Book of Abstact

ICICI 2022

International Conference on Instrumentation, Communication, and Information Technology

Preface

The International Conference on Instrumentation, Communication, and Information Technology will be held on 27-28 October 2022, Bandung. The conference will highlight recent and significant advances in research and development in the field of theory and design, system and applications. signal processing and communication, biomedical engineering, and industry 4.0. It will cover all aspects of theory and practice.

This year, we are holding our major annual event in a hybrid format, with less audience physically in the room. But this year, I am speaking to you in a much more positive context, both in terms of the public health situation and the economic outlook.

We can look to the future with cautious optimism, buoyed by progress in vaccinations and recent economic and earnings forecasts.

The goal of ICICI 2022 is to bring together the researchers to share ideas, problems and solution relating to the development in the field instrumentation, communication and information technology.

The scopes of research results to be presented and discussed in this conference covers Applied Physics, Computational Science, Electronic and Devices, Instrumentation and Measurement, and Medical Physics

After the oral presentations and discussion on 27-28 October 2022, all papers will be peer-reviewed and published in AIP Proceedings. Selected papers will be published in the Journal of Engineering and Technological Sciences or other journal partners.

On behalf of all the participants of ICICI 2022, we would like to deeply thanks to the Institut Teknologi Bandung (ITB) for sponsoring this program. Our sincere thanks also go to Department of Physics, Faculty of Mathematics and Natural Sciences ITB for their supports.

Bandung, October 2022

Mitra Djamal (Chair of ICICI 2022)

Rundown

October 27, 2022

No	Time (WIB), UTC+7	Duration	Agenda		
link: bit.ly/icici-2022 meeting ID: 936 4634 2233 password: 458221					
1	08.30-08.40	10	Opening by MC		
2	08.40-08.50	10	Opening Speech from ICICI 2022 Chair (Prof. Dr.-Ing. Mitra Djamal)		
3	08.50-09.20	30	Plenary speaker 1 Prof. Jakrapong Kaewkhao		
4	09.20-09.50	30	Plenary speaker 2 Prof. Kuwat Triyana		
5	09.50-10.20	30	Plenary speaker 3 Prof. Yusaku Fujii		
6	10.20-10.50	30	Plenary speaker 4 Dr. Mati Horprathum		
7	10.50-11.20	30	Plenary speaker 5 Prof. Hong Joo Kim		
8	11.20-11.50	30	Plenary speaker 6 Prof. Suprijadi		
9	11.50-13.00	70	Break		
link: bit.ly/icici-2022 meeting ID: 936 4634 2233 password: 458221					
Parallel Session					
			Group 1	Group 2	Group 3
			Room Staf Baru, Physics	**link: bit.ly/icici-2022**	

			Building, Institut Teknologi Bandung	**meeting ID: 936 4634 2233 password: 458221**	
10	13.00-13.15	15	ABS-3	ABS-14	ABS-25
11	13.15-13.30	15	ABS-6	ABS-15	ABS-26
12	13.30-13.45	15	ABS-8	ABS-16	ABS-32
13	13.45-14.00	15	ABS-20	ABS-18	ABS-35
14	14.00-14.15	15	ABS-30	ABS-23	ABS-36
15	14.15-14.30	15	ABS-31	ABS-24	ABS-37
16	14.30-14.45	15	ABS-33	ABS-39	ABS-40
17	14.45-15.00	15	ABS-38	ABS-41	ABS-44
18	15.00-15.15	15	ABS-43	ABS-1	ABS-45
19	15.15-15.30	15	ABS-49	ABS-5	ABS-46
20	15.30-15.45	15	ABS-4	ABS-7	ABS-47
21	15.45-16.00	15	ABS-17	ABS-9	ABS-48
22	16.00-16.15	15	ABS-28	ABS-10	
23	16.15-16.30	15	ABS-29	ABS-11	
24	16.30-16.45	15	ABS-42	ABS-12	
25	16.45-17.00	15	ABS-19	ABS-13	
26	17.00-17.15	15	ABS-27	ABS-21	
link: bit.ly/icici-2022 meeting ID: 936 4634 2233 password: 458221					
27	17.15-17.30	15	Closing Ceremony		

Photonics and scintillation materials from lanthanide +3 ion doped in glass: recent development

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Abstract

Glasses doped with Lanthanide ions (Ln^{3+}) can be developed as photonics and scintillation materials because of high emission efficiencies, corresponding to f–f and f–d electronic transitions in the Ln^{3+}. In case of f–f transition, sharp and strong emission spectra from the ultraviolet to the infrared region are obtained, because of their shielding effects of the outer 5s and 5p orbitals on the 4f electrons, while 4f–5d transition of Ce^{3+} shows very fast timing respond behavior. Ce^{3+}/Ce^{4+} concentration and ratio are also key for enhancement of scintillation intensity. In this presentation, luminescence and scintillation behaviors of the glasses doped with several lanthanide ions have been explained. Recent developments for solid state lighting, laser, display and scintillation materials from glass have been updated.

Keywords: Glass; Luminescence; Scintillation; photonics

Electronic Nose (GeNose C19®) as Screening Tool for Covid-19 and Its Potential for Other Diseases

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Abstract

In the exchange of blood gases in the alveoli of the lungs, carbon dioxide is released, and oxygen is taken from the inhaled air. Using gas chromatography methods, several hundred volatile organic compounds (VOCs) in the exhaled breath have been identified. In the case of Covid-19, hundreds of different types of VOCs are produced as a result of metabolic reactions between the virus and its host cells. The breath exhaled by Covid-19 positive and negative patients shows the similarity of all VOCs. Therefore, it is not easy for us to determine the volatile compounds of the Covid-19 biomarker based on these VOCs. Higher levels of ethyl butanoate were detected in the exhaled breath of Covid-19 patients than in healthy controls and lung cancer patients. In contrast, breath-borne butyraldehyde and isopropanol were significantly higher for non-Covid-19 respiratory infections than for Covid-19. The breath-carrying emissions of isopropanol from Covid-19 patients vary widely to a ~100-fold difference. Covid-19 patients have lower acetone levels than non-Covid-19 patients. This paper discusses the basic concept of an electronic nose (GeNose C19®) as a Covid-19 rapid screening tool. GeNose C19 does not directly detect the SARS-CoV-2 virus but detects the results of this metabolic reaction. The GeNose C19 consists of an array of gas sensors and artificial intelligence. All gas sensors used in the GeNose C19 have global selectivity, so they are very precise in detecting the VOC composition pattern of the patient's breath. Next, these patterns are analyzed using machine learning until we know their accuracy, sensitivity, and specificity. From the first and second stages of the clinical test data to the external validation test, we obtained accuracy, sensitivity, and specificity values of 85-95%, respectively. During 2020-2021, the GeNose C19 received a distribution permit and has been used both in the transportation sector and in hospitals. After Covid-19 no longer exists, GeNose C19 machines undergo clinical trials in several hospitals, which will later be used to detect cervical cancer (from urine samples), tuberculosis, and pneumonia (from breath samples).

Keywords: SARS-CoV-2 virus, volatile organic compounds, GeNose C19, gas sensor array, machine learning

Possible use of Powered Air-Purifying Respirator (PAPR) as an alternative of lockdown

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Abstract

For more than two years, securing social distancing and obliging to wear masks have been implemented, and the acquisition of herd immunity by vaccination has been pursued as measures against COVID-19 all over the world. However, the situation where the spread of infection cannot be stopped have repeatedly occurred, and lockdown has been carried out every time that has caused enormous damage to the society. By developing and producing inexpensive and high-performance Powered Air-Purifying Respirators (PAPRs) and spreading them widely in society, it would be possible to build a social infrastructure that has an ability to stop the spread of COVID-19 without lockdown. These devices would give people the options to stay at home or to go out using them, when an emergency situation that requires "lockdown" arises.

Rational Design of Optical Nanomaterials for An Intelligent Plasmonic Sensor Platform

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Abstract

Nanophotonic sensor devices based on plasmonic technologies have offered multiple opportunities to realize high-performance chemical and biological sensing devices. Design and fabrication of optical nanomaterials-based plasmonic materials have attracted a diverse range of chemical and biosensor applications such as food safety, medical diagnostics, agriculture, environmental and forensic. In this work, we present the overviews of the fabrication and characterization of optical nanomaterial for plasmonic sensor chips, including surface-enhanced spectroscopic sensors such as surface-enhanced fluorescence spectroscopy (SEFS), surface-enhanced Raman spectroscopy (SERS), and localized surface plasmon resonance (LSPR) sensor. Firstly, Numerical electromagnetic field simulation, the plasmonic coupling, and the hot-spot region of nanostructure at different geometry can be demonstrated and designed for achieving high sensitivity. The sputtering technique combined with glancing angle deposition (GLAD) has been fabricated uniformly on sculpture optical nanomaterials arrays. Moreover, with post-thermal treatment on the initial film growth process, the uniform nanodot/particles are obtained by the solid-state de-wetting process. Both techniques have been successfully used to fabricate plasmonic nanostructures, i.e., nanorods and nanodots for surface-enhanced spectroscopic and LSPR sensor chips. Combining the platform development with artificial intelligence (AI) techniques such as deep learning (DL) and machine learning (ML) to extract meaningful information spectra, the data analysis has been proposed and discussed to solve the high accuracy, sensitivity, and selectivity which potentially serves as an “intelligent plasmonic sensing platform.” Finally, we aim to extend the intelligent plasmonic sensing platform to diagnose emerging/re-emerging diseases, agriculture product, and forensics to serve the government, private parties in Thailand, and worldwide collaboration.

Keywords: Plasmonics, GLAD, Optical materials, Nanomaterials

Overview of Tl-based Crystal Scintillator Development

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Abstract

Inorganic scintillators containing heavy Thallium-(Tl) in the host lattices are the novel emerging class discovered by our research group. In this class of scintillators, we studied elpasolites, ternary lanthanide halides, ternary metal halides and Tl-based hafnium/zirconium halides as well as Tl-based Fluorine scintillator. The single crystals were grown by conventional and modified two zones vertical Bridgman techniques. The emission properties studied at room temperature under X-rays irradiation shown to have efficient intrinsic and Ce^{3+} or Eu^{2+} dopant luminescence, mostly in the 370-530 nm range i.e compatible with the spectral sensitivity response of modern photosensors. The scintillation properties studied under γ-rays and α-particles irradiation shown to have good energy resolution, high light yield, faster timing response and good pulse shape discrimination. The heavy Tl ion give rise to high effective Z number make them efficient for the detection of X- and γ-rays detection as well as fast neutron detection. The discovery and development for new Tl-based efficient scintillators and improvement in scintillation performance will be presented.

Keywords: Scintillators, Density, Pulse shape discrimination, Crystal growth, High efficiency.

Computational Study to develop new-material for sensor

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Abstract

In last decade, developing an instrumentation system growth very fast but lower cost. Increasing of microprocessor capability, data communication and Internet of Things (IoT) are play important in smart instrumentation. Computation as tools which based on algorithm and methods is more needed in instrumentation system including as material design for sensor. In recent year, a new sensor based on nanomaterial for sensing physics phenomena are more interesting to study, computational material design will help the researcher to understand and modified of composition to get a best material performance. In this paper we report the current research on developing a kind of sensor for biology sensing and gas sensing.

A Review of Routing Techniques in Location Source Privacy for Wireless Sensor Network

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Abstract

In a wireless sensor network context, a wireless sensor network (WSN) is a collection of sensor nodes made up of small nodes with minimal energy resources and powered solely by batteries. Sensor nodes that collaborate in large-scale area networks with limited energy and unsupervised situations, as well as poor security. Sensor node communication becomes vulnerable, and attackers use various methods to gather information about the location of the transmission packet's originating route. The WSN research community has taken notice of this issue. In order to protect and prevent attackers from finding the route of the source of packet delivery, the Location Source Privacy Scheme (LSP) was implemented. The LSP system employs a variety of routing mechanisms to shield the location of the route source transmitting packets from various types of attacks. In addition, because WSN energy sources are limited, the LSP routing approach is employed to reduce energy consumption. We present an in-depth assessment of current research on LSP routing strategies as route security currently utilized for WSNs in this paper, as well as some future perspectives that are still being developed

Keywords: Location source privacy, wireless sensor network, routing technique, transmission packet, attack

Absorption Spectroscopy and Dielectric Properties of Zinc Borate Glasses Modified by BaTiO3 Ceramics

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Abstract

The effect of BaTiO3 concentration on borate glass were investigated, with various BaTiO3 content and different ZnO-B2O3 solution as the sintering aids by melting quenching technique. X-ray diffraction technique confirmed the formation of powder mixtures. The density of glass is increased with increasing the amount of BaTiO3 concentration, while molar volume and refractive index were slightly altered. Absorption spectra were measured, and optical band gap were determined. Absorption bands were not discovered in the visible light spectrum. The dielectric behavior which is also observed of BaTiO3-ZnO-B2O3 system were systematically investigated. The dielectric of BaTiO3 concentration on borate glass with good permittivity and low dielectric loss were obtained at high concentrations the amount of BaTiO3. Furthermore, radiation shielding properties were calculated and found better when increasing of BaTiO3. This developed glass could be used for transparency radiation shielding materials.

Keywords: Transmission spectrum- relaxation- BaTiO3- lead-free

ABS-3

Application of YOLOv5s Algorithm for Real-Time Object Detection in Mobile Robot for Volcano Monitoring System

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Abstract

Indonesia, a county with 172 volcanoes and second after Japan for the most eruption event, should monitor and predict the volcano eruption to prevent the effect of this natural disaster. Therefore, we have developed a 4-wheeled mobile robot equipped with monitoring sensors and a Logitech camera for this purpose. The robot should have the ability to detect objects in this extreme environment to avoid collision while moving and monitoring the volcano's physical parameters. It has been designed a deep machine learning of YOLOv5s algorithm for two objects mostly found at volcano such as trees and stones. After training steps (object identification- dataset downloading (Google Chrome Extension and Open Images v6)- image labelling (LabeImg)- augmentation process (blur and rotation)) had been carried out, the images of the object then be trained in three model variation which resulted in: mAP_0.5 = 51.9%, mAP_0.5:0.95 = 28.6%, 58% of precision and 50% recall with 12 minutes and 33 second of training time for first model (batch=16 and epochs=100)- mAP_0.5 = 59.7%, mAP_0.5:0.95 = 36.6%, 74% of precision and 54% recall with 36 minutes and 4 second of training time for the second model (batch=16 and epochs=300)- mAP_0.5 = 59.9%, mAP_0.5:0.95 = 37.6%, 80% of precision and 55% recall with one hour and 25 second of training time for the last one (batch=16 and epochs=500) as the best model of these variations. Furthermore, these results were displayed for all test images for the best model.

Keywords: mobile robot, object detection, volcano monitoring system, YOLO, deep machine learning

SpO2 and BPM Monitoring System Using Blynk Application

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Abstract

An effort to avoid the transmission of the covid-19 virus and other infectious diseases during the pandemic continues to be developed. For patients infected with Covid-19, keeping their oxygen saturation and heart rate together at all times is very important. Generally monitoring of SpO2 and heart rate is done manually, so it takes continuous time by health workers. In this research, a device is designed that can unite SpO2 in blood and heart rate using the Blynk application. Measurement results can be monitored via the LCD and android. Android-based measurements can reduce the risk of health workers contracting the virus and information about patients can be monitored more quickly. This system is designed using NodeMCU Esp8266 as a microcontroller and a Max30100 sensor as a detector of oxygen levels and BPM. Data transmission comes from multiple tools in one application. The measurement results show that the data can be monitored with the value listed on the android the same as the value on the LCD.

Keywords: NodeMCU Esp8266, Blynk application, Max30100 sensor, IoT

Judd-Ofelt analysis and FTIR of the gadolinium borosilicate glass doped with Dy3+ ions

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Abstract

The novel gadolinium borosilicate glasses doped with 1.0 mol% of Dy2O3 concentration in the formula of 40Na2O-12.5Gd2O3-5SiO2-(41.5) B2O3-1Dy2O3 was investigated Judd-Ofelt (J-O) and Fourier-transform infrared spectroscopy (FTIR). The J-O intensity characteristics are calculated from the integrated area under absorption and emission, as well as refractive index. Utilizing the J-O method, optical characteristics such as oscillator strengths, J-O parameter, radiative transition probability, the stimulated emission cross-section, and branching ratios are determined. FTIR method was utilized to determine the characteristic functional groups contained in the chemical structure of composites based on its matrix.

Keywords: Judd-Ofelt- FTIR- Dysprosium- Borosilicate glass

ABS-6

The use of the Internet of Things in the Intelligence operation of the Modern era

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Abstract

Internet of Things (IoT) is currently one of the systems that are developing in the world. Not only in the private sector, but the Government through its intelligence has also taken advantage of this system. This system will assist intelligence in carrying out its functions including investigation, security, and operation. In international intelligence, IoT has become a very helpful tool for their task. Easily cross state borders, with the help of this tool, state intelligence is very easy to get data from other countries. This is reinforced because, in the modern cyber era, most of the data stored around the world has been in digital form. This research tries to look for a new perspective and compare data in the form of papers, news pieces, and articles on research topics, books, and journals. It is hoped that the research can help practitioners and academics in the field of security and intelligence to understand more about the use of IoT in today's modern era of intelligence

Keywords: Internet of Things, Intelligence, Security, Operation, National Interest

Orange emission from Sm3+ doped soda lime borosilicate glass prepared from rice husk ash for photonic material application.

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Abstract

In this work, the physical, optical properties of Sm3+ doped glass made from rice husk ash (RHA) with different concentrations of Sm3+ ion were prepared. The glass samples with chemical composition of (60-x) SiO2: 30B2O3:10Na2O: 10CaO: xSm2O3 were prepared by melting-quenching process (use RHA as a SiO2). Density and molar volume of the sample glass increase with increasing of Sm3+ concentration. The absorption spectra found peak absorbs in the UV-Vis-NIR region. Main emission peak was observed at 600 nm under excitation at 401 nm. The emission color of glasses were confirmed by CIE 1931 color coordinates and are in the orange region emission. The results show the potential of Sm3+ doped glass made form rice husk is useful in future photonics application.

Keywords: Rice husk ash-glass-Samarium

THE GHOST BUSINESS, PICKING THE VISUAL CREATIVITY PARADIGM IN HORROR MOVIE

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Abstract

The horror genre in national films is one sign of the progress of national cinema. Visualization of ghosts establishes boundaries, concepts, and paradigms that develop, in communicating the needs of society in social and commercial terms. The relationship between entertainment and the presence of a ghost figure packaged in commercial visuals has become a mandatory menu for horror films. The character of a ghost figure depicted with a face and several attributes such as clothes, long hair, sticks, and blood, becomes an identity that has a double meaning. Meeting the needs and interests of a dynamic society can be met through horror films. As a result, the development of the paradigm in the concept of horror has shifted both in understanding and engineering the presence of ghost figures by actualizing the boundaries of religion, sex, or comedy, towards a hybrid. An indication of the development of the concept of half ghost, and half human is the latest visual model of ghost figures, as the core problem of visual creativity in ghost figures. By using an interdisciplinary approach, the theory of Roland Barthe, and Gilles Deleuze, the object of research in the 1981 film 'Sundel Bolong', 'Destroy the Science of Witchcraft' (1989), 'Whisper of Satan' (2018), and 'Makmum' (2019), the findings can be stated great thinking that explains the detailed specifications of horror that impact on the dynamics of visual communication.

Keywords: design, movie, ghost, horror, visual

Design and build a monitoring system for the distribution of breast milk containers based on IoT

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Abstract

Breastfeeding is very important for the baby's growth. However, this can be constrained when the mother and baby are separated which can be caused because the mother of the baby has to work. The method that can be done is to distribute breast milk that has been expressed and then put into a special bottle. However, in the distribution process, the condition of breast milk must always be monitored both from its temperature and humidity so that the quality of the mother's milk that reaches the baby is maintained. In addition, in the distribution process from the location of the container, it must always be monitored so that the distribution process is carried out in accordance with the delivery destination. With these problems, the container used can be equipped with a DHT22 sensor that can measure temperature and humidity as well as a GPS system to be able to monitor the position of the container. For data transmission, the results of sensor measurements and location coordinates are used by the internet of tings (IoT) system. By using the IoT system, the sensor measurement results can be seen on a smartphone using the blynk application and the location coordinates can be displayed on a map. For a control system capable of connecting the system to the internet, nodeMCU esp8266 is used by completing the system with a WIFI modem for system needs to access the internet network. Thus, the condition of the container for storing breast milk in terms of temperature, humidity, and location during the distribution process will continue to be monitored online with the IoT method connected to a smartphone.

Keywords: NodeMCU ESP8266, IoT, Breast Milk

ABS-10

An Evaluation of Online Media in The Covid Coverage Based on Smart Visual Design

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Abstract

In the last two decades, the scope of the Internet of things (IoT) has developed into a popular topic of research. One of the rapidly growing entities in this era is the dissemination of information through online media. Interestingly, most disciplines discuss technological devices and how systems work digitally. Not many explore IoT and online media in the subject of design. This study discusses that online media is no longer just presenting information, but it is very necessary to elaborate the IoT paradigm with smart visual design. The research focuses on an online media portal that specifically reports information about Covid. The purpose of this research is to explore how an online media can configure information of COVID through design elements. The research method used is semantic differential, which examines various psychological aspects that owned by audience when they see visual image about Covid, which is represented in signs. This article in a semantic perspective provides a synthesis that a number of information that collaborates in the IoT paradigm represent various meanings, are integrated, and form a particular algorithm. Specifically in design analysis, the IoT paradigm and visual elements will lead to its own discursive construction and have unique affordability. This model forms new knowledge that is useful for decision making or strategic policy formulation.

Keywords: Internet of Things- Smart Visual Design- Semantic Differential- Visual Image - Covid

Design of Immersive Information Simulation of Negative Pressure Isolation Room for Covid-19 Infection Patients Using Virtual Reality

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Abstract

The COVID-19 pandemic, which is still ongoing in 2022, has an impact negative aspect of reduced human activities. All activities are many done online. This presents a challenge for researchers to provide ideas new to create innovative technology to help society and government. Room Negative pressure isolation is one solution to provide effective patient care better. This is done to prevent the uncontrolled spread of the virus. Only It's just that creating a negative pressure isolation room requires an understanding of very strict room requirements and air circulation requirements so that air circulation from the isolation room does not mix with general patients or medical personnel. To provide knowledge about how to make and circulation requirements Negative pressure isolation room air is very expensive when practiced directly because it requires the cost of procurement of space and equipment. By using virtual reality technology (VR) then the problem can be solved because VR can provide an immersive environment that it's like being in the real world. VR users will be able to feel how the requirements and how to create negative pressure isolation room-like feeling in the real world. So that this can provide information and train how to make a pressurized isolation room negative before making the actual isolation room. Activities using this VR will reduce the risk of errors and the cost of training on how to make an isolation room even with no equipment costs. The purpose of this study is to provide convenience for health extension workers and the government on how to make a negative pressure isolation room and requirements air circulation. So, it is enough to use VR technology, so information on how to use VR is enough to make the isolation room and its requirements work without having to use the right tools actually. This research method is descriptive and quantitative which begins with a literature review followed by an analysis of the needs of the isolation room and the VR immersive environment. The next VR design is done. The implementation and testing process resulted that VR technology can help understand negative pressure isolation rooms for health educators.

Keywords: Space- Covid-19 Isolation- VR- Immersive- simulation

ABS-14

Design of Elasticity Coefficient Apparatus Based on Measuring Time of Photodiode and Vibration Sensor

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Abstract

Collision events are very often encountered in everyday life, one of which is a falling ball. The ball collides with the reflecting plane at a slower speed than when it fell and in the opposite direction. The speed ratio of the ball after and before the collision is known as the coefficient of restitution (e) which describes the elasticity of the collision and affects the ball's bounce height, bounce time, and bounce duration. This study aims to design a collision experiment apparatus that can investigate the balls bounce height, bounce time, and bounce duration used to determine the coefficient of restitution. A prototype is made of a PVC cylinder with a diameter of 110 mm and 100 cm in height, which is then perforated on the wall surface to minimize the air friction in the tube. The prototype stand is equipped with a tray to replace the reflective material, while two photodiode sensors are installed on the tube with a reflective system to detect the light reflection on the falling object. To validate the time measurement, a vibration sensor is mounted on the floor which detects the bouncing ball. The apparatus is activated through an actuator that simultaneously turns on all sensors to produce accurate measurements. When the test object is dropped, the timer starts counting as the object passes through the first and second photodiode sensor, and also when it hits the floor. The results show that the restitution coefficient of the ball in various reflecting planes is agreed with the theory (0 &#8804- e &#8804- 1) and e is positive linear with the bounce height (h), the time of each bounce (t), and the duration of the bounce (total).

Keywords: Collision- straight line- coefficient of restitution- photodiode sensors- vibration sensor

Biosynthesis and Characterization of ZnO Nanoparticles Using Ketapang Leaf Extract

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Abstract

The process of biosynthesis and characterization of ZnO nanoparticles using Ketapang leaf extract to degrade methylene blue has been successfully carried out. ZnO nanoparticles were formed through a synthesis process between a 0.05 M solution of Zn(NO3)26H2O with Ketapang leaf extract. The synthesis was carried out with variations in temperature, namely 60C, 70C and 80C then dripped with 1M NaOH solution until it reached pH 12. The absorbance intensity of nanoparticles for each sample based on the UV-Vis Spectrophotometer test, respectively, was 1.479, 1.099 and 1.016. The sample with the highest absorbance intensity (A) was tested by X-Ray Diffraction, it is known that the particle size ranges from 9.04 to 25.31 nm. SEM characterization showed the presence of micro-flower morphology with a size distribution of 392 to 423 nm. The TEM characterization showed a particle size distribution between 230 to 259 nm with an average particle diameter of 241.6 nm. The degradation activity of 25 ppm methylene blue solution with variations in contact time of 0, 30, 60, 90, 120, 150 and 180 minutes resulted in a degradation efficiency of 8.4%, 12.7%, 23%, 26%, 27%, and 33%.

Keywords: ZnO Nanoparticles, Terminalia Catappa Leaves, Methylene Blue, UV- Vis, XRD, SEM, TEM

The Design of Liquid Refill Station for Dish Soap Product Based on Internet of Things

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Abstract

The abundant of plastic waste which come from sanitation products such as dish soap has been being a big problem so far. Therefore, liquid refill station for dish soap product has been designed which aims to reduce plastic waste from dish soap containers. The tool works equipped with 2 pumps and a water flow sensor. So that customers can choose the volume and type of dish soap they want to buy from the 2 available brands. The selection of the brand and volume of dish soap is done by pressing the pre-set keypad character. Payment for product purchases is made using Near Field Communication (NFC) reader PN5322 technology and a Mifare card. With this Mifare card, customers can also top up their balance for payment. Data processing uses Arduino Mega 2560 which is connected serially with Raspberry Pi 3 B as a minicomputer to run the entire program. All purchase data in the form of customer ID, brand of laundry soap purchased, volume of laundry soap purchased and date of purchase and remaining volume in the tank are sent to the MySQL database via the NodeRED platform which has been installed on the Raspberry Pi 3B and connected to the Arduino Mega 2560. the residual volume in the tank is monitored and displayed on the Grafana dashboard. The time-out of dish soap volume in the tank is predicted using linear regression. With the independent variable in the form of time (days) of purchase and the dependent variable in the form of the remaining volume of dish soap on the tank. Prediction uses training data taken from the remaining volume data in the tank when it is first filled until it is first used up. From the training data, it was found that the coefficient of determination R2= 0.99 for the first and second brands.

Keywords: liquid refill station- Raspberry Pi 3- NodeRED- Grafana- linear regression

ABS-17

MATLAB/Simulink Numerical Simulation of a Spacecraft With Reaction Wheels Having Static and Dynamic Imbalances

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Abstract

Using reaction wheels for attitude control purposes introduces jitter problems due to their static and dynamic imbalances. That is because we cannot avoid imperfections in manufacturing. As a result, it is important to take this into account when designing an attitude control system that involves computational simulation of the system model. In simplified models of the reaction wheels with imbalances, the forces and torques that were originally brought on by the reaction wheels are viewed as external disturbances. However, it is not physically realistic. Instead, there is a model that was derived based on the first-principle approach called the fully coupled model that meets the angular momentum conservation, hence is physically realistic. The fully coupled model was implemented in Basilisk, or BSK for short. Nevertheless, those who are not familiar with this software framework may implement the fully coupled model in the software they are more accustomed to using, such as MATLAB/Simulink. In addition, the reference article that reported the fully coupled model contains sophisticated and interrelated mathematical equations that are all used for explanations of how they were generated rather than for simulation purposes. This paper addresses the implementation of the model on MATLAB/Simulink. This paper describes the equations used in the simulation and their purposes. The numerical simulation run confirms the simulation validation.

Keywords: Spacecraft dynamics, Reaction wheel, Dynamic and static imbalances, Fully coupled model, Numerical simulation

ABS-18

Temperature Instrumentation System for the Phase Change Experiment of NaNO3, KNO3, and their Mixtures

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Abstract

Measurement instrumentation is crucial in carrying out experiments to obtain data in explaining phenomena that occur quantitatively. Recently, the phase transition study of materials has attracted researchers because phase change materials can be used as a medium for both cooling and heat storage in several types of energy generation. This study aimed to find out experimentally the characteristics of the phase change material using a temperature instrumentation system. The temperature instrumentation system was designed using a microcontroller and a K-type thermocouple sensor integrated with the Wiznet W5100 module as a converter protocol. XAMPP software was used as a server that handles temperature data recording in the experiment. The temperature of the salt including NaNO3, KNO3, and its mixture placed in the apparatus in the form of a stainless steel pipe wrapped with nichrome wire was measured using the temperature instrumentation system. In this case, a 6 meter long nichrome wire connected to an adjustable AC voltage regulator used as a heat source in the experiment. The experimental results showed that the temperature measured by the thermocouple could describe the melting temperature characteristics of each material according to the existing reference. The material with the highest melting temperature was KNO3 while the lowest was a eutectic mixture of NaNO3 and KNO3.

Keywords: molten salt, K-type thermocouple, microcontroller, nichrome wire, database server

ABS-19

Light Management of Transparent DSSC based on Ln3+ ion doped BaO-ZnF2-B2O3-TeO2 Glass (Ln3+ = Dy3+/Sm3+/Eu3+) as UV Down-conversion Material

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Abstract

For several decades, energy conversion from solar irradiance to electricity has been successfully conducted by solar cells device. However, not all solar wavelengths can be captured by solar cells. It is found the absorption limitation of band gap energy for all solar cell types in the ultraviolet region (high photon energy) and infrared region (low photon energy) leading to 70% energy loss. Introducing the material which can convert higher photon energy to the lower photon energy that is suitable with solar cell bandgap energy is one of the solutions for this problem. In the present work, we have prepared glass using the melt and quenching technique with the composition of 30BaO + 10 ZnF2 + 30 B2O3 + (30-x)TeO2 + xLn2O3 where xLn2O3 is 1 mol% of D2O3, 1 mol% of Sm2O3, and 1.5 mol% of Eu2O3. The absorption spectra of glass samples show several absorption bands in the ultraviolet to infrared region. Meanwhile, the emission spectra of glass samples confirm the agreement with DSSC absorption spectra in the visible region. Furthermore, we demonstrate the I-V measurement by placing glass samples on the top of the DSSC device for understanding the glass samples role. The DSSC parameters including efficiency, fill factor (FF), short-circuit current (ISC), and open-circuit voltage (VOC) are presented in detail. The I-V measurement validates the increasing DSSC efficiency indicating the enlargement of photon generation in the device. In summary, we can conclude that the present glass possesses high potential for a solar cell application, wherein Eu3+ ion doped glass is the most probable candidate for UV down-conversion material as one of light management technology of DSSC device.

Keywords: Down-conversion, DSSC, fluoroborotellurite glass, I-V measurement, light management, ultraviolet.

ABS-20

A Design of The Third Generation of UIN Sunan Kalijaga's UV Fluorescence Spectro-Imaging System

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Abstract

Research on design of the third generation of UIN Sunan Kalijaga's UV fluorescence spectro-imaging system was done. The purpose of this research was to make a design of the third generation of UIN Sunan Kalijaga's UV fluorescence spectro-imaging system as a development of the second generation one. This research was conducted through two steps, making a block diagram dan a design of the system. The system block diagram was made using Microsoft Visio, while the design was made using Google SketchUp. The result showed that that a design of the third generation of UIN Sunan Kalijaga's fluorescence spectro-imaging system was made succesfully using high power UV-LED of 350-360 nm and industrial camera module SONY IMX291.

Keywords: camera, fluorescence, spectro-imaging, UV-LED

A Plasmonic Sensor Based Gold Nanoparticles for Detection of Chlorpyrifos

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Abstract

Plasmonic sensor-based gold nanoparticles (GNPs) have been developed for detecting organophosphorus pesticides namely chlorpyrifos. Chlorpyrifos is the most common-used pesticide in agriculture (including soybeans, apples, broccoli, and corn) and non-agriculture like golf courses. The GNPs have been used as sensing materials in this sensor setup and were synthesized and deposited as a thin film using the seed-mediated growth method (SMGM). In this study, the sensitivity of the plasmonic sensor's effect and response to two different mediums which are deionized (DI) water and chlorpyrifos as targeted analytes were successfully detected by recording the changes in peak positions and intensities for transverse Surface Plasmon Resonance (t-SPR) and longitudinal SPR (l-SPR). The change in response is due to changes in the refractive index of the surrounding medium, which are water (n = 1.33) and chlorpyrifos (n = 1.56). The SPR red-shifted to a longer wavelength as the refractive index of the surrounding medium increased as well as the concentration increased from 1 mg/mL to 10 mg/mL. Furthermore, the stability of GNPs in the presence of different analytes was tested for 600 seconds and it was found that the changes in peak intensity for both peaks were minimal. The response of the repeatability test is consistent over five testing cycles, as indicated by DI water and analyte intensities that almost completely recover to their previous levels after every cycle of medium change.

Keywords: Chlorpyrifos- Gold nanoparticles (GNPs)- Plasmonic sensor

ABS-23

Designing of Optical Sensor using ZnO as Sensing Material for Pesticide Detection

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Abstract

Nowadays, the development of technology to detect pesticide, substances that is used to eradicate invasive plant in agriculture sector by inhibit their growth, still becomes a challenge. The most commonly used pesticide detection technology is chromatography, which has drawbacks such as expensive equipment, a long detection time, and the need for experts to analyze the test results. Hence, it is critical to develop pesticide detection technology alternatives that provide fast, accurate, low-cost, and simple detection methods. On the other side, optical sensor that utilize the optical phenomenon of metal oxide nanomaterial namely zinc oxide (ZnO) can be used to detect hazardous materials. In this study, an optical sensor using ZnO with nanorod shape as a sensing material has been developed for pesticide detection in solution form. This system consist of six components, i.e., light source, fiber optic, chamber, sensing material, spectrometer and computer equipped with AvaSoft software as a data analyzer. Experiments were carried out using pesticide type of diazinon as the target analyte, and deionized water (DIW) as a reference medium. The sensing parameter in this experiment is Absolute Optical Change (AOC) value. The presence of diazinon with a concentration range from 1 ppm to 10,000 ppm has been successfully detected using this sensor with a detection limit of 1 ppm. The result shows that the custom-made solution-based optical sensor system using ZnO as sensing material has the potential to be used as an alternative detection method for organophosphate pesticide.

Keywords: Optical Sensor, Pesticide, Zinc Oxide (ZnO)

ABS-24

System Integration Massive Online Simulation (MOS) of Thermodynamics for Increasing Scientific Communication

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Abstract

Thermodynamics is part of an important concept in understanding the concept of physics and the results of preliminary studies conducted by research show that the ability of scientific communication in the category is very low. The purpose of this study was to develop a Massive Online Simulation (MOS) Integration system of Thermodynamics for Increasing Scientific Communication. FODEM was chosen in developing the MOS media consisting of three related components (1) needs analysis, (2) implementation, (3) formative evaluation. The results of the MOS research that have been developed on thermodynamic material are effectively used in physics learning media and are based on N-gain calculations with an increase of 0.67 (medium category). These results indicate that MOS has been successfully developed and is effective in improving students scientific communication on the concept of thermodynamics.

Keywords: System Integration, Massive Online Simulation (MOS), Thermodynamics, Scientific Communication.

System Integration of Thermal Expansion Virtual Laboratory (TEVL) for microscopic unveil of concepts

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Abstract

Microscopic expansion is the vibration and rotation of the constituent atomic movements caused by the input heat so that the heat of the object expands in all directions. The expansion process causes an increase in length with a very small order and is difficult to observe through real practice. Developing an integrated system in the form of a virtual laboratory that can assist lecturers and teachers in teaching expansion material through investigation is the goal of research. research design and research development (DDR) with the ADDIE model was chosen in this study. The results of the research resulted in the design of a thermal expansion virtual laboratory integration system. The results of the virtual laboratory thermal expansion system can show up to a microscopic scale change in the form of an increase in length from the expansion process. The design consists of providing tools and materials virtually, practicum design, and data collection, and visualization of thermal expansion microscopically and graphically.

Keywords: System Integration, Thermal Expansion Virtual Laboratory (TEVL), microscopic unveil of concepts

Characterization of PVT-Based Scintillation Detector as a Low-Cost Early Detection Feature Option in Nuclear Reactor Safety Systems

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Abstract

The safety system for nuclear reactors continues to improve along with the development of the use of nuclear reactors as power generators. Likewise, early detection features in nuclear reactors are constantly evolving to produce the most optimum detectors. The increase in gamma radiation is one of the signs in the safety system of nuclear reactors so that the evolution of the detector refers to the gamma radiation detector. One consequence of the evolution of this detector is the production of detectors that have excellent capabilities but are very expensive. Plastic with the type of Poly Vinyl Toluene (PVT) can be used as a gamma detector and has a low cost. In this study, the possibility of using PVT-based scintillation detectors as an option for low-cost early detection features in nuclear reactor safety systems will be studied. The study was carried out by characterizing PVT-based scintillation detectors and then comparing them with commercial detectors. The parameter that is the main focus of this research is the efficiency of the detector.

Keywords: Efficiency, Gamma Radiation, Plastic Scintillator, PVT, Scintillation Detector

Measurement of Natural Radiation Dose Rate Using NaI(Tl) Scintilator and Geiger Muller in High Natural Background Radiation Areas: Study Case in Mamuju Regency, West Sulawesi

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Abstract

NaI(Tl) Scintilator and Geiger Muller are two tools commonly used to detect radiation levels associated with radioactive materials. Both have different ways of working, where the NaI(TL) Scintilator is used to detect gamma radiation while Geiger Muller can detect alpha, beta, and gamma radiation simultaneously. These two tools are used in measuring natural radiation in Mamuju Regency, West Sulawesi, which is the area with the highest natural radiation level in Indonesia. Random Systematic Technique is used in data acquisition, where the design for taking the measuring points uses a gridding system with a size of 2 x 2 km2. The data shows that the average value of the natural radiation dose rate measured by the NaI(Tl) Scintilator is 0.123 Sv/hr and by Geiger Muller 0.365 Sv/hr. The measurement results by the Geiger Muller instrument were 25.81% greater than the results of the NaI(Tl) Scintilator. The measured radiation value is almost 10 times the natural radiation dose rate in West Java. This shows that the mineralization of radioactive elements formed in Mamuju Regency contributes significantly to the high dose rate value measured in this study

Keywords: Nai(Tl) Scintilator, Geiger Muller, dose rate, radiation, Mamuju.

ABS-28

Implementing and Analyzing Fairness in Banking Credit Scoring

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Abstract

The decision made by machine learning is mostly based on the historical data that used to train them. It raises the awareness that discrimination in machine learning should be eliminated, especially towards demographic features, such as gender or age, that may contain societal bias. Financial industry uses credit scoring as a reference to reflect the customer risk profile. To achieve fairness in the credit scoring model, this paper tries to: (1) assess bias in the model with different fairness metrics and (2) improve fairness in the ML model with several bias mitigation methods and algorithms. Moreover, the model performance also becomes a concern that should be preserved. This study depicts that some bias mitigation algorithms may work, but there is a trade-off with the performance. Implementing a reduction method performs the best to improve fairness and maintain the performance.

Keywords: Machine Learning- Bias and Fairness- Fair Machine Learning- Fairlearn- AI Fairness 360

Implementation of K-Nearest Neighbors Algorithm for Energy Disaggregation Based on Internet Of Things

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Abstract

The increase of word energy consumption is not equal to the amount of energy available. Meanwhile, the availability of fossil energy cannot be renewed and will be depleted by continuous exploration, which will cause an energy crisis. One solution to overcoming the energy crisis is by saving energy, including doing energy management. Energy savings are also more effective if users are involved. Users need power consumption information to save energy. By using smart meters, users will be able to monitor the load consumption of each appliance. In this study, the author offers a way of energy management by disaggregating electrical energy. The author uses the concept of Internet of Things (IoT) in a disaggregation system that is built to communicate between devices, storage, and analytical data. In this study, we obtained a load dataset of five incandescent lamps with different power. The machine learning model used is the K-Nearest Neighbors (KNN) algorithm with the Menkowski metric parameter and the number of closest neighbors (k) is 13. The result is all the activities of the five predicted lamps are the same as the actual lamp activity. This means that the KNN algorithm that was built on disaggregation has 100% of accuracy.

Keywords: Energy management, Load disaggregation, IoT, Analytical data, KNN

ABS-30

Trimethylamine gas sensor based on quartz crystal microbalance-polyvinyl acetate nanofibers overlaid with maltodextrin

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Abstract

Trimethylamine (TMA) is a compound that occurs as a result of fish spoilage and can irritate human mucous membranes and eyes, hence it is important to monitor its levels in the air. In this study, a quartz crystal microbalance (QCM)-based sensor with polyvinyl acetate nanofibers overlaid with maltodextrin was proposed to detect TMA gas. The results of the scanning electron microscope (SEM) and Fourier-transform infrared spectroscopy (FTIR) are included to determine the morphology and chemical composition of the sensor layer. As a result, the sensor has a sensitivity of 0.508 Hz/ppm to TMA gas with a low limit of detection (LOD) of 15.8 ppm, an increase in sensitivity of 8.4 times greater than without maltodextrin. The hydrogen bond between the active group of maltodextrin and TMA gas molecules is believed to be the cause of the increased sensitivity. The sensor also has good reproducibility and reversibility. Furthermore, the sensor has fast response and recovery times of 141 s and 116 s, respectively. In addition, the sensor exhibited superior selectivity over other analytes, and the stability of the sensor during the 20 days of testing was remarkably excellent. Thus, the resulting sensor can be an alternative to the classic detection method for detecting TMA gas.

Keywords: Maltodextrin, polyvinyl acetate, quartz crystal microbalance, trimethylamine

ABS-31

Design of Soil Shift Measuring System Based on Rotary Encoder Sensor and Esp32 Microcontroller

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Abstract

This research was motivated by the many cases of landslides that have occurred in Indonesia. This study aimed to design and manufacture soil shift measuring system based on rotary encoder sensors and ESP32 microcontroller. This research was conducted in two stages, namely designing and manufacturing of soil shift measuring system. The design of the instrument was made using Sketchup software and the schematic design was made using Proteus software. Instrument manufacturing were done in two stages, namely software and hardware manufacturing. Hardware manufacturing were started from preparing tools and materials, making a PCB, assembling components, and checking of the instrument. The results showed that soil shift measuring system based on rotary encoder sensors and ESP32 microcontroller has been designed and manufactured successfully.

Keywords: soil shift measuring system, landslides, rotary encoder sensors, and ESP32 microcontroller

Characterization of Ammonia Sensor Based on Quart Crystal Microbalance Coated with Polyvinyl Acetate Modified by Chitosan

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Abstract

High sensitive and selective ammonia gas sensor has been fabricated and characterized based on Quart Crystal Microbalance (QCM) Coated with Polyvinyl Acetate (PVAc) Modified by Chitosan. Fabrication of nanofiber PVAc (15% w/w in DMF) on the QCM surface was carried out by electrospinning method with collector distance of 15 cm and a voltage of 15 kV. The low molecular weight of chitosan was modified by 1% w/w in 2% of acetate acid. Dilution of 1% chitosan to 0.1%, 0.2%, and 0.3%, followed by chitosan deposition used the drop case technique on QCM-PVAc. The results indicated that the best optimization was at 0.3% chitosan, which cause high sensitivity of sensor. QCM-PVAc/Chitosan 0.3% has a sensitivity of 1.7 Hz/ppm- and the linearity of 0.99 in the range (0 - 500) ppm. Meanwhile the limit of detection (LOD) and limit of quantitation (LOQ) 15 ppm and 46 ppm- response time was 7 seconds- good stability- great selectivity to ethanol, toluene, methanol, acetone, and water compounds. The addition of drop casted chitosan has increased the selectivity and sensitivity of the sensor.

Keywords: Ammonia, Chitosan, PVAc, QCM, Selectivity, Sensitivity.

Augmented Reality Climate Change (AR-CC) for Physics Learning in High Schools

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Abstract

This study aims to produce 'Augmented Reality Climate Change (AR-CC)' as a medium for physics learning for Climate Change in high school. The method used in this study is the Research and Development method with the ADDIE model (Analyze, Design, Develop, Implement, and Evaluate). AR-CC was developed to make it easier for students to learn the concept of climate change. AR-CC can display five 3D simulations, including 3D simulations of greenhouse effect processes, ozone depletion, acid rain, El-Nino and La-Nina phenomena. In addition to AR, in this study, a worksheet was also developed to guide student learning activities and valuable as a marker. The results of product validation covering the material and media aspects got a very good average score (85% and 90%). Based on the results of the expert validation test, it can be concluded that AR-CC is suitable for use as a medium for learning physics in high school.

Keywords: Augmented reality, Climate change, Physics learning.

Initial Design of IoT-Based Earthquake Intensitymeter Using MMI Scale with Smartphone Display

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Abstract

Indonesia is one of the countries geographically located in the ring of fire zone which causes frequent earthquakes. Earthquakes are natural disasters that cannot be predicted when they occur. The lack of development of digital tools for earthquake mitigation in the community causes losses in material terms and casualties are always high. Therefore, the author designed an earthquake mitigation tool that can run accurately and at an affordable manufacturing cost. This tool is created using the MPU-6050 accelerometer sensor which functions as an earthquake movement detector, the output produced by the sensor is in the form of an acceleration value from ground movement. The readable value will be converted into gal units so that the readable data is compared to the MMI scale. System testing is carried out by providing different treatments to the system in the form of 10 load variations by dropping the load with a load fall distance from the system, which is 40 cm. The readable data can be seen in the smartphone application with features in the form of a graph of ground acceleration movements and real-time data that can be accessed on a self-designed web server.

Keywords: Intensitymeter, Earthquake, IoT, MMI Scale, Smartphone.

ABS-36

Control System Application in The Production Unit of The MASARO Organic Liquid Fertilizer to Improve the Production Capacity

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Abstract

While struggling against the COVID-19 pandemic, Indonesia faces a fundamental problem as now the food consumption demand is growing rapidly. In fact, 19.4 million people had to suffer from hunger in 2021. This is far from the government's goals to pursue the food estate by land intensification as plant media in 2024. To accomplish the food estate, even Indonesia has a big chance to survive depending on natural sources. Moreover, about 86.5% of Indonesian farmers depend on inorganic fertilizers. That eventually will lead to environmental and economic problems. The viable option to solve these problems by applying MASARO (Manajemen Sampah Zero) to enhance the abundant organic waste as organic liquid fertilizer and improve the agricultural industry's productivity. MASARO is a waste management scheme that can manage waste until there is no residue (zero) by utilizing the waste into valuable products. POCI (Pupuk Organik Cair Istimewa) MASARO, an organic waste processing product, is made by enzymatically fermenting decomposing waste using the MASARO catalyst. The production of POCI is carried out in two fermentation stages where the carbohydrate and protein are converted into organic acid and amino acid on the first stage and continued with the amino acid decomposition on the second stage. An important indicator of the complete fermentation process of POCI is pH which is required in the range 3.9 - 4.2 within four weeks. In fact, the fermented mixture only needed 6 to 12 days to reach the desired pH range after the production operation was done. By relying on time measurement, producing a maximum production rate will not be feasible. This research is conducted to implement in-line production control in POCI MASARO production process using Arduino, sensors, and transmitters as the control equipment. Arduino is a friendly-user open-source electronic prototyping platform for designing and creating an electronic device which takes input from switches and sensors. The sensor will read the detected pH number. This control system is equipped with an alarm to produce an audible alert sound from an active buzzer as reaching desired pH range. Through this research, the effective process of MASARO operation can be accomplished by reducing production time.

Keywords: Control, fertilizer, MASARO, pH

ABS-37

Quality Levels Classification of Indonesian Black Tea using Electronic Nose Sensory System Coupled with Ensemble Learning Method

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Abstract

Aroma is considered to be the most important attribute for tea quality determination. In this work, an ensemble learning classifier was proposed to classify the quality levels of Indonesian black tea using an electronic nose sensory system. Four machine learning techniques, namely quadratic discriminant analysis (QDA), extreme gradient boost (XGBoost), k-nearest neighbor (k-NN), and support vector machine with radial basis function (SVMRBF) kernel are used as base classifiers in the ensemble classifier. All incorporated base classifiers and the final outcome of the ensemble model are being compared against several performance metrics namely accuracy, area under the curve score, recall, precision, and F1-score for the classification of black tea quality levels. The experimental results showed that the ensemble model achieve the best performance with the training and testing accuracy results of 100% and 98% respectively which is a noticeable improvement compared to the basic learners. The overall results demonstrated that E-nose sensory system combined with the ensemble learning-based method can improve the efficiency of discriminating black tea quality levels.

Keywords: Aroma, Ensemble learning classifier, Accuracy, Area under the curve, Recall, Precision

ABS-38

Factor Analysis of Intention to Adopt an Online Fish Auction System

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Abstract

The COVID-19 Pandemic has held back the growth of the fisheries sector in Indonesia, especially in its upstream supply chain. However, this is not applied to the downstream chain in which the demand is growing. These demands include consumption through digitalization. The digital platform that are emerging everyday are on their way to disrupt nearly all the areas of traditional business processes. Perishable products, including fishery products, have been one of the commodities that grab the market attention on the e-commerce platform. However, due to the long and complex fishery products supply chain, many problems were faced by suppliers and the customer of this perishable product. Thus, the availability, high quality, and competitive price of fishery products on the platform might be difficult and highly dependent on the supplier. One of the solutions proposed in digital supply chain is reducing the supply chain's complexity. One example is proposing an online fish auction system. Online fish auction systems can provide the customer direct access to the upstream of the supply chain. Despite many benefits that are potentially gained by the solution, it is not yet clear how the customer would prefer these new technologies ideas to be implemented. Therefore, this study proposed a multivariate statistical technique to investigate consumer behaviour. This study developed a framework that combined the unified theory of acceptance and use of technology 2 (UTAUT-2) and the theory of planned behaviour (TPB) to analyze the factor affecting the intention of customers to adopt an online fish auction system. This study has successfully developed the model, including several indicators for measuring the latent variable. Further study would implement the model and generate the survey to have conclusive results.

Keywords: Online Fish Auction, Structural Equation Modelling, UTAUT-2, TPB

ABS-39

Development of Moderator Based Neutron Spectrometer

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Abstract

The single moderator neutron spectrometer is a neutron spectrometer development by modifying multisphere technique. Multisphere is a moderator-based neutron spectrometer technique to measure the spectrum with the most comprehensive energy range from eV to GeV. The development aims to obtain a more practical device in mobility and technical measurement than multisphere. The development of a single-moderated neutron spectrometer in the aspect of moderator geometry has resulted in two types: spherical and cylindrical shapes. The spherical shape is applied to measure the multi-directional neutron beam, while the cylindrical shape is used for the one-way beam measurement. Therefore, compared to cylindrical, spherical shape requires more neutron detectors. Furthermore, the developments in the aspect of the applied detector have used active and passive type detectors. The active type of detector is used to measure intermediate flux neutrons, with the detector materials used generally being scintillator and gas ionizer. The passive type is usually used for measuring high or very low flux neutrons, with the detector materials used being dosimeter and activation. The validation results of 2.5% - 3.2% of single sphere and 2% - 8% of single cylinder show that the single-moderated neutron spectrometer design is sufficient to replace the multisphere type spectrometer.

CLUSTERING OF REGIONS WITH POTENTIAL FOR A TSUNAMI IN INDONESIA USING THE DBSCAN METHOD (DATA STUDY FOR 1822-2022)

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Abstract

Geographically, Indonesia is an archipelagic country that has a long coastline. Many community activities are carried out in coastal areas, especially coastal communities. Tsunami is one of the risks of natural disasters that can occur in the area. This study aims to classify areas prone to tsunamis and classify their characteristics. The variables in this study are longitude, latitude, focal depth, and earthquake magnitude. In this study, Density-Based Spatial Clustering of Application with Noise (DBSCAN) and OPTICS algorithms were used to group tsunami datasets. To test the quality of the model, the silhouette score calculation method was used. The results of DBSCAN clustering with =1.9 and MinPts=3 obtained 9 clusters with a silhouette score of 0.378835. Meanwhile, the OPTICS clustering method with =1.9 and MinPts=3 obtained 18 clusters with a silhouette score of 0.242401.

Keywords: DBSCAN, OPTICS, tsunami clustering, MinPts, silhouette score

Development of Smart Solar Panel Monitoring and Protection System from Hot-Spot Effects by utilizing Machine Learning

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Abstract

The use of solar panels as a low-carbon alternative for electricity generation is increasing as the demand to overcome the climate change problem increases. Nowadays, solar panels are now prospective to be used on a small and individual scale such as in residential houses or small offices. However, in such individual usage, solar panels are often placed in an environment with many surrounding objects that may cause sunlight obstructions forming shadows on the solar panel surface. The shadows can cause hot-spot effects that lead to solar cell panel degradation. Besides regular periodic shadows, there are also incidental sunlight obstructions due to falling leaves, bird droppings, debris, etc. Therefore, the usage of solar panels such as in this environment requires a system for controlling and monitoring the healthiness of the solar panels. Here, we develop such a system by implementing bypass circuits and machine learning. By using a data classification artificial intelligence algorithm, an early warning system can be created and remove the need for the individual to monitor the solar panels. In this presentation, the algorithm was trained on the patterns of current generated by the cells from the 8 hours during daylight. It is then used to determine whether the next-day pattern of the generated current is unusual or not. When the system decides that the pattern is unusual then it will raise an alert showing the presence of unusual sunlight obstructions or shadows on the solar panels. With such a smart system, solar panel health monitoring will be more effective and friendly to the users.

Keywords: solar panel, hot spot effect, health monitoring, machine learning

ABS-42

Quantitative Comparison of Electroencephalography Systems Based on Measurement Results Between Medical and Wireless Consumers Devices

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Abstract

Electroencephalography is a recording technique for human brain's electrical activity by the help of metal electrodes on the surface of the scalp. Electroencephalography devices record electrical analogue signal from the subject, subsequently convert it into a digital representation. This research was conducted to assess Emotiv EPOCX recording quality, by quantitatively comparing the recordings of Emotiv EPOCX with the recordings of Neuron-Spectrum-63, as a medical electroencephalography device. Recording data from Neuron-Spectrum-63 and Emotiv EPOCX were obtained from 16 male subjects in age 19-23 years old. Recording for both devices were done sequentially with similar methods of recording. The recording for Emotiv EPOCX was conducted first. Throughout the recording, subjects were asked to sit on a chair with closed and opened eyes for 30 seconds each. Subsequently, subjects took a verbal memory test. This research compared following parameters: peak PSD, FWHM from PSD, IPAF, IPAF shift, and absolute IPAF shift. Based on mentioned parameters, p-value, standard error, mean absolute percentage error (MAPE), and mean squared error (MSE) were also obtained. Based on IPAF, IPAF shift, and absolute IPAF shift results, it was concluded that Emotiv EPOCX was capable in reading EEG signals against time well. However, based on FWHM results, the quality of the EEG signals reading against time by Emotiv EPOCX was not as good as the reading by NeuronSpectrum-63. Based on PSD and FWHM results, it was concluded that Emotiv EPOCX was not capable in reading EEG signal amplitudes well compared to medical device.

Keywords: Electroencephalography, consumer grade, medical grade

ABS-43

Design of Temperature Measuring and Controlling Systems in Cascara Vinegar Acid Bioreactor

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Abstract

Technological developments attracted researchers to present systems that can help human work become easier and more efficient, especially in the production process. The vinegar acid production of coffee peel (cascara) is crucial to extend the shelf life and increase the selling value. This study aimed to design a temperature measurement and control system in the cascara vinegar acid bioreactor. The Raspberry Pi 4 microcontroller integrated the DS18B20 sensor was used to measure the temperature of vinegar and cooling water. The rate and temperature of the cooling water were controlled using the microcontroller based on the sensor output and the temperature limit set by the user. Code editing software, Visual Studio Code was used to write, edit, and upload the program to the microcontroller. The programming languages used were Python and Java. The results showed that the characteristics of the DS18B20 sensor were suitable for application as a temperature detector in the production process of cascara vinegar acid.

Keywords: cascara, temperature, control, bioreactor, vinegar production, microcontroller

Monitoring and Controlling Systems Design of pH Cascara Vinegar Acid in Bioreactor

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Abstract

Fermentation is one option to extend the shelf life and increase the bioactive compounds of coffee rind (cascara). This study proposed to design monitoring and controlling systems of pH in the fermentation process of cascara in a bioreactor. The systems were designed using the Raspberry Pi 4 microcontroller integrated with the pH sensor SKU: SEN0169 brand DF Robot. The microcontroller was programmed to optimize the pH value of vinegar acid during the fermentation process. A peristaltic pump controlled by the microcontroller could inject either base or acidic solutions into the bioreactor. In addition, the microcontroller was used to control the stirring rod in the bioreactor so that the vinegar acid be homogeneous. Python and Java-based programming languages with a code editor of Visual Studio Code software were used to write, edit, and upload programs to the microcontroller. The results showed that the pH sensor was compatible to measure the pH value of cascara vinegar.

Keywords: cascara, fermentation, vinegar, pH, microcontroller

ABS-45

Design of Oxygen Levels Monitoring and Controlling Systems for Cascara Vinegar Acid Production in Bioreactor

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Abstract

Automation technology could increase flexibility and efficiency, especially in the production of foodstuffs. Processing coffee peel (cascara) into vinegar acid is important to reduce waste and increase selling value. This study intended to design monitoring and controlling systems of oxygen levels in a bioreactor producing cascara vinegar acid. The oxygen sensor SKU:SEN0322 brand DF Robot integrated the Raspberry Pi 4 microcontroller was utilized to monitor and control oxygen levels during the cascara fermentation process. The microcontroller was programmed to ensure that there was no oxygen in the cascara anaerobic fermentation process and to deliver oxygen to the bioreactor in the aerobic process if non-optimal oxygen levels detected. Programming languages based on Python and Java were used to program the microcontroller. Visual Studio code editing software was employed to write, edit, and upload programs to the microcontroller. The results showed that the oxygen sensor was appropriate for monitoring oxygen levels in the cascara fermentation process.

Keywords: cascara, fermentation, vinegar, oxygen levels, microcontroller

ABS-46

Development of an All-sky Camera for Indonesian Sky Patrol Network

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Abstract

We developed the All-Sky Camera using a CMOS Sensor which is integrated with various other supporting devices to optimize image and video recordings. In general, CMOS cameras are not equipped with a cooling system which can cause increased noise. Therefore, our design is equipped with an external cooling system to keep the temperature stable at night or during the day. In addition, our designs are also equipped with various other sensors such as rain sensors, cloud sensors, light sensors, and sensors for environmental conditions such as pressure, temperature, and humidity. The development of the All-Sky Camera will also be used as a tool to monitor the sky throughout Indonesia with the Indonesian sky patrol network. As a result, we managed to record several astronomical phenomena, such as meteors and space debris. For future scientific needs, the All-Sky Camera that we have developed is also used to monitor changes in light pollution and identify sources of light pollution, as well as the quality of the atmosphere at the ITERA Lampung Astronomical Observatory Environment (OAIL).

Keywords: All Sky Camera- Sky Patrol- CMOS- Sensor

ABS-47

A Self-Construction Automatic Crescent Sighting Detection With Harr - Cascade Classifier Using Adaboost Algoritm and Support Vector Machine

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Abstract

The automatic detection method using computer vision applied to the crescent moon is a novel concept that will be further developed. This will be highly useful for observers during the process of observing the crescent visibility. This paper proposes a method for high-performance crescent detection based on visual attention mechanism and AdaBoost cascade classifier. Our method constructs the structural Haar features and extracts the features of samples using structural Haar features and trains an AdaBoost cascade classifier. Then we use the visual attention mechanism to extract the target candidate region. At last, we generate detecting sub-windows in the candidate region and discriminate them with the cascade classifier to realize crescent detection. The results obtained have proven excellent detection performance not only when the crescent is visible in front of the camera but also when the crescent is partially covered by clouds. In addition, our approach can be applied during real-time experiences.

Keywords: Automatic Detection- Crescent Moon- Computer Vision

ABS-48

Development of Repeatable Taste Sensor Based on a Mixture of Two Lipid membrane for Saltiness

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Abstract

Our study aimed to investigate the repeatability of taste sensors for saltiness. The sensor is based on a lipid membrane consisting of a mixture of two types of lipids. The lipids used are hexadecanol and tetradodecylammonium bromide (TDAB). Other materials used are dioctyl phenylphosphonate (DOPP) as a plasticizer, polyvinyl chloride (PVC) as a matrix and tetrahydrofuran (THF) as a solvent. The solution (sample) tested is sodium chloride (NaCl) with three variations in concentration (0.1 mM- 1 mM- and 10 mM). The response of the sensor is indicated by the potential difference between the sample potential (Vs) and the reference potential (Vr). The difference in potential (Vs - Vr), called the relative value. Sensor responses show that the sensor can evaluate saltiness with three variations of concentration. Measurements for five consecutive days show that the sensor is repeatable. This is indicated by the sensor response which is almost the same for five days.

Keywords: membrane, lipid, sensor, saltiness, repeatable

ABS-49