process analysis tools that CPM results support VSM related to continuous improvements in reducing wastes. Without wastes, the time and cost can be reduced as well as maintain the quality to the customer.

Keywords: critical path method, lean manufacturing, Microsoft project, value stream mapping

The Influence of Complexity on the Final Project Performance from Students' Perspectives

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The determination of the complexity of the final projects is useful for students who will perform their final project. Project complexity can impact project performance. Hindsight bias on the complexity evaluation of the final project may affect project performance. The complexity questionnaires were distributed before and after the respondents completed their final projects. The final project performance questionnaires were distributed after the respondents completed their final projects. This study analyzes the hindsight bias using Wilcoxon Sign Test. This study using Partial Least Square Structural Equation Modeling to analyze the effect of complexity on the final project performance. The results showed there was a hindsight bias on the complexity evaluation of the final project. According to students, the complexity after the students completed their final project is lower than when they were performing their final project. Subfactor on emotional complexity, the difficulty has a negative and significant effect on the final project performance.

Keywords: project complexity, project performance, the final project, hindsight bias, student perception

Numerical Study of Effect of Blade and Guide Vane Configuration on Performance of Savonius Wind Turbine (A Case Study on Irrigation Water Pump in Keponggok's Agricultural Land)

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Keponggok villages which are located in Purworejo Regency have a majority of its residents' work as a farmer. To keep their crop as hydrated as possible, water pumps become their main tool to meet the water needs throughout the year, especially in the dry season. This water pump is very effective in meeting their needs, but the use of a water pump will reduce farmers' income due to fuel and maintenance cost. An open wide agricultural land provides sufficient air transfer to allow for wind to build up where it can be used to drive a water pump. Therefore, it is necessary to design a wind turbine that can work at low speeds and has high torque characteristics such as VAWT. Savonius wind turbines are considered to be one of the best choices because it has high torque characteristics and self-starting ability at low wind speeds. But this wind turbine has a low efficiency, so the use of guide vane is expected to increase the efficiency of this wind turbine. CFD-based numerical analysis with Ansys software and CFX solver is used to determine the performance of wind turbines. Before conducting the analysis, the simulation method is validated first to find out the accuracy in the analysis. The analysis was carried out on Savonius 2, 3, and 4 blades wind turbines without and using guide vane which then the best configuration is chosen. The results are compared then the best configuration is chosen for driving the pump. The analysis shows that the best configuration is achieved on a 2 blades wind turbine with a 45 degrees guide vane. To pump water in a well with a depth of 20 m with a discharge of 500 liters per hour, 6 sets of wind turbines are needed.

Keywords: Numerical Analysis, Savonius Wind Turbine, Guide Vane, Turbine Power, Power Coefficient.

The classification of chili (*Capsicum annuum L.*) powder quality by using image processing and artificial neural networks

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The purpose of this study was to determine the relationship between the quality of chili powder with the color elements of the image and develop Artificial Neural Networks (ANN) architecture for the chili powder classification process. The chili (*Capsicum annuum L.*) powder samples were divided into three groups, namely 90 samples for training, 30 samples for validation, and 15 samples for testing. The images of chili powder were captured by using a webcam camera. Subsequently, the images were processed by using digital image processing to obtain the color and texture features for ANN input. The results showed that the elements of image colors used in the classification of chili powder quality were a, green, red, and hue had a very strong relationship. The ANN architecture used had three layers, namely the input layer comprised of 4 neurons (a, green, red, and hue), the hidden layer comprised of 8 neurons, and the output layer comprised of 2 neurons in the form of chili powder quality class with an accuracy of 93.33 %.

Keywords: artificial neural networks, chili powder, classification, image processing, quality

The Role of Industry Mastery in Achieving Internationalization Success: An Empirical Study on Information Technology Offshoring

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Globalization has changed many things of our life including the way we run our business such as the shift of sourcing strategy from insourcing to offshore outsourcing (offshoring) as a type of internationalization. One of the most offshore-outsourced sectors is information technology (IT) which a company in a country transfer some processes of IT function to other organizations abroad. The practice of IT offshoring keeps increasing along with the increase of interconnection among nations and the availability of skillful human resources in the developing countries. The success of IT offshoring depends on many factors, one of key success factors is the capability of vendor such as the capability of human resources management, interaction, technical. Although various capabilities have been studied previously, there is a capability that is still under studied namely industry mastery as a vendor's capability in mastering and applying client's domain business knowledge in the project. Therefore, the purpose of this study is to investigate the role of industry mastery in achieving the internationalization success, specifically IT offshoring success through the lens of innovation. A field survey by distributing questionnaires online and offline to Indonesian IT vendor was conducted over four months, yielding 78 valid responses. The empirical data were analyzed by using the partial least square-structural equation modeling (PLS-SEM) to examine the measurement and structural model. The results of analysis revealed that the industry mastery has a positive significant impact on innovation, and innovation influence significantly the success of internationalization. The practical implication from this study is that IT vendor should develop the capability of industry mastery and harness it through innovations in undertaking the client's project.

Keywords: internationalization success, innovation, industry mastery, IT vendor, offshoring

UNSUPERVISED AND SEMI-SUPERVISED CLUSTERING FOR INSIGHT TRACKING IN SOCIAL MEDIA ANALYTICS

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This study presents a formal decision-making alternative procedure for mining unstructured, non-formal, and noisy social media data on Twitter. The data were analyzed using text mining and clustering as the main approach based on unsupervised and semi-supervised. Also, a case study of the iPhone 8 product was used as an illustration in new product development. The use of supervised clustering as a control analysis was assumed to be the most appropriate for clear, convenient, and comprehensive insights but seems to be more complicated and requires an expert's services with more prolonged time for analysis. Therefore, this research aims to analyze an alternative method to replace the supervised role by developing an unsupervised and semi-supervised approach. The unsupervised clustering method provides several insights into making decisions related to business goals. However, there are some constraints in the form of models that possibly differ with supervised due to unclear insight, with the existence of less representative labels. This, therefore, led to the development of the semi-supervised method to control the possible differ from a supervised model.

Keywords: social media, data mining, clustering, unsupervised, semi-supervised, insight tracking, new product development

Gait Analysis of Stunting Children Compared to Healthy Children Using 2D Video Data

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Stunting is one of the most prevalent forms of child malnutrition with estimated 22.2% children in Indonesia suffered from it. Children with stunting have shorter body height compared with normal children and usually associated with various effects, including cognition, memory, and locomotor skills. As walking is one of the locomotor skills, it is important to evaluating stunting children by their style of walk which refers to a gait. In this present study, twelve normal children and six stunting children with 2 years of age were assessed during gait trials at self-selected speed. Fifty-four gait cycles from three gait trials for all children were selected. Joint angles and angular velocity were computed using 2D video analysis. Statistical analysis was performed to find significant difference on the kinematic parameters between two groups. Based on the current results, we concluded stunting children have similar kinematic gait characteristics with normal children. Future studies should involve kinetic and spatio-temporal parameters to understand clearly the gait character

Keywords: stunting, gait analysis, kinematic, joint angle, angular velocity

Quality Evaluation in Development of 3D Printed Chocolate Products

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Three Dimensional Printed (3DP) chocolate is one of the potential products in Indonesia, especially Yogyakarta, 3DP chocolate products are expected to be one of the choices in enjoying processed chocolate products, in order to increase the annual production of the chocolate industry in Yogyakarta and maximize the production of local cocoa in Yogyakarta, this is supported by the development of additive manufacturing (AM) technology especially 3D Printing which is growing rapidly in Indonesia. And one of the development sectors is the food sector, chocolate is one of the food products that has been produced and customized using 3D printing. In terms of commodities, cocoa production and cocoa land area as chocolate raw materials continue to increase in Yogyakarta, but in recent years there has been a decline in annual production from the chocolate industry in Yogyakarta. As a new product, this product must be able to adjust the quality to the needs of consumers. This study aims to analyze consumer needs and evaluate the quality of existing 3DP chocolate products. Research that conducted on 51 respondents using Quality Function Deployment (QFD), Sensory Analysis, and Analytics Hierarchy Process (AHP) methods found that consumer needs for 3DP chocolate products are about the detailed aspects of shape, texture, size, taste, aroma, construction resistance, and product color. This study also aims to evaluate consumer preferences for the technical parameters and the position of the existing products.

Keywords: Three Dimensional Printing, 3D Printed Chocolate, Quality Function Deployment (QFD), Sensory Analysis, Analytics Hierarchy Process (AHP), House of Quality (HOQ).

Development of Verification Scheme of the Safety Critical Element for Corrosion Protection in Piping Systems

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Loss of containment is one of most frequent causes for major accidents in the oil and gas industry. Corrosion in the piping systems is a major source of leakage. Corrosion protection is an important element that functions as a Safety Critical Element (SCE), an element that serves to prevent and reduce the impact of Major Accident Hazard (MAH). The sources of the MAH are firstly identified, then the SCE is determined to stop the failure. Subsequently, Performance Standards (PS) are developed to assess the performance of SCE using the criteria based on the code and applicable standards. Verification schemes ensure that the requirements in the PS are available. This paper provides a verification scheme for corrosion protection in piping systems. The scheme contains the PS criteria and the assurance task that serves to answer the needs of the PS, as well as the verification of activities providing the plan for the verifier in ensuring the accomplished assurance task. PS criteria cover the system functionality in SCE, reliability, and availability, sustainability, and system interaction. The verification schemes adopt the parameters that meet SCE objectives, namely life extensions and Asset Integrity Management Systems (AIMS).

Keywords: Corrosion protection, performance standards, piping systems, safety critical elements, verification schemes.

The Influence of Personality and Risk Attitude on the Accuracy of Project Duration Estimation

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A project is defined as a unique and temporary activity. It has risks that can cause project realization to deviate from the original objective. One of the causes of this risk arises due to the lack of historical project data in project planning so that it often uses subjective judgment. This study used an experiment consisting of 60 respondents in the experienced category and 60 respondents in the novice category. Before experimenting, the respondents were asked to fill in the Myers Briggs Type Indicator (MBTI) questionnaire about personality and the Holt Laury lottery to determine risk attitude. Results show that the accuracy of the estimated duration of the project is influenced by this type of respondents, while it is not influenced by personality type and risk attitude. Besides, the anchoring effect and the bandwagon effect were observed in the decision making process.

Keywords: decision making, personality type, risk attitude, anchoring effect, bandwagon effect

Value Analysis of Predictive Maintenance in Cooling System of a Die Casting Process by Data SCADA

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The cooling system is vital for the die casting process. The problematic cooling system will make the process of solidification uncontrolled. So that maintenance (especially predictive maintenance) is needed to keep the cooling system in good condition. However, the application of predictive maintenance requires complex resources. This research will simplify the predictive maintenance procedure on the cooling system in the casting process by reducing the number of sensors and calculations. This research uses SCADA technology and Machine Learning to keep getting accurate predictions. Based on the test results, the level of complexity of the proposed predictive maintenance system is more straightforward than before the value analysis was carried out, but has an accuracy level equivalent to before the value analysis applied.

Keywords: value analysis, predictive maintenance, SCADA, machine learning, cooling system

Determination of Attributes Leveling Through Online Customer Reviews Using Natural Language Processing

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Failure rate of technology Products of Start-ups on the Online Crowdfunding Platform is quite high. One of the parameters of the failure is project quality signals of attributes. The Start-ups and the Crowdfunding Platform synergize providing campaign stimulus of project quality signals to attract backers who will give funding to the start-ups. The aims of study is determination of attributes of project quality signals. This study uses online customer reviews as a research data set to plot within 7 project quality signals attributes using Natural Language Processing (NLP). The sentiment analysis was used to classify pro-con review, the features extraction was employed to get structured-words, and TF-IDF was applied to find similarity. It was then analysed to gain response values as representative of attribute levels. Results show that response values lay of in the ranges of 0.0586 to 0.9752. The highest values of 0.9752 was campaign duration and followed by campaign description, information of backers, information of funding, video, main picture and the last was graphic design. It concludes that levelling of 7 attributes based on customer reviews could be developed by NLP method. In this, the campaign duration was the most important attribute compared to other attributes.

Keywords: online customer reviews, crowdfunding, startup, product, project quality signal, natural language processing.

Study Of The Parametric Design Of Small Scale LNG Carriers Based On Hull Dimensions For The Optimum Load Capacity

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The difficulties of distributing natural gas in inland and shallow waters arise the design planning of small scale LNG carriers (SSLNG). The SSLNG has not been widely built in the world, the number of a ship operates is under a hundred unit in 2019, it because the design planning of SSLNG is still quite difficult to find the optimum design and minimal operational cost. Therefore, parametric design is an applicable method to get the optimum design in case of maximum load with the shallow draught condition. The purpose of this study is to determine the optimum dimensions SSLNG with three parametric cargo load conditions i.e. 2500 m³, 5000 m³, and 7500 m³. The determination of design criteria is based on the statistical data from existing SSLNG dimensions from all of the world. The result of optimum dimension from the analytical approach obtained the main dimension of SSLNG 2500 m³ are length overall 81.5 meters, beam 14.2 meters, and draught 4.8 meters. This optimum ship dimension is suitable for serving shallow water conditions.

Keywords: Small scale LNG, parametric design, ship design

Initial Study On The Increase Of Quay Cranes To Reduce Dwelling Time At The Container Terminal

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Currently, the container terminal is growing rapidly and is the entrance to world trade. Terminal productivity is one of the keys to superior service. One indicator of container terminal productivity is dwelling time. In developing countries, among the causes of high dwelling time is the lack of container handling equipment. This paper aims to study the effect of the number of quay cranes on the number of dwelling time. The investigation was carried out using a container terminal simulation. As a case study, a simulation of a container terminal with a berth length of 300 meters with average daily ship calls is 600 TEUs. The simulation is done by making the parameters of adding quay cranes to each case. The results of the simulation show the addition of a quay crane can reduce the number of dwelling time average by 0.1 days, this decrease depends on the container capacity of the ship. The results of this study provide an overview of the container terminal in port infrastructure planning.

Keywords: Container terminal, quay crane, dwelling time

Preliminary Research On The Effect Of The Number Of Truck Terminals On Yards Throughput At The Container Terminal

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Container terminal productivity becomes a benchmark in the level of effectiveness of a container port. One indicator of container terminal productivity level can be calculated through yard throughput. There are several factors that affect yard throughput, one of which is the number of truck terminals. The aim of this study is to investigate the effect of the number of truck terminals on yard throughput at the container terminal. The investigation was conducted using a container terminal simulation which is based on the discrete event simulation method. As a case study, a simulation of a container terminal with a dock length of 300 meters with a number of quay cranes was two units. The simulation is done by making parameters adding the number of truck terminals and variations in the capacity of ships coming. The results of the simulation show that the increase in the number of truck terminals affects the number of outputs, depending on the size of the loading and unloading vessels. From the simulation results obtained the largest yard throughput capacity of 809 containers with the number of truck terminals is 8 units on a shipload of 1000 twenty-foot equivalent units. The results of this study provide an overview of the needs of the truck terminal in the container terminal.

Keywords: Container terminal, yard throughput, terminal truks

The Differences of Green Manufacturing's Adoption by Small and Medium-sized Enterprises (SMEs) in Developed and Developing Countries: a Review

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Large enterprises have been considered to be the main cause of environmental problems globally, while the impact of small and medium-sized enterprises (SMEs) has usually been ignored. This paper provides a systematic review of green manufacturing (GM) in studies of SMEs, from developed and developing countries, adapted from Sandin and Peter's research. It makes a comparison of the research topics for developed and developing countries in the published work held by the Scopus database. The barriers and drivers of green manufacturing's adoption are also presented.

Keywords: green manufacturing, developed country, developing country.

Interpretive Structural Modeling (ISM) Approach to Identify Success Factors for Implementing A Kaizen Culture

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Many companies, especially manufacturing companies, have applied the Kaizen concept because it has a positive impact on the company. Kaizen means continuous improvement, including the notion of improvement that involves everyone, both managers and employees. However, some companies found obstacles in their implementation so that they were not implemented properly. There are already several literature studies that examine the successful application of Kaizen culture. Nevertheless, there are still a few who research further to make a structured model to find out the relationship between the success factors of applying the Kaizen culture. This study aims to determine key factors and model structurally between factors. Interpretive Structural Modeling (ISM) method that helps to know the model of the factors that exist. ISM analyzes system elements and solves them in graphical form from direct relationships between elements and the level of the hierarchy. The results of data processing are factors divided into thirteen levels and categorized into four sectors including autonomous, dependent, linkage, and independent. The key factors that influence the success of implementing the Kaizen culture are the situation and condition of the company, the choice of ideas in applying the Kaizen culture, and performance related to rewards and recognition.

Keywords: culture, kaizen, Interpretive Structural Modeling, continuous improvement, success factor

Cooperation Strategy Between Electric Suppliers Using Multi Echelon Economic Dispatch

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Multi Echelon Distribution has been widely used for the allocation of goods and people, but this model is not suitable for the allocation and distribution of electricity. In addition, the Economic Dispatch model that is often used for scheduling power plants does not consider optimization in transmission and distribution networks. Yet in these networks losses occur, where the longer the distance between the power plant and the customer, the greater the losses. Losses cause waste. For this reason, this study proposes a Multi Echelon Economic Dispatch (MED) model that has advantages in its ability to carry out combined optimization on the production and delivery sides. As a result, the MED model is able to schedule power plants and simultaneously deliver them to customers. Not only that, this model is also able to provide input to decision makers to choose electricity suppliers that are more profitable

Keywords: Multi Echelon Distribution, Transportation Problem, Economic Dispatch, Electricity, Supplier, Collaboration, Strategy



An aerial photograph of a multi-level highway interchange. The interchange features several curved ramps and straight sections, creating a complex network of roads. The surrounding area includes green grassy fields, some autumn-colored trees, and a few buildings, likely part of a university campus. The lighting suggests it's either early morning or late afternoon, casting long shadows.

REMOTE SENSING AND GEOMATICS SYMPOSIUM

Estimation Soil Erosion Using MUSLE Method and TRMM Data in Mongo Watershed, Purworejo

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The use of unbalanced land function with the ability and availability of land can increase land degradation from one of the erosion. This case in the Mongo Watershed which has a high level of soil criticism based on the data management plan of the Bogowonto 2018. This erosion can lead to decreased soil quality and loss of fertile soil, resulting in a direct impact on crop productivity. It can be minimized by doing erosion forecasts so that it can determine the appropriate mitigation. Estimate erosion by utilizing remote sensing technology and Geographic Information Systems (GIS) because the updates can be done quickly, covering a large and hard-to-reach area, and cheaper costs, so that it can be more effective and efficient. The modeling method used is the MUSLE method (Modified Universal Soil Equation). Modeling uses remote sensing data such as Sentinel 2A imagery, DEM ALOS PALSAR, and TRMM data. The use of TRMM data has improved the model through the addition of more accurate rainfall spatial information. The results of the erosion estimation in Mongo Watershed are dominated by very light and the overall erosion rate has a value from 0 to 221.483 tons/ha/yr.

Keywords: Erosion, MUSLE, TRMM, GIS, Remote Sensing

Cirrus Cloud Correction in Landsat 8 Image Using Combined Image-Based Approach and Various Classification Schemes

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The interaction of electromagnetic energy with the atmosphere causes the sensor to detect some of the elements found in the ozone layer such as ice crystals, dust, and clouds. Cirrus cloud in particular is often contaminating satellite imagery and yet relatively difficult to visually detect in visible spectrum. Indonesia as one of the tropical countries has highly cloud cover almost throughout the year. This condition causes land covers are contaminated by cirrus cloud which alters the digital numbers. The availability of cirrus band in Landsat 8 brings an advantage to eliminate cirrus clouds by performing cirrus cloud effect estimation and simple regression method. In this experiment, image-based cirrus correction was implemented in Landsat-8 over Palangkaraya city with high cirrus contamination. Cirrus cloud effect is estimated by using simple linear regression method involving samples or training area over homogeneous area cirrus contamination. Homogeneous areas were defined based on visual interpretation and statistical calculation. After estimating cirrus cloud effect on the pixel, cirrus cloud correction was performed by using arithmetic operations on images based on the slope regression coefficient which corresponded with the highest coefficient of determination. The quality of the corrected image was also statistically evaluated using reference image without cirrus contamination. Not only was the digital number evaluated but also Normalized Vegetation Index (NDVI) was compared in order to estimate the implication of cirrus correction in further image analysis.

Keywords: cirrus cloud correction, Landsat 8, image-based approach, various classification schemes

Evaluating Multi-sensor Combination of Normalized Difference Vegetation Index (NDVI) Time Series Data over Southeast Asia

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Normalized Difference Vegetation Index (NDVI) data is the most commonly used vegetation proxy from remote sensing data to model the vegetation biophysical properties. The longest time-series data of NDVI from the earlier era of remote sensing satellites is available from AVHRR GIMMS employing the red and near-infrared bands in NOAA sensors from 1981 to 2015 in 8-km spatial resolution in the monthly interval. This study aims to evaluate the compatibility of NDVI data from the newer sensors such as MODIS Terra (MOD13C2), Proba-V and Visible Infrared Imaging Radiometer Suite (VIIRS) data when combined with GIMMS data. Calibration between two time-series data from different sensors was constructed by using image-matching Pseudo Invariant Features (PIF) method and the fitness levels using all pixels and at different land-cover classes were assessed. In addition, structural change analysis was conducted to identify the sensor-shift problems at the best data combination. Our results suggested the best fit of GIMMS when being paired with VIIRS data with the R of 0.91 (n = 3132) and 0.89 (n = 1044) for model and validation analysis. Although the fitness level from the linear regression showed a good fit, an artifact as a result of sensor-shift problems still can be detected from structural change analysis, revealing the imperfection of linear calibration method. Future works should aim to explore the performance of non-linear methods to calibrate the different time-series data and explore the combination with other sensors.

Keywords: Image matching, Pseudo-Invariant Features, Structural Change, GIMMS, MODIS, PROBA-V, VIIRS

Comparison of Supervised Algorithms for Built-up Classification in Indonesia Metropolitan

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Built-up area are covering less than one percent but are estimated grow rapidly due to human population and economy activities. The built-up area information is crucial for measuring achievement of Sustainable Development Goals (SDGs) number 11 in making sustainable cities. Supervised machine learning from public satellite imagery, such as Landsat 8 and VIIRS-DNB, is one of method to achieve that information. In this paper, comparison of supervised algorithms is conducted to measure the performance and the ability to classify the builtup class and non built-up. Algorithms used here are Support Vector Machine (SVM), Random Forest, and Extreme Gradient Boosting (XGBoost). The research focused on distinguish buildup area in six metropolitan area of Indonesia. Parameter tuning are conducted to get the best model of every algorithm in each area. Using Area Under Receiver Operating Characteristic (AUROC) as comparison indicator, GBoost outperformed other algorithms in five metropolitan areas. Using best model in each area, built-up area classification was conducted in 2014 and mostly built-up area was shown accumulated in center. Then, built-up transformation was measured from 2015 to 2019 and found that Jabodetabek and Kedungsepur experienced the larger built-up area transformation compared the others.

Keywords— built-up area, satellite imagery, supervised algorithm, XGBoost, Indonesia metropolitan area

Identification of Reef Characteristics Using Remote Sensing Technology in Ayau Islands, Indonesia

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The Ayau Islands, located in the Pacific Ocean in Indonesia, has an extensive reef formation. However, information about the characteristics of shallow water, including coral reef and seagrass distribution, is measly in those islands. The aim of this study is to provide the lack of information by utilizing remote sensing technology and field data that was collected by Research Center for Oceanography (RCO-LIPI) through Nusa Manggala Expedition. This study uses Landsat 8 OLI as primary data besides measured field data and Ocean Color data which provide Sea Surface Temperature information. All the data used are processed using image processing and Geographic Information System techniques to obtain the result that reveals the Ayau Islands has 32,347.08 hectares of a shallow areas. The area is dominated by the MIX class due to the long tide time in a reef flat zone and occurs almost throughout the day. The coral reef cover spreads in the deeper and cooler areas while the seagrass cover grows along the coastline, which is nutrient-rich. Moreover, most of the shallow areas are not suitable for the maximum growth of coral reefs in general, which is 78.28% and 21.72% remaining requires protection mainly from anthropogenic factors.

Keywords— benthic habitat, water depth index, sea surface temperature, Landsat 8, Ayau Islands

Seabed Classification Using Multibeam Echosounder Measurement Data

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Multibeam Echosounder (MBES) utilizes acoustic waves emitted to the seafloor through a transmitter or transducer and records its reflective. The information obtained by MBES are depth data and the scattering value of the acoustic signal reflected by the object or the seabed, called backscatter. Acoustic backscatter can be used to classify objects or the seabed such as shipwrecks or seabed sediments. This study focuses on seabed classification using an acoustic backscatter obtained from the measurement at Alur Pelayaran Barat Surabaya (APBS). The data used in this research are acoustic backscatter from bathymetry data extraction and ground truth

data of sediments. This study found the fine sand sediments with backscatter value -15.56 dB, and clayey silt sediments with backscatter value -24.36 dB. The correlations between backscatter and seabed sediments in study area were classified into four classes, clay class sediments with backscatter intensity range [(-33.81) – (-28)] dB, clayey silt class sediments with backscatter intensity range [(-27.99) – (-23)] dB, sandy silt backscatter intensity range [(-22.9) – (-18)] dB, and sand class sediments with backscatter intensity range [(-17.99) – (-10)] dB.

Based on the results data are known in the study area of seabed conditions dominated by sediments type sandy silt.

Keywords: Multibeam Echosounder, Seabed Classification, Backscatter, Bathymetry, APBS

Application Of Remote Sensing Technology And GIS For Extraction Of Groundwater Potential Zone Parameters In Gesing Watershed, Purworejo

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The increase in the number of residents and the long dry season is the cause of the increasing need for clean water in several areas in the Purworejo regency, one of which is the Gesing river basin area. Therefore, information is needed related to the potential of groundwater in the Gesing watershed, Purworejo district. This study has three objectives, namely: assessing the ability of remote sensing imagery (Sentinel 2A and TerraSAR-X) in extracting land parameters

that affect groundwater potential, mapping groundwater potential zones using remote sensing data with geographic information systems in the Gesing watershed, and evaluating the results mapping groundwater potential zones to determine the most influential parameters on groundwater availability in the Gesing sub-watershed Purworejo district. The accuracy of the interpretation results is done by using the confusion matrix method. Spatial modeling uses a quantitative approach weighted with weighted parameters. The weight of each physic parameter is obtained from the Analytical Hierarchy Process (AHP) method. The results showed the accuracy of interpretation of lithology and land use respectively by 93% and 87%. The results of the mapping show that there are 4 classifications of groundwater potential in the Gesing sub-watershed, namely less, medium, good, and very good has and accuracy Of 87%. The parameter which greatly influences groundwater potential in the Gesing sub-watershed with a weight value of 0.49 is the aquifer characteristic. While the parameter that has the least effect is drainage density which has a weight value of 0.05.

Keywords: Remote Sensing, Geography information system (GIS), Sentinel 2A, Analytical Hierarchy Process (AHP), Groundwater Potential Zone.

Estimation of Mangrove Fractional Canopy Cover using Sentinel-2A Imagery

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Monitoring the condition of mangrove forests is very important to support effective management and protect from forests degradation. One important biophysical aspect for assessing mangrove degradation is the fractional canopy cover (Fcover), which shows the percentage of the canopy cover over a specified ground area. The location of this research is Bedul Mangrove which is an ecotourism area located in Alas Purwo National Park, East Java, Indonesia. The aim of this study is to estimate and map the mangrove Fcover in the Bedul ecotourism area using Sentinel-2A imagery. A field survey was carried out to measure in-situ mangrove forest canopy using a hemispherical camera. Semi-empirical approach was used for

Fcover modeling of Sentinel-2A image. A Soil Adjusted Vegetation Index (SAVI) image was used as a proxy for Fcover modelling from Sentinel-2A. Statistical analysis of correlation and regression was performed to determine the strength, shape, and direction of the relationship between the pairs of Fcover field values and the SAVI pixel values. The modeling result shows that the Fcover ranges from 0 to 0.91 (n: 24). Mangrove canopy cover in this location is dominated by dense canopy cover classes which indicate that the mangrove forest is in good condition.

Keywords: Mangrove, Fcover, Sentinel-2A, SAVI, Bedul

Estimation of Fractional Canopy Cover of Bedul Mangrove Forest Using PlanetScope Imagery

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The existence of mangrove forests has various roles for coastal ecosystems in terms of physical, biological, and chemical functions. Mangrove forests also play an important role in balancing environmental quality, neutralizing pollutants, and carbon sink in coastal environment. This study aims to (1) estimate the fractional canopy cover (Fcover) of mangroves using a semi-empirical approach utilizing PlanetScope imagery and (2) determine the accuracy of PlanetScope imagery in modeling mangrove Fcover. Field mangrove Fcover was acquired by hemispherical photography technique and calculated using CAN-EYE software. The canopy cover model was built by determining relationship between field Fcover values and PlanetScope pixel values at corresponding locations. The Normalized Difference Vegetation Index (NDVI) was used as proxy for developing the model. The results of field measurement show that mangrove Fcover in Bedul area, East Java Province, Indonesia has a value range of 1 to 66% ($n = 24$). The estimated canopy cover obtained from PlanetScope is dominated by a range of 44 to 85%. While the accuracy value obtained is moderate with a maximum accuracy value of 48.77%.

Keywords: Mangroves, Hemispherical Photograph, PlanetScope, NDVI, Fractional Canopy Cover.

Hybrid Remote Sensing for Estimating Timber Production and Carbon in Tropical Rainforest

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Sustainable timber production and global climate change mitigation become important issues in tropical rainforests management around the world, including Indonesia. In this case, the existence of a tropical rainforest is not only directed to stabilize wood supply but also reduce carbon emission in the atmosphere. Estimation of timber production and carbon storage in a tropical rainforest using field inventory requires long-time consuming and high cost. Therefore, an alternative method is proposed to support a more efficient forestry inventory. This study aims to evaluate the potential of remote sensing for facilitating the implementation of forest inventory in a tropical rainforest area. A hybrid approach of remote sensing using two different images resolution, i.e. medium and high was developed to estimate timber production and carbon storage with three predictor variables, namely canopy closure (C), crown diameter (D), and tree density (N). Then, a computational model was constructed from database management systems using a case-based reasoning approach. Results demonstrated that using remote sensing for tropical rainforest inventory provided a good accuracy to estimate timber production and carbon storage with Normalized Root Mean Square Error (NRMSE) around 18%. This study recorded the mean timber production in the study area was 79.91 m³ ha⁻¹ with average carbon storage by approximately 14.33 Mg ha⁻¹. Reviewed from these findings, there was an opportunity to use a hybrid approach of remote sensing for supporting forest inventory in the tropical rainforest.

Keywords: Forest Inventory, Canopy Closure, Crown Diameter, Tree Density, Case-based Reasoning

Susceptibility Distribution Analysis of Tsunami Using Spatial Multi-Criteria Evaluation (SMCE) Method in Parangtritis, Indonesia

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The coastal area of Parangtritis is one of the areas in Indonesia which is potentially exposed to tsunami hazards. Tsunami is a secondary hazard generated from various events before their occurrences, such as volcanic eruptions, earthquakes, landslides, and extra-terrestrial objects, that disrupting the seawater column. This research aims to estimate tsunami susceptibility using Spatial Multi-Criteria Evaluation (SMCE) method in Parangtritis, Yogyakarta, Indonesia. Physical factors such as elevation, slope, distance from the riverbank, distance from the shoreline, landform, and land cover were collected from several sources and were combined to determine the distribution of tsunami susceptible areas. The result shows susceptibility index classes vary from the lowest to the highest level. The area with the lowest susceptibility level is located in Baturagung Hill. Meanwhile, the area near the shoreline and the riverbank has a relatively high level of susceptibility. The sand dunes landform which has been relied on to decrease the susceptibility level is covered by various levels of susceptibility from the very low to high. This susceptibility distribution analysis can be used for disaster mitigation and planning purposes.

Keywords: GIS, Susceptibility, Tsunami, SMCE, Mitigation

Built-up Area Monitoring Using Cloud Computing-Based on Remotely Sensed Imagery in Samarinda City, Indonesia

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Samarinda City is noted to have a population rate that increases with the passage of time. Population growth is in line with increasing human activity in an area, relating to economy, social, culture and political activity that impact the growing number of built-up area in Samarinda City. The study aims to determine the direction of built-up areas expansion in Samarinda and estimate the increase of built-up area as the main parameter in urban sprawl monitoring. The methods used in this research are the integration of remote sensing techniques and cloud computing in

Google Earth Engine and image statistical analysis using Buffer Boundary Analysis The results showed the city of Samarinda has a rapidly growing built-up area from year 2002 to year 2019 with an estimated increase of 19.25% or an area of 13,818.65 Ha with the direction of expansion of built-up areas likely to lead northeast and southeast as the highlights of infrastructure development such as international airport and toll road covering Samarinda Utara subdistrict, Sungai Pinang subdistrict and Palaran subdistrict. The accuracy of Distribution of Built-up Area map year 2002 and year 2019 reaches 91.28% with kappa coefficient by 0.7253 and 98.95% with kappa coefficient by 0.966.

Keywords: Remote Sensing, Built-up Area, Cloud Computing, Spatial Analysis, Geographic Information System

Modification of Temperature Vegetation Dryness Index (TVDI) Method for Detecting Drought with Multi-Scale Image

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The objective of this research is to assess the accuracy of Temperature Vegetation Dryness Index (TVDI) methods applied to Principal Component Analysis (PCA) and multi-scale images. The TVDI method will revamp with PCA in vegetation and surface temperature variables. Each variable has three algorithms, which are VCI, NDWI, and SAVI, for vegetation, and TCI, CWSI, and LST for surface temperature. The band input used was the PC1 resulted from PCA in each variable. The regression relationship between vegetation and surface temperature with PCA shows an average value of 0.99. The results of the PCA increased drought area throughout the research area and showed a negative relationship on the TVDI concept. Validation uses TRMM data for MODIS images and field surveys for Landsat imagery. Landsat showed an accuracy value of 75% and influenced by climate change. Besides, multi-scale imaging proves very useful in monitoring and mapping droughts.

Keywords: Temperature Vegetation Dryness Index (TVDI), Principal Component Analysis (PCA), MODIS, Landsat, Drought

Estimation of Slip Rate and the Opak Fault Geometry Based on GNSS Measurement

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GNSS observations are usually used in periodic deformation monitoring. The Opak fault, which was in the Special Region of Yogyakarta, became a concern after the 2006 earthquake. The horizontal velocity values of each observation station are needed to estimate the slip rate and locking depth values of the Opak fault. The magnitude of the velocity vector is computed by the linear least square method, then translated into the Sunda Block reference frame. The creep of fault assumption is used in analyzing the potential for the earthquake in the Opak fault region. The velocity is done by reducing the Sunda Block using the Euler pole method, and it produces a velocity vector value on the east component is -6.08 to 5.25 mm/year while the north component is -3.38 to 5.74 mm/year. Meanwhile, in the northern segment of the Opak fault, the estimated slip rate is around 3.5 to 10.5 mm/year, with the locking depth obtained of 1.1 to 8 km, while in the southern segment of the Opak fault, the estimated slip rate is 4 to 5.5 mm/year, with a locking depth obtained of 0.6 to 1.2 km. The creep of the fault effect is predominantly in the southern segment of the Opak fault. This case indicates that the potential for earthquake hazards is smaller in the south segment than in the north segment.

Keywords: Deformation, GNSS, Grid Search, Slip Rate, Locking Depth

Estimation of Strain Rate in the Opak Fault with Postseismic Correction After the 2006 Yogyakarta Earthquake

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The 2006 Yogyakarta earthquake was indicated as a result of the Opak fault which is still active today. Global Navigation Satellite System (GNSS) measurements as soon as possible after an earthquake are very important because it is an early indication of postseismic deformation. The characteristics of postseismic deformation can be modeled by logarithmic equations with the assumption that the deformations that occur due to the influence of afterslip. In this study, fifteen periodic GNSS data provided by Geodetic Laboratory Universitas Gadjah Mada (UGM) and four continuous GNSS data provided by Geospatial Information Agency of Indonesia (BIG) were used to determine the velocity and strain rate around the Opak fault. The result showed that the Yogyakarta region especially in the Opak fault area has been deformed with the varying horizontal velocity rate. The stations move to the southeast direction as an effect of the movement of the Eurasian and Indo-Australian plates. Based on the computation of the principal strain using modified least square method, strain rate value in the Opak fault area are less than 1 micro strain/yr with extensional strain is dominated. Some stations especially on continuous stations have decreased of strain values and their standard deviation after corrected by postseismic parameters in logarithmic functions. It shows that to capture the postseismic deformation would be better to use continuous data.

Keywords: Opak Fault, GNSS, Postseismic Deformation, Logarithmic Function, Strain Rate

Spatio-Temporal Analysis of Post-Disaster Built-up Expansion in Banda Aceh City, Indonesia

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The 2004 tsunami destroyed most of the built-up areas in the city of Banda Aceh, Indonesia. The physical development recoveries were immediately taken place to restore urban function. This study aims to identify spatio-temporal patterns of built-up expansion in the city of Banda Aceh during the recovery (2005–2009) and post-recovery period (2009–2019). Urban land cover was classified from Landsat imagery using the supervised classification method with maximum likelihood. The results indicate that the built-up area has increased from 1426 ha in 2005 to 3321 ha in 2019. The intensity of growth in the initial period was high, while the intensity in the following period has decreased significantly. Urban recovery had contributed greatly to the built-up expansion in a relatively short period of time. This study also proved the difference in the direction of expansion at the micro-scale (sub-district level) in the two periods.

Keywords: Urban expansion, Spatio-temporal Pattern, Landsat, Reconstruction, Banda Aceh

Gravity Disturbance Derived from Airborne Gravity and Its Geodynamics Interpretation of Sulawesi Island

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Airborne gravity technique is more effective for geodetic and geophysical purposes especially over large and varied areas. However, the use of airborne gravity of Sulawesi Island has not been optimal, including the use of gravity disturbance data components compared to gravity anomaly data that is more commonly used. In this research, mapping of gravity disturbance is done based on airborne gravity data and subsequently is applied for interpretation of the geodynamics of Sulawesi Island region. Gravity disturbance value is obtained through the conversion of free-air anomaly. The results showed that the gravity disturbance of Sulawesi Island ranged from -206.10 to 352.58 mGal with a pattern similar to the free-air anomaly and two global models (EGM2008 and EIGEN-6C4). The difference with EGM2008 and EIGEN-6C4 is an average of -3.77 and -3.43 mGal with a standard deviation of ± 26.59 and ± 26.21 mGal. The large difference is probably due to a data gap and topographic area of the mountains. Map of gravity disturbance can also be used for the initial interpretation of active faults such as Palu Koro and Matano which show a significant color deviation from the representation of significant differences in subsurface geological structures.

Keywords: Sulawesi Island, Airborne Gravity, Gravity Disturbance, Geophysics, Geodynamics

Integrating GIS and ABM for overland flow model in Central Celebes, Indonesia

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Overland flows have been worldwide known as an agent of erosion and its spatial distribution has become an object of Terrain Analysis in geographical studies. They would generate debris flows in mountainous areas and lahars in volcanic areas which provoke casualties, economic damage and environmental disturbance as well. The objective of this research is to identify the spatial distribution of river response to excessive overland flow on a confined channel. This study

was conducted in northwestern part of Katopasa Mountain in Central Celebes, Indonesia. A massive debris flow had been initiated along the unvegetated area near the summit (2427 m asl), shut down the national route 20 km downstream before hitting the shoreline next to it. Geographic Information System (GIS) and Agent Based Model (ABM) was integrated in order to develop overland flow model. The result showed that raindrops which acted as agent were moving downslope indicating overland flow mechanism within the catchment area. This flow was spatially directed by local slope orientation into a deep confined channel. The accumulation of agents in this channel formed an increased river discharge and flooding area at the outlet of the catchment. This finding would be useful for supporting mitigation strategies.

Keywords— GIS, ABM, overland flow, Celebes, Indonesia

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Field of Interest

- Solar Fuels

Education and Profil

Fatwa Abdi is a group leader and the deputy head of the Institute for Solar Fuels, Helmholtz-Zentrum Berlin (HZB). He obtained his undergraduate degree in 2005 from Nanyang Technological University and master's degree in 2006 from National University of Singapore and Massachusetts Institute of Technology, all in Materials Science and Engineering. After a short stint in the semiconductor industry, he pursued a PhD at TU Delft, the Netherlands, and graduated cum laude in 2013. He was the recipient of Singapore-MIT Alliance fellowship (2005) and Martinus van Marum prize (2014) from the Royal Dutch Society of Sciences and Humanities.



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Field of Interest

- Renewable solar energy
- Electrochemical glycerol partial oxidation for hydrogen production
- Carbon dots applications in photocatalysis and electrocatalysis

Education

- 2015 BA Composite Material Science and Engineering, Donghua University, Shanghai, China
- 2019 Visiting Researcher Chemical Engineering, Imperial College London, London, United Kingdom
- 2019 PhD Materials Science, Queen Mary University of London, London, United Kingdom

Research Projects

- Luo, H et al. Pt Single-atoms Supported on Nitrogen-doped Carbon Dots for Highly Efficient Photocatalytic Hydrogen Generation, *J. Mater. Chem. A*, 2020, 8, 14690014696.
- Hui Luo et al. Nitrogen-doped Carbon Dots/TiO₂ Nanoparticle Composites for Photoelectrochemical Water Oxidation, *ACS. Appl. Nano Mater.*, 2020, 3, 3371-3381.
- Hui Luo et al. Carbon Dots in Solar to Hydrogen Conversion, *Trends in Chemistry*, 2020, 2, 623-637.
- Luo, H et al. Manipulating the optical properties of carbon dots via fine tuning their structural features, *ChemSusChem*. 2019, 12, 4432 - 4441.
- James King, Linda Zhang, Szymon Doszczeczko, Olga Sambalova, Hui Luo, et al. How to Functionalise Metal-organic Frameworks to Enable Guest Nanocluster Embedment, *J. Mat. Chem. A*, 2020, DOI:10.1039/C9TA12837A.
- Xiong Wei, Harshit Porwal, Hui Luo, et al. Photocatalytic Activity of 2D Nanosheets of Ferroelectric Dion-Jacobson Compounds, *J. Mat. Chem. A*, 2020, 8, 6564.
- Zhang, D.-W.; Papaioannou, N.; David, N. M.; Luo, H. et al. Photoelectrochemical Response of Carbon Dots (CDs) Derived from Chitosan and Their Use in Electrochemical Imaging. *Mater. Horizons* 2018, 5, 423-428.
- Wang, Y.; Luo, H.; Li, G.; Jiang, J. Highly Active Platinum Electrocatalyst towards Oxygen Reduction Reaction in Renewable Energy Generations of Proton Exchange Membrane Fuel Cells. *Appl. Energy* 2016, 173, 59-66.



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Field of Interest

- Chemistry and Applied Chemistry

Education

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1992 Kyushu University, Graduate school of Engineering, Department of Chemistry and Biochemistry (Master course of Engineering)
1999 Kyushu University, Graduate school of Engineering, Department of Chemistry and Biochemistry (Doctor of Engineering)

Research Projects

- Y. S. Kurniawan, R. R. Sathuluri, K. Ohto, Droplet Microfluidic Device for Rapid and Efficient Metals Separation Using Host-Guest Chemistry, *Advances in Microfluidic Technologies for Energy and Environmental Applications*, 1-19 (2020. 5).
- K. Ohto, N. Fuchiwaki, T. Yoshihara, A. B. Chetry, S. Morisada, H. Kawakita, Extraction of scandium and other rare earth elements with a tricarboxylic acid derivative of tripodal pseudocalix[3]arene prepared from a new phenolic tripodal framework, *Sep. Purif. Technol.*, 226, 259 - 266 (2019).
- K. Ohto, M. Yamamoto, S. Morisada, H. Kawakita, Extremely high extraction ability of bisphosphonic acid type extraction reagent to a series of rare earth metal ions, *J. Incl. Phenom. Macrocycl. Chem.*, 76 (3,4), 241-248 (2019).
- K. Ohto, Research on Various Structural Effects of Calix[4]arene Derivatives on Extractive Separation Behavior of Metal Ions, *J. Ion Exch.*, 30(2), 17-28 (2019). (in Jpn.)
- Yoga Priastomo, S. Morisada, H. Kawakita, K. Ohto, Jumina, Synthesis of macrocyclic polyphenol resin by methylene crosslinked calix[4]arene (MC-[4]H) for the adsorption of palladium and platinum ions, *New J. Chem.*, 43, 8015-8023 (2019).
- Y. S. Kurniawan, M. Ryu, R. R. Sathuluri, W. Iwasaki, S. Morisada, H. Kawakita, K. Ohto, M. Maeki, M. Miyazaki, Jumina, Separation of Pb(II) Ion with Tetraacetic Acid Derivative of Calix[4]arene by using Droplet-based Microreactor System, *Indones. J. Chem.*, 19(2), 368-375 (2019).
- Y. S. Kurniawan, R. R. Sathuluri, K. Ohto, W. Iwasaki, H. Kawakita, S. Morisada, M. Miyazaki, Jumina, A rapid and efficient lithium-ion recovery from seawater with tripropylmonoacetic acid calix[4]arene derivative employing droplet-based microreactor system, *Sep. Purif. Technol.*, 211, 925-934 (2019).



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Field of Interest

- Algorithms, Data Mining and Artificial Neural Network

Education and Profil

Pitoyo Hartono was born in 1969 in Surabaya. He received the B. Eng., M. Eng., and Dr. Eng., from the Department of Pure and Applied Physics, Waseda University, Tokyo, in 1993, 1995 and 2002, respectively. He was a Software Engineer with Hitachi Ltd., from 1995 to 1998. From 2001 to 2005, he was a Research Associate and followed by a Visiting Lecturer with Advanced Research Institute for Science and Engineering, Waseda University. From 2005 to 2010 He was an Associate Professor with Future University Hakodate, in Hakodate City. Since 2010 he has been a full professor with the School of Engineering, Chukyo University in Nagoya, Japan.



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Field of Interest

- Microwave Remote Sensing
- Synthetic Aperture Radar

Education

- 1995 Department of Electrical and Computer Engineering, Kanazawa University, Japan (Bachelor of Engineering - B.Eng) Thesis title: Development of low frequency high current depth subsurface radar
- 1997 Graduate School of Electrical and Computer Engineering, Kanazawa University, Japan (Master of Engineering - M.Eng) Thesis title: Development of subsurface radar system
- 2002 Center for Environmental Remote Sensing, Graduate School of Science and Technology, Chiba University, Japan (Doctor of Philosophy - Ph.D) Thesis title: Tropical forest monitoring using Synthetic Aperture Radar (SAR) - Theories and applications

Publication

- Hisato Kashihara, Josaphat Tetuko Sri Sumantyo, and Cahya Edi Santosa, "Broadband X Band Patch Antenna for Circularly Polarized Synthetic Aperture Radar onboard UAV," EL-08.1, The 9th Indonesia Japan Joint Scientific Symposium (IJSS 2019), Bali, Indonesia, 14 November 2019
- Noboru Hamaguchi, Kazuteru Namba, and Josaphat Tetuko Sri Sumantyo, "CP-SAR Image Processing System using TCP/IP with Kintex-7 FPGA Board," EL-05, The 9th Indonesia Japan Joint Scientific Symposium (IJSS 2019), Bali, Indonesia, 14 November 2019.
- Husnul Kausarian, Susilo, A Suryadi, Batara, Josaphat Tetuko Sri Sumantyo, "A GIS Analysis for Flood Problem in the Big City : A Case Study in Pekanbaru, Riau Province, Indonesia," ES-33, The 9th Indonesia Japan Joint Scientific Symposium (IJSS 2019), Bali, Indonesia, 14 November 2019
- Akira Kato, Hiroyuki Wakabayashi, Manabu Watanabe, and Josaphat Tetuko Sri Sumantyo, "Radarscape – How Our Landscape is Described by Radar," O4, The 2nd Seminar on Microwave Remote Sensing (SeMIRE 2020), Chiba University, 21 February 2020.
- Joko Widodo, Daniele Perissin, and Josaphat Tetuko Sri Sumantyo, "DInSAR Method and Ground Water Table Stations Contrast for Detection of Combustible Peat Areas," O5, The 2nd Seminar on Microwave Remote Sensing (SeMIRE 2020), Chiba University, 21 February 2020



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Field of Interest

- Functional polymeric materials
- Inorganic adsorbents
- Membrane separation processes

Education and Profil

Nalan KABAY is a Professor in the Chemical Engineering Department, Faculty of Engineering, Ege University, Turkey and has been working at Ege University, Turkey since 1984. She graduated from Ege University and received her PhD from Kumamoto University, Japan in 1992 through a Monbusho Scholarship. She worked as a post-doc at National Institute for Research in Inorganic Materials, Japan between 1998 and 1999 by a grant of STA-Japan. She visited Loughborough University and Imperial College-London, UK several times through the grants of the Royal Society, EPSRC and British Council between 1996 and 2008. She was Vice-Dean of the Engineering Faculty of Ege University between 2003 and 2009, a member of the steering committee of the Engineering Research Group at Turkish Scientific and Technical Research Council (TUBITAK) between 2004 and 2007. Professor Kabay has around 150 SCI papers, several book chapters and has acted as guest editor of several special issues of international journals such as Reactive and Functional Polymers, Solvent Extraction and Ion Exchange, Desalination, Water Research. She is the co-editor of three books. She is a member of editorial boards for 4 international journals and an honorary member of Japan Ion Exchange Society. Professor Kabay was involved in many international and national research projects and invited to give lectures and conferences at leading institutions of different countries. She has collaborated with many distinguished scientists from various countries and worked for the organizations of several international conferences and workshops. She has received the TUBITAK-Science Promotion Award in engineering field (2001), Canon Foundation in Europe Award (2001), Ion Exchange Award of Society of Chemical Industry, UK (2012). So far, she has supervised more than 50 graduate students for their PhD and MS theses. Her main interests are membrane separation processes, ion exchange, functional polymeric materials, inorganic adsorbents, solvent impregnated resins, separation and recovery of boron and lithium, desalination, wastewater reclamation and reuse, energy production from biomass (biogas and biodiesel).

Presentation Guidelines

Session structure

- 10 minutes before the session: the host will start the designated room.
- 1 minute before the session: the session chair introduces the session.
- Beginning of the session: the session chair will check attendance and introduce the presenter.
- The talk will be presented using the pre-recorded video submitted by the presenter followed by a live Q&A session:
 - Pre-recorded video presentation: up to 15 minutes
 - Live Q&A session: 2 minutes
- End of the session: the session chair will conclude the session.

Scenario for symposia sessions

#	Time	Agenda	Session chair	Presenter
1	5 minutes before session	Preparation	Join the zoom webinar	Be ready in zoom webinar room
2	Beginning of the session (1 minutes)		Camera & mic on	
3	2 minutes	Session introduction	Check attendance all the presenters, Introduce the session structure Read the presentation schedule	Can ask a questions by typing during the video playback (as attendee)

#	Time	Agenda	Session chair	Presenter
4	1 minutes	Presenter introduction	Introduce the title and presenter of the 1 st paper Ask the host to play the video	Attend as a panelist
5	Up to 15 minutes	Presentation	Camera & mic off Observe the Q&A panel from the audiences	Camera & mic off Observe video Observe the Q&A panel from the audience
6	2 minutes	Q&A	Camera & mic on Read up to two questions from Q&A	Camera & mic on Answer the question from the session chair
7	<i>Repeat step 4 to 6 for all other presenters</i>			
8	2 minutes	Closing	Close the session Ask for photo session	Camera & mic on Pose for photo session
9	1 minutes	End of the session		

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POLICE
110



AMBULANCE
118 OR 119



FIRE
113



SEARCH AND RESCUE
115



MOBILE AND SATELLITE PHONE
112



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