CONFERENCE PROGRAM

The 4th International Seminar on Sensors, Instrumentation, Measurement and Metrology

(ISSIMM) 2019

Padang, November 14th, 2019
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Steering Committees
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Dr. Yulkifli, M.Si

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Yohandri, M.Si, Ph.D

Co-Chairs
Dr. Ramli, M.Si

Secretary
Mairizwan, M.Si

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Even Triaga, S.Si

Accommodation
Nofri Hardisal, S.Si

Documentation
Edi Kurnia, S.Si
Meeting Venue

UNP Hotel and Convention

The participants may use one of the few options written below to reach the venue:

- Intercity bus from any cities in Sumatera and Java to Padang
- Air plane: There is flight directly from Kuala Lumpur International Air Port and any cities in Indonesia (Jakarta, Medan, Batam, Pekanbaru etc.). Arrive at Minangkabau International Airport (BIM). Take a taxi and tell the driver to go to UNP Hotel and Convention, Universitas Negeri Padang (UNP).
Chair’s Report

On behalf of the Steering Committee, it is my great pleasure to welcome you to attend The 4th International Seminar on Sensors, Instrumentation, Measurement and Metrology (ISSIMM 2019) will take place in Padang, West Sumatera, Indonesia at November 14th, 2019.

This 4th ISSIMM is hosted by the Physics Department, Faculty of Mathematic and Natural Science, Universitas Negeri Padang. It is jointly organized by Universitas Indonesia (UI), Universitas Brawijaya (UB), Universitas Gadjah Mada (UGM), Institut Teknologi Bandung (ITB), Institut Teknologi Sepuluh Nopember (ITS), Universitas Airlangga (UNAIR) and Universitas Negeri Padang (UNP). Moreover, Physical Society of Indonesia (PSI), Instrumentation and Metrology (Puslit KIM-LIPI).

The main objective of this seminar is to provide an international platform for researchers, Academicians as well as industrial professionals to present their research on sensors, instrumentation, measurement and metrology and other related fields. The seminar will include 2 (two) plenary speeches (Prof Koo form Multimedia University, Malaysia and Prof Setiawan form Universitas Brawijaya, Indonesia) and 90 (ninety contributed presentations) from various affiliation.

I would like to express my sincere appreciation to all the participants, supporting organizations and all the committee members who will make ISSIMM 2019 successful. With these strong support, we are sure ISSIMM 2019 will be beneficial to all the participants, and you will enjoy Padang.

Thank You

Yohandri, Ph.D
General Chair of ISSIMM2019
Welcome Message: Dean of Faculty of Mathematics and Natural Science

Assalamualaikum wr. wb.

Rector of Universitas Negeri Padang
Vice-Dean of Faculty, Mathematics and Natural Science
Head of Department and Graduate Program in Faculty of Mathematics and Natural Science

Distinguished Invited Speakers
Organizers of this conference

Dear participants
Ladies and gentlemen

I am delighted to have this opportunity to welcome you in the 4th International Seminar on Sensors, Instrumentation, Measurement and Metrology (ISSIMM 2019) which is hosted by Physics Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang. We are especially honored by the presence of the eminent keynote speakers, who have graciously accepted our invitation to be plenary Speaker.

- Prof. Dr. Koo Voon Chet, Multimedia University, Malaysia
- Prof. Dr. Setyawan Purnomo Sakti, Universitas Brawijaya, Indonesia

To all speakers and participants, I am greatly honored and pleased to welcome you to Padang.

This conference is a special occasion for those who work in sensors, instrumentation, measurement and metrology and other related fields. It will be an occasion to meet, to share information, to exchange new ideas and application experiences. In addition, direct contacts among the researchers and scientists will therefore promote international research networking as well as collaboration in the future.

In closing, I wish the participants a very fruitful and productive meeting, but I do hope you will also take time to enjoy fascinating Padang, with its tropical setting, friendly people and multi-cultural cuisine. I also wish to express my gratitude to the Organizing and Scientific Committee for their diligence.

Finally, we respectfully request the Rector of Universitas Negeri Padang to open the ISSIMM 2019 officially.

Thankyou,

Dr. Yulkifli, S. Pd., M. Si.
Dean
Opening Remark from the Rector of Universitas Negeri Padang

Assalamualaikum wr. wb.

Vice Rector of Universitas Negeri Padang
Dean and Vice-Dean in Universitas Negeri Padang
Distinguished Invited Speakers
Organizers of this conference
Dear participants

Ladies and gentlemen

It gives me great happiness to extend my sincere and warm welcome to the participants of the 4th International Seminar on Sensors, Instrumentation, Measurement and Metrology (ISSIMM 2019). On behalf of Universitas Negeri Padang, let me welcome all of you to the conference in Padang, West Sumatra, Indonesia.

We believe that from this scientific meeting, all participants will have time to discuss and exchange ideas, findings, creating networking as well as strengthen the existing collaboration in the respective fields of expertise. On the other hand, through this conference we can improve the quality of our researches as well as innovation and trend in Sensors, Instrumentation, Measurement and Metrology and other related fields.

I would like to express my sincere appreciation to Physics Department, Faculty of Mathematic and Natural Science and organizing committee who have organized this event. This is a great opportunity for us to be involved in an international community. I would also like to extend my appreciation and gratitude to keynote speakers and participants of this conference for their contribution to this event.

Finally, I wish all participants get a lot of benefits at the conference. I also wish all participants can enjoy the atmosphere of the city of Padang, West Sumatra.

Thank you

Prof. Ganefri, Ph.D
Rector
# Rundown Of ISSIMM 2019

## Seminar Day: Thursday, November 14th, 2019

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**Moderator: Gita**

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<td>Non galvanis measurement of partial discharge using antenna boutique.</td>
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<td>Arie Listyarini</td>
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**ROOM 4: Big Data and metrology, and Remote Sensing Technology.**
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<td>Ali Syahputra Nasution</td>
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<td>Prediction of PM2.5 and PM10 Parameters Using Artificial Neural Network: Case Study in Kemayoran, Jakarta</td>
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## The 4th International Seminar on Sensors, Instrumentation, Measurement and Metrology

### Encrypted Remote Sensing Satellite Images

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<td>Detecting the Burned Area in Southern Kalimantan by Using the Sentinel-1 Polarimetric SAR and Landsat-8 OLI Optic</td>
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### ROOM 5: Computational intelligence technology, and Image and signal processing

**Moderator: Nidya**

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Planary Session
The 4th International Seminar on Sensors, Instrumentation, Measurement and Metrology
Quartz Crystal Microbalance for Physical Sensor, Chemical Sensor and Biosensor: Sensing Devices, Acquisition and Challenge

Setyawan P. Sakti
Sensor Technology Laboratory & Collaborative Research Center for Advanced System and Material Technology
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The sensitivity of the Quartz Crystal Microbalance (QCM) sensor to a mass change, viscosity change and film property change have been known and continued to be explored for various applications. The availability of the quartz crystal resonator, the sensor preparation and its system instrumentation attract the development of the QCM sensor around the world. The wide range of sensor application together with the possibility to develop the instrumentation system which requires simple and low cost to a high sophisticated research tools makes it attractive. The development of the system covering the instrumentation system, sensor surface modification, sensitive layer development and sensing device is an interesting aspect for the academic and commercial interest. The advance of the microelectronic technology resulted in a compact form of the instrumentation for the QCM sensor. The detection limits of the sensor were reported as low as nanograms of mass. Which have been used for material deposition detection, chemical sensor and biosensor. Based on current state of the electronic technology, detection limits down to an order of picogram could be possible. In other aspect, the surface modification of the sensor both for the sensitive layer or matrix layer has been reported from monolayer to a thick layer. This allows the utilization of the QCM sensor not only based on the traditional mass change detection, but also by using other physical change property of the coating film. Swelling and phase transition of the film which affects the resonance frequency as well as the impedance of the sensor could be an interesting aspect to be explored further for high sensitive chemical sensor application. However, it leaves many challenge to better understanding the coating material property change in contact with the target molecules.
Smart Sensing For A Better Tomorrow

Koo Voon Chet

ABSTRACT:

A country is said to have a better quality of life if the country can provide better opportunities for a healthy, safe and prosperous life in the years ahead. Quality of life concerns about the general well-being of individuals and societies. It observes life satisfaction in various aspects, including physical health, safety, wealth, the environment, and more. In this talk, we will review some of the state-of-the-art technologies used for the purpose of improving tomorrow’s quality of life. Particularly, we will discuss on how smart sensing can help in protecting our environment, safeguarding our properties, increasing productivity for farmers, and connecting people to the love one.

Prof. Ir. Dr. Koo Voon Chet

Director, Research Institute for Digital Lifestyle, MMU

Voon-Chet KOO is currently a full Professor of Multimedia University. His research interests include remote sensing technologies, signal processing, and embedded system design. With more than 20 years of experience under his belt, he has become a renowned international speaker for various international conferences, seminars and lectures for universities, and public and private agencies in various countries around the world.

In terms of publication, he has successfully published more than 100 papers in refereed journals, international conferences, 4 books, and 11 patents. With his extensive and rich knowledge and experience, it is no wonder that he became the recipient of the inaugural Young Engineer Award by the Institution of Engineers, Malaysia in 2004.

As for other professional involvement, Prof. was the Chairperson for the Centre for Remote Sensing and Surveillance Technologies, MMU, Chair of the IEEE Geoscience and Remote Sensing Society Chapter, Malaysia Section, a registered Professional Engineer with Practicing Certificate, a Fellow of the ASEAN Academy of Engineering and Technology (AAET), and a senior member of IEEE. Prof. Koo is also the founder and the current CEO of a spin-off company of the university research centre. The company, iRadar, was incorporated in 2011 with primary focus to provide smart sensing solutions for precision farming, construction, mining, and more.
ABSTRACT COLLECTIONS

Parallel Session

The 4th International Seminar on Sensors, Instrumentation, Measurement and Metrology
Low Cost Dual Frequency Impedance Analysis For Measuring Internal And External Cellular Fluid

Khusnul Ain 1,a, Riries Rulangingtyas 1,b, R. Arif Wibowo 2,c, Soegianto Soelistiono 1,d, Lailatul Muniroh 1,e, Tri Anggono 2,f, M. Rizky Yusdy 1,g

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3Public Health, Airlangga University, Indonesia
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Keywords: low cost, intracellular, extracellular, dual frequency, bio-impedance

ABSTRACT. The regulation of body fluid balance is a major concern in body health. Disruption of body fluid balance is a major factor responsible for changes in cell volume. It can affect cell function and survival. Intracellular fluid (ICF), extracellular fluid (ECF) and total body fluid (TBW) have been used as information on body fat levels, dengue indications and some chronic diseases. The design and development of dual frequency bioelectrical impedance analysis prototype as a candidate of intracellular and extracellular fluid measuring instrument. The device is built using sine wave generator from ICL8038 which can produce 20 kHz and 75 kHz, voltage controlled current source (VCCS) from LF412 which can generate 0.5 mA from Howland dual op-amp method, potential was measured by instrument amplifier from AD620 and used AD536 as AC to DC converter. The device performance was tested on 10 volunteers. The performance indicator is relationship between ICF and ECF calculations against H²/Z. The analysis of intracellular fluid (ICF) was obtained from measurement of total body impedance at high frequency 75 kHz. It has excellent linearity with R² = 0.9636. While analysis of extracellular fluid (ECF) was obtained from measurement of total body impedance at low frequency 20 kHz. It has a very good linearity with R² = 0.9579.

References

A High Voltage Electrostatic Filter For Fine Particles Capture Applied in Motorcycle Exhaust System

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**Keywords:** Efficiency; electrostatic principle; filtration system; fine particle; motor vehicle emission.

**ABSTRACT.** Increasingly strict air pollution regulations along with a global warming issue have peaked an interest in cleaner emission emitted by motor vehicles. In line with this, this study was aimed to develop a low-cost particulate filtering system based on an electrostatic principle for particulate matter with the diameter less than 2.5 \( \mu \)m, as known as a fine particle, and to test the performance of the filter. The filter consisted of aluminum anodes and cathodes as the electrostatic electrodes. These electrodes were placed into the filter frame and installed on a motor vehicle muffler. The test was conducted to obtain the filter performance by measuring particle concentrations before and after using the filters. The filter was tested under four different electrostatic voltages: \( V_1 \) 100Volt, \( V_2 \) 200Volt, \( V_3 \) 300Volt, and \( V_4 \) 400Volt. The results show that the filter can reduce fine particle concentrations with the best efficiency of 50\%, 60\%, 62\%, and 68\%, respectively for \( V_1 \), \( V_2 \), \( V_3 \), and \( V_4 \). Filter performance was directly influenced by the applied voltage and the time of the test.

![Figure 1. Correlation between voltage and filter efficiency at 10\textsuperscript{th} minute (blue line) and 40\textsuperscript{th} minute (green line)](image)

**References**


Design and Implementation of Water Pump Control System for Rice Field Irrigation

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Keywords: Electronic instrument, control system, water pump, irrigation, rice field, short message service.

ABSTRACT. We have built an electronic instrument of water pump control system for rice field irrigation, as shown in figure 1. This instrument is developed from the previous prototype\textsuperscript{[1]} with some additional features. This instrument is equipped with the keypad, GSM modem, water flow sensor, and relay as the input sources. An Arduino Mega 2560 is used as the main controller of the system. The working time of the water pump can be set using the keypad or short message service, which is received by GSM modem in the instrument. If there is no water flowing through the water pump as detected by the water flow sensor, the instrument will automatically shut down the water pump, and send the notification message to the user’s handphone. When the abnormal condition is detected on the water pump, the relay will disconnect the electricity to avoid the severe damage of the water pump. This instrument has been installed and used by the farmer in Desa Ngunut, Babadan District, Ponorogo Regency, with support from DRPM Kemenristekdikti through Program Kemitraan Masyarakat\textsuperscript{[2]}.

![Figure 1. Picture of water pump control instrument](image)

References

Beat Frequency Measurement of the Stabilized He-Ne Laser 633 nm Calibration in BSN

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Keywords: optical wavelength, calibration, beat frequency measurement, stabilized He-Ne laser

ABSTRACT. In the metrology area, typically stabilized lasers are used as length primary standard. Iodine stabilized He-Ne laser in National Standardization Agency of Indonesia-BSN (KIM-1) has been traceable to SI unit through CCL-K11 inter-laboratory comparison in 2014, the result was suitable for KIM-1 to be used as the length primary standard in BSN. The optical wavelength calibration system has been established as a dissemination system of the reference value of KIM-1. Beat frequency measurement was applied in the calibration system for stabilized He-Ne laser 633 nm. In the calibration replica, a dual-frequency mode (Agilent 5519B) took a role as UUT laser, which emits a pair of beams with a central wavelength of $\lambda=632.991354$ nm in vacuum with frequency difference 3.4 to 4.0 MHz and $\pm 0.02$ ppm stability for a typical lifetime. As a calibration result, the optical wavelength of Agilent 5519B is (632.991 371 06 ± 0.000 000 13) nm and (632.991 374 73 ± 0.000 000 14) nm, respectively for vertical and horizontal polarization beams. It shows that Agilent 5519B produces a wavelength in the acceptable range and can be traced back to SI unit of length through KIM-1.

![Figure 1. Scheme of the configuration setup for beat frequency measurement in SNSU-BSN](image-url)
References


Changes Of Mangrove Area In Pangpang Bay, Banyuwangi 2014-2018 Using Landsat-8 Imagery

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**Keywords:** Area Changes, Landsat 8, Mangrove, Maximum Likelihood Classification, Pangpang Bay.

**ABSTRACT:** The existence of mangrove has important role for environment and living creatures. Mangrove is a habitat for various types of animals and it can produce wood and non-wood products such as charcoal, fodder, firewood, food and medicine. Other than that, mangroves also produce various environmental services, such as stabilizing coastlines, controlling water quality and mitigating global climate change. With many important roles of mangrove, monitoring the changes of mangrove area become important to give us the information. One of the effective ways in monitoring mangrove is using remote sensing system, in this case, Landsat 8. This research aims to identify the changes of mangrove area in Pangpang Bay conservation area during 2014-2018 by using Landsat 8 imagery. Research carried out by several phases: pre-processing, band selection, image classification and accuracy assessment. Composite of 564 RGB on Landsat 8 imagery was used for identification of mangrove and the classification method used in this research was maximum likelihood classification (MLC), that consider several factors including the prior probability that chances of a pixel to be grouped into classes or certain categories. The classification result indicated 3 land cover classes: water bodies, land and mangrove. The result of 564 RGB composite on Landsat 8 imagery showed that there was an increase of 1363.61 Ha in total mangrove area from 2014 to 2018. Pangpang Bay experiencing expansion of mangrove area from 2014 to 2018 because that place is a mangrove conservation area, so that the sustainability of mangrove is maintained.

![Figure 1. 564 RGB composite of Pangpang Bay on Landsat 8 Imagery](image)

**References**

Oil Spill Monitoring using Radar Image

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Keywords: oil spill, radar image, sentinel, dark spot, image processing

ABSTRACT.
Litter or Debris on ocean has become major issue in the world, Indonesia is an island country that has known has so many islands was also facing this problem. The litter was consist of several things like plastic garbage, oil spill, home waste and others. Monitoring the Indonesian seas with a very broad scope would be very difficult, without the help of technology, current satellite technology is quite useful in monitoring the sea. One of the advantages of satellite imagery currently being used is oil spill monitoring. Radar satellite imagery is often used to monitor the distribution of oil spills, by using VV polarization from Sentinel-1 (Descending and Ascending mode), the images will available on 6 day repetition. Monitoring very large area will be easier using Sentinel 1 data. Location and date acquisition can be modified through Google earth system, but for specific date user can access scihub system (Sentinel official website). Currently Google Earth engine only provide Sentinel-1 image pre-processing from Ground Range Detected (GRD level), for Single Look Complex still have some issue for averaging the value. Providing Sentinel-1 data in enhanced image processed will be suitable for detecting oil spill object and also can differentiate between another object (caused by alga bloom and natural surfactant), this mean that the dark spot object in Sentinel-1 image is not always oil spill.

Figure 1. Oil Spill Predicted as Dark Spot in Radar

References
Algorithm of Time and Frequency Remote Calibration System of SNSU-BSN

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Keywords: Atomic clock cesium, GPS receiver, remote calibration, time and frequency, UTC(IDN).

ABSTRACT. National Measurement Standards-National Standardization Agency of Indonesia (SNSU-BSN) as the National Metrology Institute of Indonesia has provided time and frequency calibration services for customers. Time and frequency equipment should be calibrated to traceable to the SI units. The calibration process can be carried out in a calibration laboratory. However, some measuring devices cannot be sent to the calibration laboratory. One of the devices that cannot be sent to the calibration laboratory is Cesium atomic clock. The Cesium atomic clocks must be calibrated to get the time difference with the local coordinated universal time (UTC), namely UTC(IDN). Therefore, to calibrate the Cesium atomic clock, a remote calibration method is needed. The remote system is also intended to conduct the calibration more effective and efficient. This method requires two Global Positioning System (GPS) receiver devices placed on the client-side and a calibration laboratory. For this reason, an algorithm for remote calibration has been developed. The algorithm has been tested to calibrate Cesium-3 of SNSU-BSN against UTC(IDN). The time difference between Cesium-3 and UTC(IDN) was 5.8 microseconds by using the algorithm. Based on the algorithm that has been built, it was concluded that the algorithm can be used to perform remote calibration for the related customer.

Figure 1. Measurement result of time difference of Cs-3 against UTC(IDN)

References


Analysis and Characterization of Magneto-Optical Kerr Effect Measurement System: Case Study on CoFeB

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Keywords: BH1750, CoFeB, Kerr, Effect Polarization

ABSTRACT. In this research, a magneto-optical Kerr effect (MOKE) measurement system is made to analyze the magnetic properties of CoFeB film. The Kerr signal is obtained by measuring the polarized light that passed through the polarizing beam splitter (PBS) that was reflected by CoFeB thin film, as shown in Figure 1. In this work, a RGB laser is used as the light source with three different wavelengths and the light intensity that is reflected by the thin film is measured by BH1750. To complete the observation, the applied magnetic field is observed by using Gauss meter with current source which given by constant current power supply. Hysteresis loop of CoFeB from the measurement were observed to analyze and determine the characteristic of the system to get the optimal measurements. All the measurements system worked automatically, the data of light intensity is being acquired by using a microncontroller and the data acquisition is processed by using LabVIEW.

![Figure 1. Measurement system schematic based on Magneto-Optical Kerr Effect (MOKE)](image)

References
The Design of Litopenaeus Vannamei Automatic Feeder

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Keywords: vannamei, shrimp, auto-feeder, android-based-system.

ABSTRACT: The province of Bangka Belitung in Indonesia has a potential production of ocean fishery production about 1,200,000 tons per year. On the other side, there is another opportunity for the government to take advantage of mainland usage for ocean fishery. Vannamei shrimp is one fishery product that can be farmed on mainland. Based on the statistical information published by BPS in 2017, Bangka Belitung province has only used 419.14 hectare of land for fishery from the total of 1,602 hectare. The Vannamei shrimp has been farmed on small portion of that land, while Vannamei shrimp sits on the highest export commodity of the ocean fish product that is about 40% compared with others. Nowadays, there are numbers of Vannamei shrimp’s company in Bangka Belitung. Feeding process of Vannamei shrimp is one problem in this business. The foods and its vitamins consume about 50-80% of the total cost. Another big problem is the food residual can cause about 60% of organic waste. This problem is due to the feeding process done manually. The shrimps do not consume all the foods. The rest of the food is then be an organic waste. This then gives another problem that makes the reduction of dissolved oxygen in the shrimp pond. To anticipate this problem, an automatic feeder has been produced, but they are not optimized yet. The existing auto-feeder that is used by one of shrimp farmer in Bangka Belitung has several problems such as: (1) the food spreading does not cover all area, (2) the mechanical system or food transporter could not be used for long time (it needs to be replaced frequently). The propose of this study was to design a new method of automatic feeder which can spread the pellets from 0 to required distance in meters and of a food transporter that can flow pellets properly. The machine has been designed to be operated using android-based system. This brings the ease of use to control and monitor the feeding process. The system was divided into two parts, mechanical and electronics. The mechanical parts are a container for shrimp food, a transporter for delivering the food from container to thrower part, and a throwing part to spread the food. The electronics part are an input which is sensors and other input components are attached, a processing unit to update the output status based on the program stored in it, and output parts to actuate the mechanical parts. Several steps has been conducted in the research process. Literature study, interview with business owner and technical staffs, and comparing with their available system was firstly conducted. Secondly is designing the mechanics, electronics, and software parts. The third stage was making and building each designed parts. The testing of each part was conducted when it finishes and ready for testing. The last stage was the test for the whole system in the lab and continued in the real Vannamei shrimp pond. The result shows that the automatic feeder can achieve 15 meter in maximum distance of food throwing. Spreading the food can be from 0 up to 15 meter based on the speed controlling of throwing (0 to 700 rpm). The auto-feeder can also be monitored using android system such as the volume of the food, and on/off the system manually.

References

Implementation of Single Shot Detector for Object Finding in Drone Platform

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**Keywords:** Object Detection, PID Control, Quadcopter, Single Shot MultiBox Detector, Time Responses.

**ABSTRACT.** The developing of object detection for many purposes has come to various techniques. Some of those works also implement to solve our daily life problem. Those developments which are state-of-the-art are mostly applicable to many pros than others. In this paper, we use one of the state-of-the-art object detection to control a quadcopter, i.e., Single Shot MultiBox Detector (SSD). SSD is used to detect an object as a quadcopter target for approach missions. SSD also use to keep an eye on the target. The shape of the ROI location represents the target. Figure 1 shows the result of using SSD in a 6 meters object detected. The control system of a quadcopter uses this ROI or bounding box location as its feedback, which will guide the quadcopter to approach for it. In this paper, a lab-scale quadcopter was built, uses simple Proportional- Integral-Differential (PID) to control it. A method for fine-tuning the PID also given in the discussion. Times and responses of the whole process provided in the graphics display. The mission considered as a success if the quadcopter can stop at a minimum range of 1 meter toward the target.

![Image of object detection using SSD model to detect person.](image)

**Figure 1. Example of object detection using SSD model to detect person.**

**References**


Stroke Severity Classification of EEG Signals by Recurrent Neural Network

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Keywords: Acute Ischemic Stroke, Electroencephalogram, Long Short-Term Memory, Principal Component Analysis.

ABSTRACT. Acute Ischemic Stroke (AIS) is one kind of stroke that occurs the most. Stroke itself is the number one cause of death that can reduce blood flow and deprive the oxygen into the brain. Early diagnosis can help patients getting faster medical treatment thus avoid unwanted damage to the brain. Electroencephalogram (EEG) is an alternative tool for diagnosing AIS to the standard tools as in MRI or CT-scan. In this research, we try to classify stroke severity with one of the Recurrent Neural Network (RNN) architecture i.e. Long Short-Term Memory (LSTM). The proposed method took the input from 18 EEG channels with 10-20 electrode placement system. The signals would be preprocessed first through Principal Component Analysis (PCA) to reduce dimensionality and find the new smaller set where most of the information is not lost. The output would be classified into 4 classes: normal, mild, moderate and severe stroke.

References

Influence of The Nitrogen exposure Time to The Plasma Treatment on the Hydrophobicity of polystyrene surfaces

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**Keywords:** Nitrogen plasma, polystyrene surface, exposure time, hydrophilic, NH\textsubscript{2} and N-H functional groups.

**ABSTRACT:** The wettability of material can change from hydrophobic to hydrophilic when treated using plasma nitroen. The present work investigated the influence of the plasma treatment duration on the modification of polystyrenes's surface coating on a glass surface. The polystyrene layer was produced by means of spin coating method with the rotational speed of 3000 RPM for 1 minute. The plasma was established by a 2 MHz RF generator at the power of 40 watts, pressure of 0.3 torr, flow rate 40 mL/min. The samples were treated at various exposure time which were 2 minutes, 5 minutes, 10 minutes, and 15 minutes. The hydrophobicity of the polystyrene was measured using a contact angle measurement before and after the nitrogen plasma treatment. Polar functional groups related to the wettability were observed by a Fourier Transform Infrared (FTIR). The longer the treatment duration, the smaller the contact angle was observed. A very low contact angle of 6.42\textdegree was achieved at a power of 40 watt at 0.3 torr for the exposure time of 15 minutes. The means that the surface of the polystyrene changed to superhydrophilic or superwetting. The FTIR results show the spectra of NH\textsubscript{2} and C-H functional group at the wavenumber of 3485.76 cm\textsuperscript{-1} and 2962.61 cm\textsuperscript{-1}, respectively. These functional groups indicate the existence of the polar groups, which contribute to the change of surface hydrophobicity into hydrophilicity.

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Plasma Intensification in 2 MHz RF Glow Discharge in Carbon Film Plasma Sputtering Deposition by means of a Hollow Cathode

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Keywords: carbon film, emission spectroscopy, hollow cathode, rf plasma, sputtering.

ABSTRACT. A hollow cathode has been one of the methods to intensify the plasma in etching or ashing process. This work examined a number of technique in intensification of a 2 MHz RF glow discharge plasma to deposit carbon film by means of the hollow cathode. Three types of the cathode configurations, which were cylindrical, rectangular and a cylindrical-rectangular combination, were tested to get an optimum condition for the carbon deposition. Both carbon target and substrate were fixed inside the hollow cathode. The plasma was characterized by means of an optical emission spectroscopy (OES) at the range of 200 nm – 1000 nm. The results showed that the combination where the rectangular hollow was placed inside the cylindrical one, produced the most intense glow. Ion density and electron temperature in the plasma were determined by a calculation based on the atomic data related to the specific electronic transitions of the ions. The density of ions was very high in the center area of the rectangular hollow producing a complex reactions. On the other hand, the high density of the ions decreases the electron temperature. The energy of the ions was difficult to be predicted since the spectrum showed the existence of large number of ion states. Observations on the resulted deposit on the surface of quartz substrate suggest that the intensification needs to be further investigated related to the effectiveness of sputtering and deposition process.

Figure 1. Argon Plasma in a combined rectangular-cylindrical hollow cathode (left) and its optical emission spectra (right).
Implementation of Convolutional Neural Networks to Determine Lightning Location

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Keywords: Detection, lightning, learning, machine.

ABSTRACT. Lightning produce not only electromagnetic signals but also thunder sound signal. A new method was proposed to determine lightning location by measure Time of Arrival (TOA) of lightning electromagnetic signals and thunder sound signal to get lightning distance using Convolutional Neural Network (CNN). These signals were caught by using a set of cell phones. These cell phones collect three main data i.e. the TOA of lightning electromagnetic signals, the TOA thunder sound signal, and the coordinates obtained from Global Positioning System (GPS). In this study, CNN determines thunder sound signal pattern which is recorded by certain cell phone. More than one hundred samples of thunder sound signals were used as data set. Whole data set divide into three categories i.e. training data, validation data, and testing data. The model runs few hours to train the network and then produce a confusion matrix. The Matrix consists of several column represents a set of samples that previously predicted by their labels and several rows represents actual labels. The labels are thunder sound and the other sound. After the model created, it is exported to the cell phone so that every time cell phone record a sound signal, the model will predict whether the thunder sound or not. When the model predicts the sound as thunder sound, the cell phones save the exact occurrence time. This determination is very important when the cell phone is going to measure lightning distance between lightning location and cell phone location.

![Figure 1. Observation on thunder sound signal (a) thunder sound signal in time domain (b) Spectrogram of thunder sound signal](image-url)
References


Rain Detection in Image Using Convolutional Neural Network

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Keywords: Convolutional neural network, image processing, rain detection, weather.

ABSTRACT. Weather is a phenomenon occurs in the earth's atmosphere. Weather affects human daily activities, especially outdoor activities. Weather observations including rainfall observation in Indonesia conducted by Meteorological Climatological and Geophysical Agency (BMKG). BMKG facing a major problem in terms of rainfall data spatial density. The insufficient amount and unevenly distributed rainfall measurement instrument, are two main factors contributing to rainfall data special density problems. One of the very prominent methods to gain a larger amount of rainfall measurement location is using the image obtained from existing Closed Circuit Television (CCTV) spread over vast areas, especially in the Jakarta region. The approach to recognize and classify the rainfall in a certain area from the CCTV image used in this research is the Convolutional Neural Network (CNN) method. The image data was taken from CCTV located in Kamal, Kalideres, West Jakarta. The total of 2480 images taken is split into two categories, the one that shows a rainy day and the one that shows a clear day. These two categories of images will be used as sample data to train CNN, an effort to obtain a suitable model. By using the CNN method, it’s possible to recognize and classify the rainfall condition within an image based on the model. Python is an open-source programming language that widely used nowadays to run CNN. The image classification using this CNN, scored approximately 97% of accuracy, which means that the model is optimal to recognize and classify rainfall conditions in a certain area based on the CCTV images.

Figure 1. Training Performance Graph

References
Cloud Detection Method for Pleiades Images Using Spectral Indices

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Keywords: Cloud detection, NDCI, Pleiades.

ABSTRACT. Very high spatial resolution satellite images such as Pleiades have been widely used for many remote sensing applications. But there is a main issue regarding cloud cover which interfere the information of the images. Another issue is that there are very few studies discussing cloud detection for Pleiades images. In this study, we developed a cloud detection approach for Pleiades images to address these issues. In the first step, normalized difference cloud index was used to detect thick cloud. We used the mean of the index in each 25x25 sliding windows. To improve the accuracy, we used soil-adjusted vegetation index. We also used band two to decrease commission error. In the second step, haze optimized transformation was used to identify haze and thin cloud. As a result, we found that by using first step, cloud can be detected, but the results still have commission error in some areas. Therefore, we used blue band of Pleiades to minimize this error. Haze and thin cloud can be identified by using blue band and red band as a haze optimized transformation algorithm. We used visual and statistical assessments. The results showed that the proposed approach in this study has a high accuracy.
Characterization of Circular Patch Antenna at 1 GHz for Crack Sensing

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Keywords: Sensor, Structure Health Monitoring, Crack, Antenna

ABSTRACT. Microstrip antenna has been attractive in many research to development as a sensor to detect crack in metal material. This subject is very useful to Structure Health Monitoring (SHM). The concept of this method replaced the ground of microstrip antenna to tested metal. This paper presents circular patch microstrip antenna at 1 GHz frequency resonant with insert feed as a sensor to crack detection. Length and position of the crack on tested metal effected electrical property of microstrip antenna.

Figure 1. Purposed Circular Patch Antenna

References


Quality Assessment and Validation of Digital Surface Model Derived from LiDAR Using TerraSAR-X in Land Cover

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Keywords: Radar, DSM, Validation methods, Quality Assessment, TerraSAR-X, Image Processing.

Abstract. Digital Surface Models (DSMs) are highly important product obtained from either conversional measurements or from remote sensing imagery. The height estimation of the earth's surface can be measured using interferometry synthetic aperture radar (InSAR). The InSAR method uses phase information to produce the height of the earth's surface. The accuracy of the DSMs produced by InSAR depends on the shadow, the layover area, and the coherence of two SAR data. This paper proposes a quality of DSMs derived from the InSAR method, which is from ascending and descending paths using high resolution TerraSAR-X / TanDEM-X. In this research we generate DSMs in Urban area in Jakarta. Generating DSMs was done by the InSAR method which covers the same test area and came from one pair of ascending TanDEM-X images and one descending pair of TerraSAR-X. The quality level of elevation to be validated compared to validation datasets and application requirements. The comparison of the two DSMs from the ascending and descending path has been done by validating with LiDAR. The images pairs with 33 angles for descending path and 37 degrees for ascending path. The results show error distribution within different terrain characteristics, which are presented using various ways including statistics, error maps and profiles. There is significant reduction in missing pixel counts due to layover, shadow and low coherences after co-registered. These include terrain characteristics, vegetation and land cover. For different slope we found accuracy to decrease with slope increase with an average standard deviation between a very low slope class and very steep slope class.
Analysis of Magnetic Resonance Image Quality Using an In-House Phantom: Gamma Knife Application

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Keywords: Gamma Knife, Image Quality, MRI, Phantom

ABSTRACT. Magnetic Resonance Imaging (MRI) is increasingly being used for purposes of radiosurgery and radiotherapy planning. This imaging modality can explore the physical properties of tissue with great details and is probably the best imaging technique in the current practice of radiology, chiefly for imaging of the brain. However, the geometric distortion is reasonably occurred and can make significant differences in certain MR application such as, for example, stereotactic localization in Gamma Knife. Therefore, the geometric distortion measurement and correction should be applied. Previously, some of 2D or 3D distortion phantom designs have been proposed. In this study, an MRI in-house phantom was developed to measure not only 3D geometric distortion, but also uniformity and high contrast spatial resolution of MR image. The design of the phantom follows AAPM Report No. 28: Quality Assurance Methods and Phantoms for MRI. The materials of the phantom are resin and acrylic, copper sulfate pentahydrate solution is used as phantom filler. The phantom is characterized by 1 cm³ MRI visible 3D cartesian grid and 3D grid that is MR-signal negative. The phantom attached with Leksell stereotactic frame was scanned using 1.5 T MRI GE Healthcare. Both Bravo and Fiesta (Fast Imaging Employing Steady-state Acquisition) scan protocol were applied. The image of the in-house phantom then would be compared to the standard MRI phantom, Magphan 100. The result showed that geometric distortion could not be found, either in in-house phantom or Magphan 100 images. When Bravo scan protocol was applied, the measurement using Magphan 100 showed that the high contrast spatial resolution of MR image is 5 lp (line pairs)/cm, yet using in-house phantom, it showed 4 lp/cm. In addition, the high contrast spatial resolution of MR image generated by Fiesta scan protocol is 6 lp/cm and 5 lp/cm for Magphan 100 and in-house phantom respectively. The percent uniformity (PIU) of MR image, when Bravo scan protocol was applied, is around of 90.06 % and 79.570 % for Magphan 100 and in-house phantom respectively. Furthermore, PIU of MR image, when Fiesta scan protocol was applied, is around of 86.75 % and 56.39 % for Magphan 100 and in-house phantom respectively. For this study, it was concluded that the in-house phantom could be used to analyze image quality of MR image, yet still needs some improvements, especially in uniformity test part.
Dose Evaluation of Organ at Risk during Treatment Using Gamma Knife Stereotactic Radiosurgery (GKSRS): Phantom Study

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Keywords: Gamma Knife, Organ at Risk, Radiosurgery, Rando, Stereotactic Radiosurgery, TLDs.

ABSTRACT. Gamma Knife Stereotactic Radiosurgery (GKSRS) treatment requires the high accuracy of delivering single high dose without negative impact on the surrounding tissue. During radiosurgery treatments using GKSRS, the surrounding tissue will receive high scatter radiation because the single dose treatment will employed long irradiation time. Therefore, radiation doses in critical organs in patients during GKSRS treatment is needed to be evaluate. In this study, we investigated the radiation dose to the right lens, left lens, thyroid, right breast, left breast, uterine fundus, right ovaries, left ovaries and testes during treatment using Leksel Gamma Knife Perfexion (LGK; Elekta AB, Stockholm, Sweden). The dose was simulated using the variation of tumor target of 5 to 20 cc The measurement were performed using variation of collimator size of 4 mm, 8 mm, 16 mm and employed thermoluminescent dosimeters (TLDs) to be inserted to Female Rando anthropomorphic phantom. TLDs reader Harshaw model 3500 were employed to evaluate the measurement result. The result of study explains that the dose of organ at risk decrease linearly depend on the distance of the target and the size of collimator.
Figure 1. Organ Dose with Variation of Tumor Volume
Analysis Of Energy-Peaks Characteristic In NaI(Tl) Spectrometer For Radionuclide Identification In Environmental Radiation Monitoring device

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Keywords: Identification Radioisotope, High Summing Ratio, NaI(Tl) Detector, Radiation Monitoring.

ABSTRACT. The risk of radiation exposure can be obtained from radiation facilities or national border lines. For this reason, an environmental radiation monitoring device is needed to determine abnormalities. Currently, environmental radiation monitoring equipment used in various regions only monitors gross gamma radiation. So that the device used cannot distinguish whether the increase in dose rate is due to abnormal events, or due to natural radiation. Therefore, we need a device that can have the ability of spectroscopy so that it can distinguish the elements that cause an increase in the dose rate like NaI(Tl) gamma spectrometer. The device has been built using a NaI (TI) detector with a peak characteristic observation method with various conditions of acquisition time and distance. This has test in laboratories using Cs-137 as sample source. Tests have been done by varying the value of time and distance between the source and detector in the measurement process. Time used varies, 1 minute, 5 minutes, 10 minutes, 30 minutes, 60 minutes, 90 minutes and 120 minutes with varying distance of 50 cm, 70 cm, 100 cm, 200 cm and 300 cm. Data has been analyzed using the high summing ratio method to be able to distinguish measurement values using source and only background measurements. The result show that detector has stable when measuring for 30 minutes with FWHM value 60, and distance is not less than 200 cm, and it was able to distinguish background and source value from 1 minutes acquisition using high summing ratio method.

![Figure 1. High Summing Ratio From The Measured Spectrum in Accordance With A Cs-137 Source](image)

References


A Systematic Literature Reviews of Multichannel Analyzer Based on FPGA for Gamma Spectroscopy

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Keywords: FPGA; Gamma spectroscopy; Multichannel analyzer; Systematic literatur review

ABSTRACT. Radiation measuring devices based gamma spectroscopy require a multichannel analyzer (MCA) which functions to record and analyze nuclear radiation spectrum data. MCA is one of the main components in radiation measurement and nuclear spectroscopy. There are currently many studies related to MCA based on field programmable gate array (FPGA). The main reasons for using FPGA as MCA are parallel processing capabilities and ability to be programmed for pulse signal processing to produce spectra which resolution adjustable to ADC. An FPGA consisting of a single chip also simplifies the PCB layout design and thus effectively reduces power consumption and relatively lower costs than non FPGA based comercial MCA. The main objective of this paper is to present the systematic literature review (SLR) of MCA based on FPGA for gamma spectroscopy that was developed during past 10 years. This review was conducted by selecting papers from leading journals in three scientific databases namely ScienceDirect, IEEE Xplore and Scopus. For the SLR execution, specific keyword strings used for each database and paper selecting using inclusion and exclusion criterion. This review highlights the design of MCAs, pulse signal processing methods, their main results and system performance. Figure 1.a reveals the amount of searched documents in the databases using the selected keyword string. The total of searched papers was 337, then using extraction criteria selected 38 papers. Figure 1.b shows the distribution of publications for 10 years from 38 selected papers. This search confirms that research of MCA based FPGA for gamma spectroscopy is relatively constant but still limited. This fact is related to nuclear technology research which is still limited. So the challenges and opportunities for future research are quite high. The implications of this study can be used as a reference for MCA research and development.

1.a The number of papers in three scientific databases using extraction criteria
1.b Distribution of papers per year

Figure 1. The number of papers in three scientific databases using extraction criteria and distribution of publications for 10 years

References

Object Detection for Autonomous Search and Rescue Quadrotor Application

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Keywords: Automation, Cascaded Canny Edge with SURF, Disaster, SIFT, Quadrotor.

ABSTRACT. Indonesia is located in the ring of fire zone. It causes a high risk of disaster threats. Mitigation of potential disaster becomes more critical to explore as much as SAR activities in the first disaster relief. Quadrotor is an aerial vehicle that can access the location easily without any difficulties. It is because of its prominent advantages of flying vehicles. In addition to its capabilities, an automation algorithm can increase searching efficiency. Object detection will take a high responsibility to move the quadrotor in the response of feedback control. In this paper, we proposed to use a cascaded canny edge with SURF compared with SIFT to get more robust detection in real-time applications. First, we detect the object by using a cascaded canny edge with SURF and also the same treatment with SIFT at the same time; both of them check whether the target is valid or not. When both of them approved that we have detected the target, then the process will use only the cascaded canny edge with SURF to tracking the target, as shown in Figure 1. This method will reduce image processing time. This method then applied to our lab-scale quadrotor by using simple Proportional-Integral-Derivative (PID) control to approach the target. The quadrotor will fly to target and note the victim position and reports it to the base station by wireless connection. This paper will provide data comparison between our methods with the only SURF and the only SIFT to doing the task.

Figure 1. Cascaded Canny Edge with SURF

References


Unmanned Aerial Vehicle Object Tracking and Following

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Keywords: Camshift, HSV-RGB, Kanade-Lucas-Tomasi, Quadcopter, Robot Operating System (ROS), Tracking

ABSTRACT. The use of quadcopter on SAR activity is increasingly dominant, especially in the field of search and rescue. One of the most challenging cases from search and rescue is tracking any object that we choose directly (real-time). Then the object is immediately recognized; further, we can track and follow it with a high degree of precision. This research reports the results of the design and program to control quadcopter, which can track and follow 3D objects, which were initially determined. The algorithm for tracking system used several methods from image processing to extract the information from the image (feature extraction base on color), then the information will be used as a reference movement quadcopter in following the target. The object tracking system used various methods of image processing in the domain of HSV-RGB, Camshift, and Kanade-Lucas-Tomasi Tracker to optimizing the 2D tracking system and increase the success rate of the program, as shown in Figure 1. While the method of distance estimation using the camera calibration towards the distance. The output from the tracking system is the object coordinates (x, y, z). This information is fed back to the quadcopter Robot Operating System (ROS) as the error between the position of the camera with the position of objects and is known as Visual Servoing. Quadcopter control system using PID constants in the leading to the movement of the pitch, throttle, and roll, to maintain the position of quadcopter towards the target and follow an object moving forward or backward.

![Figure 1. Object Tracking System](image)

References


Infant Cry Classification Using CNN-RNN

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Keywords: convolutional neural networks, infant crying, recurrent neural networks

ABSTRACT. Study of infant cry recognition aims to identify what an infant needs through her cry. Different crying sound can give a clue to caregivers about how to respond to the infant's needs. Appropriate responses on infant cry may influence emotional, behavioral, and relational development of infant while growing up. From a pattern recognition perspective, recognizing particular needs or emotions from an infant cry is much more difficult than recognizing emotions from an adult’s speech because infant cry usually does not contain verbal information. In this paper, we study the problem of classifying five different types emotion or needs expressed by infant cry, namely hunger, sleepiness, discomfort, stomachache, and indications that the infant wants to burp. We propose a novel approach using a combination of Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) that acts as feature extraction and classifier method at once. Particularly, CNN learns salient features from raw spectrogram information and RNN learns temporal information of CNN obtained features. We also apply 5-folds cross-validation on 200 training data set and 50 validation data set. The model with the best weight is tested on 65 test set. Evaluation in Dunstan Baby Language dataset shows that our CNN-RNN model outperforms the previous method by average classification accuracy up to 94.97%. The encouraging result demonstrates that the application of CNN-RNN and 5-folds cross-validation offers accurate and robust result.

![Figure 1. Average Accuracy Result](image)

References


A Study of Micro-Bubble Generator for Litopenaeus Vannamei Pond

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Keywords: litopenaeus-vannamei, micro-bubble, dissolved-oxygen, android-based-system.

ABSTRACT. The numbers of Litopenaeus Vannamei pond have grown in the Province of Bangka Belitung in Indonesia. Majority of the ponds use paddle wheel as the aerator. The use of paddle wheels consumes much energy beside its function to add oxygen into the water and to make the water flowing. Most of Litopenaeus Vannamei ponds' owners are facing to this problem. They spend much cost of electricity on their aerator system. This paper presents the study of micro-bubbles to generate oxygen for Litopenaeus Vannamei pond. This study was supposed to carryout the possibility of replacing paddle wheel as the aerator. A study literature, interview and discussions with technical staffs of Litopenaeus Vannamei pond was firstly conducted. This was accomplished to gain the information regarding the requirement of oxygen in the Litopenaeus Vannamei ponds. The second stage was observing the possibility of equipments and devices that can be used in the experiment. It was then continued with designing and assembling the equipment, and evaluating their functionality. An analog gravity DO (Dissolved Oxygen) sensor was used to measure DO within the pond. To make it easy to read the measurement value of the sensor, an Arduino Uno controller was programmed to display the sensor's value on LCD. The sensor was firstly calibrated by comparing its measurement value with the existing measurement device. A combination of 750 Watt water pump and JSW 8 aerator nozzle was then used to generate oxygen with the pond. The android-based system was developed to make user's easy to control and monitor the aerator system in this study. The next stage was examining the whole aerator system within the laboratory scale. A container with 0.5m in length and width, and 1 m in height was used to accommodate the water pond-like. The micro-bubble aerator system was then installed within the container. The experiment shows that for one hour testing the DO value increased about 0.8 mg/L from its base value. The experiment was continued in the real Litopenaeus Vannamei pond with has 35 m x 35 m x 1.5 m of width, length, and height respectively. Two ponds was used in the comparison. The first pond used existing aerator system with four paddle wheels, while the second pond used the proposed micro-bubble system with two paddle wheels and the proposed system. The result shows that the second pond has DO about 0.3 mg/L higher that the first pond. This indicates that with micro-bubble generator, the DO in Litopenaeus Vannamei pond can increase. Even though it did not show significant result of the proposed system in terms of DO value, it is still efficient in terms of the cost. The proposed system used two paddle wheels and one micro-bubble generator which consume 2,25 kW electricity, compared with the existing system with four paddle wheels which consume 3 kW electricity. The proposed system also can display the oxygen through android based system. This makes the technical staffs do not need to measure the DO directly to the pond.

References
Comparison between two-stage and three-stage Peltier Thermoelectrics driven by Pulse Width Modulation

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Keywords: Peltier Thermoelectrics, Pulse Width Modulation, Temperature

ABSTRACT: Thermoelectric is one of electronic devices commonly used as temperature sensors, electrical generators, and cooling devices. Peltier thermoelectric as a promising device offers greater performance in terms of electronic cooler, especially for computer components. However, the performance of single-stage Peltier thermoelectrics is limited. For certain optoelectronic devices, a single-stage Peltier thermoelectric cannot achieve a desired temperature to pump heat from the devices. In addition, to drive temperature of the thermoelectrics, a complex interface circuit should be made. In this research, two-stage and three-stage Peltier Thermoelectrics driven by Pulse Width Modulation using Arduino and H-bridge Motor Driver were examined. The three-stage Peltier thermoelectric showed better performance than the two-stage, where it achieved higher temperature difference between hot and cold. Both Peltier thermoelectrics had distinct temperatures in each interstage connection, with increasing values from near cold side to near hot side of the thermoelectrics.
Fog Prediction Using Deep Learning: A Case Study in Wamena Airport

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Keywords: aviation, deep learning, fog prediction.

ABSTRACT. Fog is one of the atmospheric phenomena that affect airport operations. It can reduce visibility which impacts flight operations (taxiing, take-off, landing). Therefore, fog prediction is needed to support flight safety. The biggest challenge in making weather predictions is the chaotic and complicated process of the atmosphere. This research tries to use deep learning method to predict fog events in Wamena Airport. Design of model prediction using hourly synoptic data set from January 2015 till May 2018. Variables input such as dry ball temperature, wet ball temperature, dew point, relative humidity, cloud cover, wind direction, wind speed, visibility, and present weather for the past six hours ago are used to predict fog or no fog events. We performed a grid search parameter tuning on sixteen deep learning models. The parameters tuned are epoch and hidden composition. Results of this process described in Figure 1. Analysis of the testing data shows that deep learning models are appropriate in fog prediction. They can generate a decision boundary among multidimensional input affecting fog and no fog condition.

Figure 1. Evaluation results of sixteen deep learning models

References
Effect of skull contours using manual measurement and CT Image on doses distribution in Gamma Knife Stereotactic Radiosurgery: Phantom Study

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Keywords: Gamma Knife Perfexion, Anthropomorphic Rando, Stereotactic Radiosurgery, Film GafChromic EBT3, Dose Calculation

ABSTRACT. The Leksell Gamma Knife Perfexion (LGK Perfexion; Elekta, Stockholm, Sweden) is equipped with a conical collimator which is divided into eight sectors and its configuration is completely different from the previous model. Doses in LGK Perfexion are calculated for each shot by summing the contribution from the 192 radiation beams emitted by cobalt-60. In general, the skull shape of a patient is modeled based on 24 skull measurements and a special ruler. However, due to the limitation of the 24 skull measurement and special ruler, the results of the contours have slight differences from the patient's actual contours based on the MRI image. This study was conducted to evaluate the distribution doses of LGK Perfexion in the treatment planning system using manual measurement and using a CT image. The dose was simulated using the same tumor target with isodose 6 Gy @50% and measurement was performed using a variation of collimator size of 4 mm with a 24 shot number, 8 mm with 10 shot number, 16 mm with 1 shot number, and combination size collimator with 15 shot number. Film GafChromic EBT3 inserted into Head Rando anthropomorphic phantom. Epson Scanner 10000 XL and Imagej were used to evaluate the measurement result. The results of the study explain that the treatment planning system using actual patient contours based on CT image is better than using manual measurement.

Figure 1. Comparison of doses calculation using CT image and Skull Measurement

References
Design Of Water Height Detectors In Runway Based On Internet Of Things

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Keywords: Arduino Mega 2560, Internet Of Things, thingspeak, sensor design.

ABSTRACT. The runway of an aircraft is designed to keep it dry even if it rains to avoid hydroplaning. Hydroplaning is a plane slip on the runway due to standing water. In accordance with regulations from the Direktorat Bandara, Ditjen Perhubungan Udara NO. KP 212 in 2017, the operational requirement for runways to be able to serve landings and aircraft flights is when there is a maximum of 3 mm of standing water on the runway surface. The design of the water level detector on the runway uses the Arduino Mega 2560 as a microcontroller which processes and sends the detected data to the thingspeak via the internet network. Performance specifications for water level detectors are water level sensor designs, U detector pipes, runways, electronic circuits. The water level sensor is a touch sensor that is designed and printed on a PCB board with horizontal and vertical strip designs. However, the level of accuracy and accuracy of the vertical sensor strip design is higher than the horizontal sensor strip design. Detected data will be processed in Arduino Mega 2560 and typed into the thingspeak page using the internet network. Data output can be accessed via a PC or smartphone connected to the internet network. The results of comparison with standard tools found the average percentage of errors for the horizontal sensor strip design was 97.08% while for the vertical sensor strip design was 4.98%. From the comparison results, the average percentage of accuracy for the horizontal sensor strip design is 8.57% and for the vertical sensor strip design is 95.01% with precision of 42.32% and 84.77%.

Figure 1. Water level detector data on the runway using a vertical sensor design

References


Design of Neural Network and PLC based Water Flow Controller

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Keywords: Flow Control, MATLAB SIMULINK, Neural Network Controller, OPC Server, PLC.

ABSTRACT. Flowrate is a fundamental physical quantity in the fluid transportation system from one place to another. To achieve this, a reliable controller that can produce a constant flowrate in the industry is needed. The most used flow controllers in industries are PID-based controllers that are implemented using PLCs. However, there are still shortcomings, for example, the response time and steady-state errors that are not optimum, which cannot be overcome by conventional PID controllers. In this study, a neural network-based flow controller is proposed to deal with those problems. The controller will be operated in a miniature plant which consists of a water tank, a water pump, a control valve, and a flow transmitter. Due to PLC limitation that cannot be programmed with common programming languages such as MATLAB, a personal computer (PC) is used to run the proposed neural network controller. The PC communicates with the PLC using OPC (OLE for Process Control) server, while the PLC reads the flow transmitter and also controls the control valve directly based on the resulting output of the neural network controller.

To evaluate the performance of the proposed controller, several experiments have been conducted. The performance of the proposed controller has been compared with the conventional PID controller. It shows that neural network-based controller outperformed the conventional PID controller, in terms of maximum overshoot and steady-state error, where the neural network controller has maximum overshoot = 5.36%, steady-state error = 0.85%, rise time = 8.22s, and settling time = 8.4s, while the PID controller has 11.3% for overshoot, 1.10 % for steady-state error, 5.16s for rise time, and 18.36s for settling time.

Figure 1. Performance Comparison between PID Controller and NN-based Controller

References
Monitoring Distribution System of Carbon Monoxide and Surface Ozone Based On GPS and Microcontroller

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**Keywords:** Arduino, Carbon Monoxide, GPS, Surface Ozone

**Abstract.** Jakarta is the most populous city in Indonesia. This is directly proportional to the increasing number of motorized vehicles in Jakarta. The number of Jakarta motorized vehicles causes air pollution in Jakarta to become uncontrollable. Air pollution is the presence of one or more physical, chemical or biological substances in the atmosphere in an amount that can endanger the health of living things. Ozone and Carbon Monoxide, including dangerous elements that exist in air pollution. Ozone is a pollutant that causes significant respiratory disease. Carbon Monoxide is dangerous because it can form compounds with Hemoglobin to form HbCO, and this is toxic to the blood. We can find out the quality of the air somewhere, through the content of Ozone and Carbon Monoxide in the area. At present the number of Ozone and Carbon Monoxide gauges in Indonesia is still small, so that not all regions have been monitored for air quality conditions. The purpose of this design is to determine the level of air quality and to monitor ozone gas and carbon monoxide automatically based on Global Positioning System (GPS) and portable. This system was built using Arduino Mega 2560 (used as a controller), ozone sensor, Carbon Monoxide gas sensor and GPS (used as a timing and determinant of location). Programming is done using the Arduino IDE application. The measurement results are stored using a microSD Card, and displayed on the LCD. This system can inform the condition of air quality in an area, because this tool is portable (can be carried anywhere), in real time and data generated every second.
References


Diurnal Variation of Radar Reflectivity Factor In Intense Convective Clouds Over Indonesia

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Keywords: TRMM-PR 2A25, intense convective clouds, diurnal variation, Indonesia.

ABSTRACT. Intense convective clouds is represented by very high of clouds tops that produce heavy rainfall / intense convective precipitation. The vertical structure of intense convective clouds over Indonesia was investigated using radar reflectivity factor (dBZ) data from Tropical Rainfall Measuring Mission (TRMM) satellite-Precipitation Radar (PR) 2A25 product during 1998-2014. The vertical distribution of dBZ was classified into two convective cells following the classification proposed by some previous studies. The first type, Comulonimbus Tower (CbT) that contains Z threshold of 20 dBZ in 12 km altitude with at least 9 km depth and Intense Convective Clouds (ICC) that contains Z threshold of 30 and 41 dBZ at 8 and 3 km, respectively. The distribution of intense convective clouds is more frequently observed over land such as Sumatra, Kalimantan, Java and Irian Jaya than over ocean areas. To observe the pattern of vertical structure of intense convective clouds, the vertical profile of dBZ for several locations that represent land, coast and ocean areas were analyzed. The land and coastal areas show similar vertical structure of intense convective. On seasonal basis, intense convective clouds are more frequently found during March, April and May (MAM) which coincided with the maximum of convective available potential energy (CAPE) value. Furthermore, on diurnal basis, intense convective clouds are significantly observed during 01-03 LT (local time) and 16-18 LT over ocean and the mainland areas, respectively.

Figure 1. Climatology of radar reflectivity factor of intense convective clouds over Indonesia

References
Design Measuring Instrument of Volume and The Number of Drops Infusion on Automatic Infusion Monitoring System Arduino Based

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Keywords: intravenous fluids drops, load cell, photogate, motor servo, arduino mega

ABSTRACT. Intravenous Fluids Drops are very important for the process of healing or treatment for patients. The function of infusion is to replace the loss of fluids or nutrients in the body. In Indonesia, monitoring system of condition about infusion is still done manually, but for the cases such a large hospitals which is the number of patients is not balanced by medical personnel, it is becomes ineffective so that it can cause mistakes in monitoring. A very serious mistake can occur are too late in replacing the infusion. The solution to solve this problem is to make an automatic infusion monitoring system with an alarm warning. This research is experimental research. The measurement technique taken is direct and indirect measurement. Direct measurement data is mass of infusion and indirect measurement data is the number of infusion drops and the percentage of infusion volume. The purpose of this research is to determine the design specifications and performance specification of the instrument. The sensor used to measure infusion drops per minute is photogate and to measure the infusion volume is load cell. Motor Servo Tower Pro SG90 are used as automatic drip control and arduino mega used as a brain for this instrument. The display is use TFT LCD and using buzzer for alarm warning. The accuracy of infusion drops per minute system is 0,97 with error 1,25% and accuracy of infusion volume is 0,978 with error 1,944%.

![Figure 1. Relations of Load Cell Output Voltage with Mass](image)

References


Center Silver nanoparticle preparation by colorimetric method and its application as a metal ion detector

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Keywords: silver nanoparticles, ion detector, UV-Vis spectrometers

ABSTRACT. Silver nanostructured particles with controlled size, shape, and morphology were achieved by gamma irradiation of aqueous solution containing AgNO₃ and poly (vinyl alcohol) (PVA). Synthesis of silver nanoparticles and their application as metal ion detectors. Silver nanoparticles are synthesized by the colorimetric method which is based on the change in color of the solution as the irradiation time increases. The solution of AgNO₃ + PVA silver nanoparticles with a concentration of 1M was irradiated with gamma rays and then added to various types of metal ions. Characteristics of silver nanoparticles formed were then analyzed using UV-Vis spectrometers. Analysis of absorbance of AgNO₃ + PVA nanoparticle solution with metal ions shows the color change in the variation of metal ions. AgNO₃ + PVA nanoparticle colloidal silver can be used as a heavy metal ion detector.

References
Integration of LAPAN’s Remote Sensing Ground Station Control and Monitoring System Application

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Abstract: The National Institute of Aeronautics and Space (LAPAN) - Remote Sensing has developed different website-based application systems. The application system is used to control and monitor several series of ground station processes ranging from acquisition, recording, processing, storage, to cataloging data and remote sensing satellite products. At present these applications are still working separately which are built from various platforms both operating systems, programming, databases, infrastructure, and architecture. Therefore, an application system integration solution is needed in order to facilitate and speed up ground station operators to control and monitor the processes that take place and obtain useful and valid information for decision making. The design of this system integration application is done by preparing materials and defining layouts, coding Hypertext Preprocessor (PHP), testing designs, granting domains, and providing hosting. The User Interface (UI) uses a bootstrap framework to display responsive results for each screen size.

Keywords: Integration, control and monitoring application, remote sensing ground station, PHP, bootstrap.
A Measurement Low Magnetic Field at Copper Plate Electromagnet

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Abstract. The discovery of electromagnets has had a great influence on the development of science and technology, which due to the nature of the magnetism that can be arranged so that it can provide practical benefits including electric motors, relays, power generators, and automatic door switches. In this research, an electromagnetic design and design in the form of a copper plate in the form of a coin chip with a hole in the middle for the iron core. Each plate has an insulator that separates between each plate which is arranged in threads to form a helical coil of copper plates. The experimental results obtained that the design of electromagnets using copper plates, can produce magnetic fields, 0 to 8 mT, with measurements using Gaussmeter as a reference in the development of sensors using giant magnetoresistance. The implications of this research will have an impact on physics and engineering research related to the use of portable and concise electromagnets in the form of copper plate models. In addition it has the potential to be developed in order to produce high magnetic fields.

Keywords: electromagnet, giant magnetoresistance, magnetic field, copper plate.
Verification of Dose Distribution on The Gamma Knife Perfexion Radiosurgery Using Gafchromic Ebt3 Film: Rando Fantom Study

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Keywords: Leksell Gamma Knife Perfexion (LGK PFX), Leksell Gamma Plan (LGP), Gafchromic EBT3, RANDO, Dose Distribution Calculation.

ABSTRACT. Leksell gamma knife (LGK) is an advanced modality of gamma ray radiation therapy sourced Co-60 radioactive for treating patient with intracranial lesion, malformations and functional diseases. Small field techniques with high doses delivering to patients in single session must be calculated accurately and verified carefully. This study illustrates a procedure to verify the accuracy of dose distribution associated with Leksell Gamma Plan (LGP) using RANDO phantom and gafchromic EBT3 film dosimetry. Firstly, we assessed the profile dose on LGK standard phantom with collimators size 4, 8 and 16 mm and compared the results with the profile dose based on RANDO to obtained Full Width Half Maximum (FWHM) and beam-symmetry. Next steps absorb dose distributions inside a RANDO with various combinations of lesion volume, collimator size, location, and number of shots assessed by EBT3 film were irradiated inside the phantom using LGK Perfexion. Scanned images of the measured films were processed following standard EBT3 film-handling procedures. Dose distribution calculation were performed using ImageJ software and Matlab in-house software. The study shows different FWHM and beam symmetry of collimator size of 16 mm on standard phantom between LGP and measurement is 1.83 % and 1.58 % respectively, whereas the discrepancy in RANDO phantom is 2.15 %, and 1.64 % for beam symmetry and FWHM respectively. Verification of max dose shows the smallest discrepancy between LGP calculation and measurement with collimator size 16 single shot is 1.9 % on 7.61 cc superior lesion volume, where 12.12 Gy obtained by measurement and 12.36 Gy from LGP. In conclusion, collimator size 16 mm have a highest accuracy of FWHM and beam-symmetry value, but on smaller lesion volume, collimator 16 mm with single shot give higher deviation dose value.

Figure 1. Profile Dose of SWP and RANDO Phantom

References
Feature Selection with LASSO for Classification of Ischemic Strokes Based on EEG Signals

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Keywords: Acute Ischemic Stroke; EEG; Lasso; Random Forest.

ABSTRACT. Electroencephalography (EEG) is an electrical signal data that can describe brain activity in which the signal contains important information that can be used to detect several diseases. One of the diseases that can be detected by EEG signals is stroke. The most common type of stroke is the acute ischemic stroke (AIS) due to blockage of blood supply to the brain which can generate tissue damage in the brain. EEG signal recording uses several electrodes where the more electrodes used in the recording, the greater the number of EEG features produced (high dimensional data). This can make it difficult for models of machine learning to have optimal performance on high-dimensional data. In this study, we try to optimize the performance of the machine learning model by selecting features with the Least Absolute Shrinkage and Selection Operator (LASSO) method, where this method can select the relevant features by shrinking some coefficients to zero. The type of classification used in this study is random forest with features used for classification are Brain Symmetry Index (BSI), Delta-Alpa Ratio (DAR), Delta-Theta-Alpa-Beta Ratio (DTABR). The results showed that the feature selection method with the lasso method can optimize the performance of learning machines with an accuracy value of 78.8% with 9 features out of 45 features.
Predictive Maintenance Magnetic Sensor using Random Forest Method

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Keywords: predictive maintenance, random forest, magnetic sensor

ABSTRACT. BMKG has observations of earth’s magnets which are scattered in Indonesia. The BMKG earth magnetic sensor produces real-time data output. This research focuses on predictive maintenance models on earth magnetic sensors based on data output. The resulting data output is in the form of a delimited format in the form of spaces so that it is easy to process. The magnetic component used is the total component data (F) from the earth’s magnetic sensor. Data processing using python scripts with the algorithm used is the random forest method by comparing the resulting value difference to find out whether the data generated is still in tolerance or not. The results of this processing are used to predict the sensor’s ability.

Figure 1. Flowchart of the research process

References
Calibration of Dynamic Thorax Phantom In-house for Radiotherapy Dosimetry

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Keywords: Stepper Motor, Dynamic Thorax Phantom, Real-Time Positioning Management,

ABSTRACT. Accuracy in determining of tumour position inside the human body is very important, (Giraud et al., 2006). Moreover, Real-Time Positioning Management (RPM) techniques are needed when scanning objects on a CT Simulator, for the tumour located in moving organs (Prunaretty et al., 2019). In order to ensure the RPM technique had properly function, we need a quality control tool that represents moving objects on the human body. Inspired by the CIRS Dynamic Thorax Phantom model 008A, we developed a Dynamic Thorax Phantom In-house using three of Nema-17 stepper motors with 200 steps a cycle. In addition, the first stepper motor was used to move objects in superior-inferior direction, the second one was used to move objects in rotation, then the third was used to move the Real-Time Positioning Management marker vertically. Calibration of three stepper motors is performed by finding out the number of counts that needed. Especially for stepper motor that uses for rotational movement, were calibrated with Arduino rotational sensor. With the circuit diagram as shown in fig.1 we found that the stepper motors have less than 0.01% deviation for rotation and Superior-Inferior movement, they could be applied for Dynamic Thorax Phantom In-house.

References
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Synthesis and Characterization of Graphene Oxide from Biomass Waste

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Abstract. Biomass waste is ranked as the most abundant type of waste in Indonesia. If not managed properly, it will cause environmental problems such as pollution and damage to the environmental ecosystem. The purpose of this study was to obtain advanced material of graphene oxide from empty fruit bunch (EFB) from palm oil biomass waste. Biomass waste then burned in the furnace at atmospheric pressure at 350°C for 2 hours to produce bio charcoal. The silica content in bio charcoal is removed with hydrogen fluoride (HF) and then used as a precursor for the manufacture of graphene oxide. The graphene oxide is synthesized by a modified Hummers method with oxidizing agents KMnO\textsubscript{4}, H\textsubscript{2}SO\textsubscript{4}, and NaNO\textsubscript{3}. Graphene oxide is characterized by Uv-Vis to see its optical properties. The results of this research are useful to provide economic added value to biomass waste after being transformed into graphene oxide.

Keywords: biomass, bio carchoal, empty fruit bunch, oil palm, modified Hummers method, uv-vis

References


Design of High Efficiency Active Class E Rectifier using PMOS Switch for Hybrid Wireless Power Transfer

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Keywords: active class-E rectifier, DC output regulation, high efficiency, medical applications, PMOS switch, hybrid wireless power transfer.

ABSTRACT. Recently, research in hybrid wireless power transfers (H-WPT) are growing rapidly. For medical applications, most H-WPTs are built on frequencies of several KHz to below 20 MHz \cite{1,2}. The H-WPT circuits are very promising to conduct therapy in several conditions. Many therapies especially in neurological stimulation for sleep apnea, pain management, Parkinson’s Disease, epilepsy, bladder control, gastrointestinal disorders, numerous autoimmune diseases and psychological disorders can be effectively conducted using implantable circuits \cite{3}. In addition, the retinal prosthesis system using WPT in \cite{4} for retinal degenerative patients is also interesting solution to reduce the cause of blindness in the world.

Increasing transmission frequency is useful to design a compact and high efficiency WPT circuits. Generally, the configuration of the H-WPT’s receiver consists of the receiver coil, rectifier and voltage regulator. The voltage regulator circuits is used to maintain the output voltage of the H-WPT eventhough the coil’s position is changed (mutual inductance change). Some approachs to minimize the influence of mutual inductance changes i.e., impedance compression topologies \cite{5}, feedback-based control \cite{6}, and thinned-out method \cite{7}. In active class E rectifier \cite{8}, the high efficiency rectification and the DC output regulation are performed simultaneously without the need of an additional regulating circuits. However, at the DC output voltage there is a significant ripple thereby reducing the efficiency of the rectifier. This is due to the use of NMOS as a switching device, where the threshold voltage of NMOS is strongly influenced by the body bias voltage. In this paper, the design of the active class E rectifiers using PMOS switch produces a more stable and lower ripple DC output voltage. So that the efficiency of rectification increases significantly. With simple structure and compact size, this proposed active class E rectifier can be applied for the future H-WPT applications especially in low power operations.

References


EEG-EMG based Bio-Robotics Elbow Orthotics Control Development

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**Keywords:** ADS1299, Brain-Machine Interface, Electroencephalography, Electromyography, Hybrid Brain-Machine Interface, Orthotics.

**ABSTRACT.** Brain-computer interface (BCI) or also its advancement, hybrid brain-computer interface (hBCI), is a technology that is vastly developed. This technology has been used in many fields. BCI is a system that directly changes a human’s mind into data that can be extracted to information that can be meaningful to people. The development of this technology has applications as a rehabilitation aid for someone suffering from an inability to move his limbs, such as the arms. Through this research, it is hoped to be able to design an orthosis control system as a rehabilitation device by using a classification method with EEG and EMG signals, so that subjects who use this tool can carry out rehabilitation in upper arm movements especially in the elbow joint. The system utilized Raspberry Pi 3 B+ as the computer and ADS1299EEG-FE as an analog front end for EEG and EMG. EEG frequency band power and EMG Vrms feature are extracted using Wavelet Transform and the model used for movement classification is Support Vector Machine. The results of the movement classification using both signals, using delta alpha ratio and root mean square features, obtained training accuracy for three movements namely relax, flexion, and extension of 90.3\% and for testing accuracy of 85.2\%. The combination of EEG and EMG signals are considered a promising approach for developing rehabilitation device of right arm limb.

![Figure 1. Elbow Orthotics Hardware System Design.](image-url)
References


Atmospheric Correction Models for Monitoring Rice Plants with Landsat-8 OLI and Sentinel-2

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Keywords: Atmospheric correction, Landsat-8, Sentinel-2, Rice growth phases, Statistical analysis, Vegetation indices.

ABSTRACT. Atmospheric correction is a critical pre-processing step required in quantitative remote sensing applications such as extraction of biophysical variables and multi-temporal analysis. The objective of this study was to evaluate surface reflectance of four atmospheric correction models based on scene-based empirical models namely Dark Object Subtraction (DOS) and Quick Atmospheric Correction (QUAC) and the radiative transfer models namely the Second Simulation of Satellite Signal in the Solar Spectrum (6S) and Fast Line-of-sight Atmospheric Analysis of Spectral Hypercubes (FLAASH). We applied these models to Landsat 8 OLI and Sentinel-2 images above rice fields in West Java Province and compared surface reflectance from atmospheric correction models with ground measured reflectance based on spectral response and vegetation indices (NDVI, EVI, SAVI and MSAVI). For that purpose, two stages of rice growth phases (vegetative and generative) were analyzed by using statistical analysis. The result showed that the 6S model has better accuracy followed by FLAASH, QUAC and DOS and it has a consistent value for the vegetative phase with green vegetation very dominant.
Comparative Study of Hyperspectral Acquisition Technique for Measuring Total Soluble Content and pH in Honey

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Keywords: honey; hyperspectral; reflectance; transmittance; total soluble solid.

ABSTRACT. Transmittance and reflectance modes are the two most common technique used for investigating liquid psychochemical properties based on optical spectra. In the case of honey characterization, this research performed to show a comparison between both modes to measure honey’s Total Soluble Solids and pH based on the Vis-NIR hyperspectral imaging system. The system consists of Specim FX10 hyperspectral camera with 448 bands (400-1000 nm), three 200 W halogen lamps, a light diffuser, a motor slider, and a PC. Then, PLSR algorithm applied to predict measured values based on acquired transmittance and reflectance spectrum. Performance of each technique tested by tenfold Cross Validation, which randomly grouping the dataset into ten partitions. Samples are prepared from 28 different honey types with varied colors, placed in 5 cm diameter Petri dishes at 10 ml volume. Performance of transmittance mode results in R\textsuperscript{2} of 0.93 and 0.80, RMSPE of 1.06% and 5.36% for total soluble solid content and pH measurement. For similar measured properties, reflectance mode results in R\textsuperscript{2} of 0.94 and 0.82, RMSPE of 1.01% and 5.23%. In this research, reflectance mode performs slightly better than transmittance mode in the measurement of Total Soluble Solids and pH in honey samples.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{plot.png}
\caption{Fig. 6. Plot of predicted and measured values of TSS measurement with transmittance mode (left) and reflectance mode (right)}
\end{figure}

References
Real Time Monitoring State-of-Charge Battery using Internal Resistance Measurements for Remote Applications

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Keywords: Battery management system, internal battery resistance, overcharging, real time monitoring, remote applications, state-of-charge battery.

ABSTRACT. Currently, the use of batteries as energy storage applications in various fields initiates many researcher to maximize the battery performance. One of the most important things to prevent a battery from over-charging or discharging issue is an accurate State-Of-Charge (SoC) estimation of the battery [1]. Inaccuracies in determining the SoC reduce the power-output capability and decrease the quality of the battery management system (BMS) [2]. Especially if the battery is used for remote applications which can not be monitored any time. Remotely accurate SoC information can be used to precisely control the charging and discharging operation of the battery. Several approaches have been proposed regarding SoC estimation i.e., the Coulomb Counting (CC) [1], [3], the so-called open circuit voltage (OCV) -based methods [4], [5] and the model-based methods [6].

In this paper, real time monitoring SoC battery for the remote applications is proposed by calculating the battery’s internal resistance when charging or discharging. When charging process, the battery’s internal resistance ($r_{ic}$) is low and will increase according with increasing the level of SoC. While at the discharging process, the internal battery’s resistance ($r_{id}$) is low and will increase in proportional to the decreasing of the SoC level. The calculation of $r_{id}$ and $r_{ic}$ is conducted by measuring $V_L$ (load voltage), $I_L$ (load current), and $I_C$ (charging current) using a voltage divider mechanism on the Arduino Uno and current sensors, respectively. LORA RA-02 SX 1278 433 MHz is used to transmit the parameters $V_L$, $I_L$ and $I_C$ of the batteries from the remote area (transmitter) to the server (receiver). Then the SoC will be estimated based on internal resistance calculation using these parameters on the server. With a simple structure, the proposed systems can be applied to the future remote real time monitoring battery systems.

References
Prediction System for Flavonoid Content on Bisbul Leave (Diospyros discolor Willd.) Using Deep Neural Networks Regression

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Keywords: bisbul leave, flavonoid content, prediction system, prediction model, deep learning.

ABSTRACT. Polyphenols are an important substance since it correlated with antioxidant level of food. One of polyphenol is flavonoid. In most cases, flavonoids measured with destructive methods. Hyperspectral imagery is part of the solution to cope this issue, unfortunately to extract useful information in it is hard. Velvet apple leave (Diospyros discolor Willd.) is one of plants in southeast Asia that rarely used. In this research, velvet apple leaves hyperspectral images acquired within the 400-1000 nm wavelength. The image is a cropped leaf which labeled with laboratory data of flavonoid. The working of the model in this research is used to predict the levels of flavonoid. Deep Neural Networks algorithm was used for predicting flavonoid compounds contained within the leave. Using an unoptimized and shallow Deep Learning model, it predicts the flavonoid compound with the R² performance of 70.47%. Furthermore, the model is optimized so it can get the best hyperparameters and a deeper architecture. The proposed model can predict of flavonoid with R² performance of 94.50%.

References
Design Analysis of Consolidation of Cellular Operators in Indonesia

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Keywords: Cellular Operator, Consolidation, Efficiency and Fair Competition, Operational and Financial Data

ABSTRACT. The increased use of data traffic by users increases the demand for cellular network capacity that operators must provide. For this reason, cellular operators have to add sites, use technology with a high efficiency spectrum, and increase spectrum allocation. The limited frequency spectrum becomes an obstacle for operators in increasing the availability of system capacity, which in turn can reduce the quality of mobile broadband services. Indonesian cellular operators are expected to have a spectrum deficit of around 400 - 450 MHz in 2020. One way to overcome spectrum deficits is consolidation between cellular operators. It is therefore very interesting to conduct a consolidation research of Indonesian operators and evaluate and analyze their impact on reducing spectrum deficits and competition. In this research the consolidation design was carried out with the following provisions: a maximum of two operators, the migration of spectrum 2 of the consolidated operators that were not contiguous was carried out to a minimum, the consolidated spectrum of results is a contiguous frequency, and no spectrum divestment. The consolidation model of Indonesian cellular operators is simulated on operators namely Tsel, XL, Isat, and H3I operating at frequencies of 900, 1800 and 2100 MHz in six regional mobile broadband services namely Sumatra, Java, Bali Nusa Tenggara, Kalimantan, Sulawesi and Maluku Papua. There are three consolidation models. Model I consolidation consisted of H3I + Isat consolidation, XL + Tsel, model II consolidation consisted of H3I + XL consolidation and Isat + Tsel consolidation, and model III consolidation consisted of H3I + Tsel and Isat + XL consolidation. First evaluated consolidation which gives the least spectrum deficit. Then the consolidation model is evaluated using company operational and financial data to decide which operator consolidation provides efficiency and fair competition.

References

Prediction of PM2.5 and PM10 Parameters Using Artificial Neural Network: Case Study in Kemayoran, Jakarta

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Keywords: Air quality, Artificial Neural Network, Forecasting Modeling, PM2.5, PM10.

ABSTRACT: It was recorded that in August 2019 the case of acute respiratory infection in Indonesia had doubled compared to the previous months. This is in line with the increasing levels of PM10 and PM2.5 in several regions in Indonesia. In the end the public is increasingly aware of the importance of air quality information. Prediction of air quality will greatly help the public to anticipate the dangers of declining air quality. The use of Artificial Neural Network can be a solution in making daily air quality forecasts whose parameters are not linear. This research shows that utilization of historical data parameters of temperature, humidity, air pressure and wind speed as well as BMKG’s PM10 and PM2.5 data is able to produce forecasting modeling for PM2.5 and PM10 concentrations in the Kemayoran area, Jakarta by utilizing Artificial Neural Network Modeling. The result is satisfied as follows: r<1.

Figure 1. Flowchart of the research process

Identification System for Beeswax on Malang Apple Using VNIR Imaging

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**Keywords:** Beeswax, Classification model, identification, reflectance profile, VNIR Imaging

**ABSTRACT.** Wax coating identification on fruits is very difficult without a non-destructive method. In general, destructive methods were used to identify wax or coatings by soaking the fruit in hot water or using a mixture of vinegar and water. There are also destructive systems that was used such as gas chromatography linked with mass spectrometry, but this method takes much time and difficult to operate. Visible Near Infrared Imaging (VNIR) becomes the alternate solution to identify wax on the surface of the fruit without spoiling the quality of the fruit. In this study, identification system for beeswax application on apples has been made successfully. The process starts through image acquisition, image correction, object detection, window averaging, classification model, and the coating status. The VNIR image was acquired on a wavelength range from 400 to 1000 nm. The data was divided for training and testing the classification model using cross-validation method, then the model was evaluated using confusion matrix. Several classification models were used to compare the result and to conclude which model gives the best accuracy for identification and classification problems. The accuracy of the three models were 72.92% for PCA-SVM model, 81.25% for DT model, and 91.67% for RF model.

![Averaging Spectral Profile (All Bands)](image)

**Figure 1. Averaged Spectral Profiles of the Waxed and Nonwaxed Apples**

**References**


Magneto-Optic Faraday Effect of Vegetable Oils

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\textbf{Keywords:} Magneto-Optic, Faraday Effect, Vegetable Oil, Food Authentication

\textbf{ABSTRACT.} This study presents a novel Faraday Rotation measurement system and magneto-optic characterization of vegetable oils with different origin (corn, sunflower, and soybean oil) and various temperature conditions. The results show that different sample has a distinct Verdet constant value depending on the origin, measured wavelength, and temperature. The change in gradient is insignificant for each wavelength measured and with increased temperature, the angle difference in which the plane of polarization rotates are noticeably higher. The results show the possibility to differentiate vegetable oils based on the origin; while the temperature conditions results suggest a novel method to identify reused vegetable oil in comparison with the same control samples to those of under investigation.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Comparison of Verdet constant value based on origin and wavelength measured for (a) corn, (b) sunflower, and (c) soybean oil}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Soybean oil’s Verdet constant value based on temperature variation for (a) not heated, and heated for(b) 15min and (c) 30min}
\end{figure}

\textbf{References}


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ABSTRACT. The distribution of remote sensing satellite data from National Remote Sensing Data Bank (BDPJN) of National Institute of Aeronautics and Space (LAPAN) to users via internet requires security so that it is not used illegally by unauthorized parties. Encryption and reversible data hiding are two effective and popular privacy protection and confidential communication solutions. With encryption, data is randomized so it can’t be read. Whereas with reversible data hiding, the receiver can extract hidden data and restore the original image without distortion. In this paper, some remote sensing satellite images are used as input in the simulation that is analyzed and compared based on the three methods of joint reversible data hiding in encrypted images, i.e. Zhang’s work, Hong’s work, and Fatema’s work. The experimental results show that Hong’s et al. method reveals the best performance of the three methods. For example, when the block size is 8x8, the bit error rate (BER) of SPOT-6 test image of the Hong’s et al. method was 12.06\%, which is slightly lower than the 14.01\% Zhang’s method and 11.89\% Fatema’s et al. method. Likewise, the quality of remote sensing satellite image (image\_spot6) recovery represented by the peak signal to noise ratio (PSNR) of Hong’s et al. method is 49.96 dB, which is quite higher than the 48.26 dB of Zhang’s method and 48.98 dB of Fatema’s et al. method.

Keywords: Encrypted remote sensing satellite images, joint reversible data hiding, BER, PSNR.
Implementation of Artificial Neural Networks for Very Short Range Weather Prediction

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Keywords: Weather Prediction, Artificial Neural Networks, Artificial Intelligence

Weather conditions are a significant factor for various sectors such as transportation safety,
development, health, etc. Therefore, high development is needed in forecasting future weather
conditions. Many ways are used to predict weather conditions. Along with the development of
technology now, weather prediction can be made using Artificial Intelligence (AI) technology or
artificial intelligence so that the results obtained are more optimal. In this study, the artificial
neural network used has a feedforward neural network algorithm using training data consisting
of temperature, air pressure, air humidity, wind speed, hourly wind speed at the Juanda
Meteorological Station in Surabaya from 2018 to 2019 with the target being speed bulk breeze.
Furthermore, the data was released in the period of 1 January 2019 to 31 August 2019. Based on the
analysis results, the Artificial Neural Network model has a fairly good performance in predicting an
increase in rainfall in Surabaya. The best model is considered by a model with architecture 7 - 30 - 1
with an estimated estimation level of 0.72, with an error value of -0.18. With this model, it is expected
to become one of the forecaster considerations in making special weather forecasts at intervals every
hour.

Figure 1. Scatterplot Input vs Output

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Simple I-V Acquisition Module with High Side Current Sensing Principle for Real Time Photovoltaic Measurement

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**Keywords:** INA-219 sensor, high-side current sensing, linearity, PV module

**ABSTRACT.** This work presents a data acquisition module for measurement of I-V of PV module based on INA219 sensor Adafruit integrated with the Atmega328 Microcontroller. The module has ability to measure a high degree of precision for DC current and equipped with software interface as a data logger display. The sensor works based on the principle of high side currents sensing consists of sense and load resistor to accommodate 4 sensors of 3 Amps in the maximum voltage range up to 26V. The measurement in real-time is performed in graphical form using visual studio software. Calibration and linearity tests result an error of

0.659% and 0.572% for currents and voltages respectively. The result of linearity test shows a value of

R = 0.99 for current and voltage of PV module compare to the calibrator.

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**Figure 1. Block diagram of a PV module monitoring system**

**References**


Development Of LVDT (Linear Variable Differential Transformer) Sensor as Land Displacement Sensor

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Keywords: Landslides, Land displacement, LVDT, Sensor.

ABSTRACT. In mitigation, one of the sensors used is the sensor to observe the movement of land in anticipating of landslide that is occur in Indonesia. In this research has been developed Linear Variable Differential Transformer (LVDT) sensor that is a position sensor to serve as land displacement sensor. The development of LVDT sensor has been developed and has started to be produced in prototype, but the price is expensive, therefore in this research used the material that is affordable so that the price is cheaper. This LVDT sensor has the smallest scale specification is 0.1 mm with measurement range up to 140 mm. For testing of this sensor by making experimental simulations using a container measuring. The container is tilted to an angle with varying angle of 40°, 45° and 50°. The results of land displacement experiments at angles of 40°, 45° and 50° are 5.5 mm, 27.6 mm and 28.3 mm. From this data shows the angle of the ground is directly proportional to the magnitude of landslides.

Figure 1. Prototype of LVDT Sensor

References

An Implementation of Haar-Cascaded Detection for Indoor Hexacopter Application

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Keywords: A* algorithm, Haar-Cascaded method, hexacopter, image processing, natural disaster, ultrasonic sensor.

ABSTRACT. The Asian region has a high level of natural disasters, especially in Indonesia. Buildings in Indonesia usually do not resist to natural disasters, so some buildings can easily damage by them. One type of natural disasters that often occur lately is an earthquake, which is happened spread out each year in Indonesia. Dealing with the buildings that partially collapsed after an earthquake is not an easy task for the people (rescue teams) in the scene. This situation gives a considerable risk to the search and rescue activities. This paper reports the use of a hexacopter, which can maneuver into the damage buildings and does the search activity. The hexacopter must be made autonomous in mapping the situation and detect the possibilities of injuries. Ultrasonic sensor detects obstacles when hexacopter navigates inside the building. In parallel with it, the hexacopter uses image processing to search for victims. Haar-Cascaded, as the primary method of image processing detects human faces that could possibilities counted as the victim. When detected, the victim will be localized in the frame picture and will be identified in one of four quadrants in the picture, as shown in Figure 1. Quadrants of the image are needed to find out whether the target is one of them or not. Detection results show the position of the victim uses as the input of hexacopter control system. Hexacopter control system uses simple PID, which will be a response of image detection. Hexacopter flying routes use A* algorithm method for path planning. This method guaranteed the shortest route.

![Figure 1. Determination of target position is simulated in 4 quadrant](image)

References

The Influence of Particle Size to Diffusivity of Nanogold Particles Based on Brownian Motion

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Keywords: brownian motion, diffusivity, image processing, nanogold.

ABSTRACT. Diffusivity calculation has been conducted by many researchers in various methods. One ingenious and sample-efficient way to determine the diffusivity is the examination under the microscope by using microbead random movements, called Brownian motion, through the footage of its movements. This study was conducted to observe the diffusivity of nanogold particles towards the use of various microbead sizes. The one-micron-sized microbead was mixed into nanogold particles solution and prepared onto slide glass, so was the three micron-sized and five-micron-sized microbead. The footage of microbead movements for each size then was tracked and processed using MATLAB image processing to obtain the mean square displacement (MSD) of the microbead and then fitting it to time to find the sample diffusivity. As a result, the nanogold diffusivity observed using one-micron-sized microbead is greater than three-micron and five-micron-sized microbead, which can be concluded that the bigger of microbead size used, the smaller diffusivity obtained.

Figure 1. One micron-sized microbead particle tracking and fitting data

References
Development of ECG Sensor using Arduino Uno and E-Health Sensor Platform: Mood Detection from Heartbeat

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Keywords: Heartbeat, ECG, Arduino Uno, Mood Detection, E-Health Sensor Platform

ABSTRACT. Many researcher said that emotion or mood can be detected from physiological changes like the heartbeat. In order to measure human heart activity, we were using tools like Electrocardiograph. The changes on human emotion or mood affect physiology. This paper is part of our research that talked about Analysis of Mood State from Heart Signal during Playing Flappy Bird. In this paper, we will explain how we design ECG tools that could measure or detect the human heartbeat especially that affect by mood changes. E-Health Sensor Platform v2.0 and Arduino Uno were used to build this system. E-Health Sensor Platform v2.0 contains several sensors that can measure the biological state of humans such as heart rate, breathing, skin conductance and many others. This device can operate when connected with Arduino Uno as a microcontroller. Arduino uno role as a liaison between the Platform and the PC via a serial port. We were using C programming language on Arduino Uno.

400 Hz were set in programming code so we can read all data from ECG sensor clearly. To visualize the heartbeat signals we were using KSTPlot. This system has successfully read the heart signals of 20 participants. Although there is signal noise but it does not affect the data. The noise can also be removed with a filter. In our next study, the raw data will be analyzed using the HRV method, but this will be discussed in another paper.

Figure 1. ECG System (Left), Heartbeat Signal (Right)

References


Blown Fiber Technology for Out Site Plan Network Deployment in Apartments Project

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Keywords: blown fiber, flexible design, micro duct, outside plan, the blowing apparatus, vertical residential

ABSTRACT. The current deployment of optical fiber networks in several major cities in Indonesia is intensive. Development of fiber as the backbone or last mile for special services and almost all of us have encountered. Maybe one of them is a network deployment studio in one of the Apartment Projects in Depok City. The population of Depok reaches 4% per year higher than the national growth, the number of students and students who reach more than 80 thousand who live in Depok from only 2 campuses namely the University of Indonesia and Gunadarma University make the residential business growth both in the form of residential horizontal (boarding rooms) or vertical residential (Apartment). Developers are competing to build Apartments which, of course, are potential new revenue and new markets for Internet & Pay-TV Providers. The problem of the length of time the deployment of network infrastructure, traffic is not taken into account and still prioritizes the quality and cost that remains efficient become an issue of concern to the Provider. Blown Fiber is a new technology with four main components namely products, blowing devices, optical fiber bundles, and terminating/connecting hardware. This technology results in more cost-efficient, more flexible designs, better work costs in installation, termination and cheaper testing compared to conventional optical fiber deployment technology. The implementation of Blown Fiber in a deploying studio in one of the Apartments in Depok specifically on the Out Site Plan (OSP) turned out to provide convenience and acceleration in terms of network deployment.

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Examination System of Chicken Meat Quality Based on Hyperspectral Imaging

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Keywords: Chicken meat, pH, VNIR, RF (Random Forest), PLSR (Partial Least Square Regression).

ABSTRACT. The freshness of the chicken meat will be degraded due to microbiological and chemical processes and will affect the quality of the chicken's meat. Measurements of freshness was done by laboratory test that usually destructively and takes a long time. In this study, a VNIR imaging system was built with a wavelength range of 400-1000 nm to determine the freshness of broiler chicken meat. The freshness of the chicken meat was analyzed by using organoleptic and pH measurement approach. Classification using Random Forest (RF) modelling has been developed to predict the freshness of chicken meat. The freshness of chicken meat was evaluated by using the correction value of 85.5%. The Partial Least Square Regression (PLSR) algorithm was successfully used to determine the pH. The pH measurement system for fresh chicken meat was evaluated using correlation coefficient 0.80 and RMSE 0.16. Meanwhile for the spoiled chicken meat, pH was measured using correlation coefficient of 0.84 and RMSE of 0.18. Both classification and regression methods indicate that this measurement system is effective for predicting the quality of chicken meat.

![Figure 1. Averaged Spectral Profiles of the Fresh and the Unfresh Chicken Meat](image)

References
Measurement And Analysis Of The Impact Of Air Quality Because Co And NO2 By Pollutants From Motor Vehicles On The Road Of Margonda Raya Around The Balaikota Depok

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Keywords: Air Quality, CO, NO2, Pollutants, Impacts, Depok.

Abstract: The biggest ambient air parameters produced from this transportation are Carbon Monoxide (CO) and Nitrogen Dioxide (NO2). CO gas or carbon monoxide is a gas that can release living things including humans. This CO gas will divert the binding of oxygen to the blood because CO is easier to flow blood to oxygen and other gases. NO2 levels in urban air are usually 10-100 times higher than rural air. Based on data from the Central Statistics Agency (BPS) in 2019, the current population of Depok City has jumped to 2,254,513 people. Air quality analysis is important for knowledge because this information is a pollutant in the Depok area. One of the means of transportation is transportation vehicles. Transition vehicles have. The natural environment that supports the lives of people is increasingly threatened by its quality, increasing from air pollution from transitional vehicles. Ground transportation activity is one of the biggest causes in ambient air quality in a city. The number of vehicles obtained after calculating the traffic on selected road sections is on Jalan Margonda Raya that passes through Depok City Hall. The research conducted in Depok City was considered not to have had any previous research done. In this study, monitoring of air quality on Jalan Margonda Raya through the City Hall of Depok with the parameters of Carbon Monoxide (CO) and Nitrogen Dioxide (NO2). The sensor used is Arduino Mega 2560, SHT11 Sensor, MQ-7 Sensor, MQ-135 Sensor, Wind Direction Sensor, Wind Speed Sensor. Data from the designed tool will then be sent to the cloud server which will then be collected in the dashboard application. The results will be analyzed later for their effects on weather parameters and their impact on community art.

References

Automatic Take-off Landing Quadcopter Control on Dynamics Platform

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Keywords: SAR, UAV, Take-off & Landing, Visual Servoing, Quadrocopter, Yolo v3, PID

ABSTRACT. SAR (Search and Rescue) become an interesting topic discussed worldwide because of its urgency to save humans life. Recent natural disaster in Palu, Central Sulawesi Indonesia demonstrates the lack of mobility which can cause a problem for the SAR team reaching the victim within the isolated area. Uneasy job for the SAR team become more challenging in time response and in finding and saving disaster victims. Consider the fact, there is a need to develop more efficient and effective way to search and rescue the survivors. The using of Quadcopter can answer the problems. Unfortunately the Quadcopter still conventionally controlled by a remote and further it has to be on static ground whenever its take off or landing. This paper reports a Quadcopter fitted with dynamical autonomous take off and landing systems. Thus it can carry out the advantage from a tactical SAR vehicles or other moving platforms. Using object detection approach, The navigation system in an image-based quadcopter or called visual servoing is the use of machine vision as a control of the closed loop position for movement. Images can be detected using YOLO v3 Real Time Object Detectora, and tracks it by estimating the motion of objects in successive video frames. By using 3D reconstruction the distance and position of the designated target and the quadcopter could be determined. Then the estimation of the relative position of the object is used as input for the control system on the quadcopter using PID controller.

The controller commands the quadcopter to approach the target, while the image processing checks the relative position between the two. If the position satisfies the minimum landing parameter, then the controller commands a landing. While for take off we implement the controller to maintain its equilibrium and sufficient power to throttle.

References


Detecting the Burned Area in Southern Kalimantan by Using the Sentinel-1 Polarimetric SAR and Landsat-8 OLI Optic

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Keywords: Synthetic Aperture Radar (SAR), backscatter, forest fire, Normalized Burn Ratio (NBR), Southern Kalimantan

ABSTRACT. Synthetic Aperture Radar (SAR) imageries data have turned out to be one of the essential sources for forest fire mapping, especially in tropical region since the smoke haze obstruct data acquisition by optical sensor. Despite these limitations, until now, the use of optical sensors still dominates in monitoring forest and land fires in the world. The Sentinel-1 satellites presently offer unreservedly accessible and freely available, world coverage and fast recurrent time (6–12 days), gives Sentinel-1 images the possibility to be broadly utilized for observing the Earth’s surface, including forest and land fire phenomenon. However, the use of sentinel-1 data for monitoring and mapping forest and land fires in the tropics of Indonesia, is still limited and has not been widely implemented. This study investigated the use of Sentinel-1, synergy with optical Landsat-8 OLI (Operational Land Imager) data, to identify the burned area, in the tropical region of Indonesia, during 2019 fire season. A pair of Landsat-8 OLI, collected before and after fires, has been used to delineate the boundaries of sample location of burned area. Then, the difference of reflectance and Normalized Burn Ratio were analyzed. A series of Sentinel-1 images, collected before and during/after fires, has been utilized to produce the backscatter values among images. Fire incident causes landcover changes from vegetated land to bareland. This changes can affect the reflectance detected from Landsat-8 OLI. This changes also affect the backscatter detected from SAR sensor. Then analysis of SAR backscatter on the location of the burned area detected from Landsat-8 was performed. The synergy between SAR polarimetric and optical reflected data, creates a valuable tool for identifying and interpreting burned area following a fire event.

Figure 1. Landsat-8 imageries, before and after 2019 peak fire in Southern Kalimantan

August 14, 2019

October 17, 2019
References


Parasitic Resistance Calculation of PV Module at Various Irradiance Based on Three Condition Lambert-W

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**Keywords:** Irradiance, Lambert-W, parasitic resistance, photovoltaic.

**ABSTRACT.** Changing conditions of sunlight irradiance and degradation of solar cell due to ageing will produce fluctuations in the output of solar cell modules during operation. Characterization of photovoltaic module (PV) using direct sun light is relatively difficult to get constant irradiance. In this work, PV module is characterized at various levels of direct irradiance from the sun to obtain parasitic serial resistance ($R_s$) and shunt values ($R_{sh}$). The parasitic resistances of PV module alter after a long period of operation. A monocrystalline Solarland SLP100S-12 photovoltaic module of 100Wp was illuminated by direct irradiance of sunlight with various intensities of 0\% (unfiltered), 25\%, 50\% and 75\% using a filter that covers the surface of the PV module. The I-V curves obtained were then modeled after Lambert-W function based on three calculation conditions: short circuit current ($I_{sc}$), open circuit voltage ($V_{oc}$), and also current and voltage at the Maximum Power Point ($I_{mp}$, $V_{mp}$). The results give $R_s$ values of $0.66 \, \Omega$, $0.65 \, \Omega$, $0.62 \, \Omega$ and $0.60 \, \Omega$ respectively, while for $R_{sh}$ values $92.6 \, \Omega$, $92.8 \, \Omega$, $93.6 \, \Omega$ and $93.8 \, \Omega$ with a deviations of 4.3\% and 0.6\% for $R_s$ and $R_{sh}$. This results show a relative same parasitic resistance values under various irradiance intensities.

![Figure 1. Measurement results of I-V PV modules with direct illumination](image-url)

**References**

The pH Measurement Based on Color Image Sensors Using Convolutional Neural Network Modeling

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Keywords: CNN, Colorimetric, pH, \textit{Brassica oleraceae}

ABSTRACT. pH is an important unit to represent the chemical condition of a liquid, solid substance, food nutrition, and microbial activity as well. pH is also commonly used to detect the behavior of chemical substances. The pH detection can show any color change based on the acidity condition from a measured environment. The color change can indicate the pH value. In this research, the colorimetric based on neural network and color information detected from the pH value for point-of-care applications. For this investigation, we used the pH buffer solution and natural dyes derived from \textit{Brassica oleraceae} (Red Cabbage) that showed colorimetric response gradually shifted from red to green along with the increasing of pH from 2 (acid) to 11 (alkaline). In this paper, we propose a method for predicting pH value based on Convolution Neural Network (CNN) regression with RGB and HSV color space. As a result, the accuracy of this method could estimate the pH reasonably well for point-of-care application.

Figure 1. Characterization of Methyl Red Dye

References
Non galvanic measurement of partial discharge using antenna boutique.

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Keywords: Partial discharge, Corona, Bowtie Antenna

ABSTRACT. Electricity Phenomena produced by corona or partial discharge will result in the propagation of electromagnetic waves into the air. Measurement of this existing phenomena developed to a measurement technique with an antenna known as a Non-galvanic sensor. This paper discusses the sensitivity of bowtie antenna in measuring and detecting the occurred phenomena caused by corona and partial discharge. The measurement result of the antenna-based sensor is compared with the measurement result of a commercial galvanic sensor. The Antenna is connected with the digital Oscilloscope as an acquisition instrument, which has a 50-ohm impedance with a reading sensitivity of up to one millivolt. Even the commercial sensor performs better than the antenna, both phenomena corona and partial discharge can be measured by the antenna-based sensor.[1]–[6]

References
Microstrip Slot Antenna Design for Radar Remote Sensing Application

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Keywords: Axial ratio, circular polarization, microstrip slot antenna, radar remote sensing.

ABSTRACT. The development of radar remote sensing applications in Indonesia is increasingly being used for environmental monitoring, rainfall estimation, earth and coast observation, or even for disaster mitigation [1, 2]. An antenna with circular polarization, wide bandwidth, good axial ratio, high impedance matching and also high isolation between antenna’s elements, as well as a symmetrical design is needed to support the radar antenna system [3, 4, 5, 6]. The study in this paper is to carry out a design of a microstrip slot antenna for radar remote sensing applications, in the X-band frequency range (7.9 - 8.5 GHz), with good axial ratio.

References

Surface Temperature Changes of the Crater of Agung Volcano from Landsat-8 TIRS during 2017-2018 Eruption

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Keywords: Thermal anomaly, Agung Volcano, Landsat-8 TIRS

ABSTRACT. This paper described the application of Landsat-8 TIRS (Thermal Infra Red Sensor) to analyze the surface temperature changes of the crater area of Agung volcano during 2017-2018 eruption. Agung volcano is an active stratovolcano located in Bali island. We processed the brightness temperature from channel-10 of Landsat-8 TIRS during 2016-2018 and analyzed the changes. The results of this research showed that the eruptions that occurred during 2017 - 2018 have indicated changes in the surface temperature of the crater. The surface temperature changes of the crater, which can be detected from Landsat-8 TIRS data, can be used as a precursor of an eruption.

Figure 1. Brightness Temperature (in Kelvin) of the Crater of Agung Volcano during April 2013 – August 2019

References


Abstract. Observation of air quality is now very important related to the increasing pollution in Indonesia as a result of the use of motor vehicles, industrial activities, land burning, and others. This triggers the emergence of PM10 and PM2.5 particulate pollutants that is increasing in the atmosphere. One solution to overcome these problems is the design of IoT based PM10 and PM2.5 digital monitoring system that is integrated with parameters of temperature, humidity and wind direction and speed. The design of this system consists of sensor hardware ZH03A, SHT11, and JL-FS2. Data is processed on an ATMega2560-based microcontroller and then sent to the server using the internet so that it can be displayed on website. The information system on the website uses PHP and HTML. The device has been tested with calibration and comparison methods with standard and operational equipment. The result of this study is the device can operate properly and the measuring results are displayed on web in real time to provide air quality information. The relation between particulates PM10 and PM2,5 is directly proportional to air temperature and inversely proportional to humidity.
Development of Landsat/LDCM Data Acquisition System Integration for Parepare and Rumpin base on Virtual Ground Station In order to Provide National Intermediate Resolution Remote Sensing Data

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Abstract. In order to maintain continuity of remote sensing satellite data to support the National Remote Sensing Data Bank (BDPJN), particularly medium resolution data for agricultural, plantation, forestry and other applications. LAPAN in this case the Center of Remote Sensing Data and Technology needs to build an infrastructure for receiving, processing and managing natural resources remote sensing satellite data (Landsat/LDCM) covering the territory of Indonesia. Therefore Landsat/LDCM data acquisition, processing and cataloging system is built on Lapan Parepare and Rumpin earth stations to be integrated, facilitated in operation and can be monitored through an integrated system in accordance with the stages of the process and schedule. Data acquisition integration includes scheduling process and data acquisition process which can be monitored through acquisition monitoring system (Lapan Satrac web) and remote desktop monitor system (web Guacamole). The integration of data processing includes raw-level data processing of standard-1G/T level products that can be monitored through Landsat data processing and management system (FarEarth web and Landsat Processor system). The integration of data cataloging includes merging catalogs of Parepare and Rumpin earth station acquisitions that can be monitored through the Landsat catalog web-based Landsat/LDCM catalog system. The development of integration of remote sensing ground stations in Parepare and Rumpin base on virtual ground station, by using nearly remote, almost automated and nearly real time method, both in the stage of acquisition, processing and cataloging. So it does not depend entirely on the operator in the ground station, then more the operational just for monitoring the schedule of acquisition, processing, data management and reporting.

With a built-in ground station integration system, Landsat/LDCM reception, processing and cataloging of Landsat / LDCM data is almost remote, nearly automatic and nearly realtime. In operation the system of acquisition, processing and cataloging Landsat/LDCM data 2x a day/night and can reach 3 hours speed for each scene to data available in web-catalog and every 16 days for all scene of Indonesia region. In this case the integration system could be a redundant backup and compliment of Parepare and Rumpin ground stations in order to provide remote sensing medium resolution data to support the National Remote Sensing Data Bank.

Keywords: Landsat/LDCM, Virtual Remote Sensing Ground Station, Integration of Acquisition-Processing-Cataloging Systems, Nearly Remote-almost Automation and nearly realtime.
FPGA based Switching Circuits and Acquisition Module for Electrical Impedance Tomography

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Device Electrical Impedance Tomography (EIT) is an imaging tool that produces cross-sectional images of an object based on its conductivity distribution. The electrical voltage distribution data, which represents the conductivity distribution, is obtained through a combination of measurements of the voltage values of the electrodes mounted around the object when electrified currents with amplitude and frequency. There are several methods of combining measurements of electrode surface tension values, such as adjacent, opposite, and cross methods. In order to carry out such methods, a switching circuit is required which governs the roles of each electrode, either as a current injection site or a voltage reading. The switching circuit is designed to obtain the control signal of the electrode role of a Field Programmable Gate Array (FPGA). The voltage data obtained from the switching circuit is acquired by a data acquisition module consisting of signal conditioning circuit, Analog to Digital Converter (ADC), FPGA board, and serial communication device. Before being converted to digital data by ADC, the voltage data is conditioned by the signal conditioning circuit to reduce noise and keep the sampling frequency of the signal satisfying the Nyquist frequency and in the ADC input range. The digital data from the ADC is then forwarded to the FPGA board to be processed into peak-to-peak value. Once converted to peak-to-peak values, this digital data is transmitted to the computer via a serial communication device to be reconstructed into an EIT image. The FPGA board used in this project is the Altera DE2-70 Cyclone II.
Development of Mechanical Platform for Picosatellite Ground Simulator and Communication Protocol

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Picosatelit is one type of satellite with a small size and has a maximum mass of 1 kg. In developed countries, the role of universities and research institutes in the development of picosatelit is very large. Unfortunately in Indonesia, the role of universities and research institutes in the development of picosatellite is still low. The creation of a picosatellite simulator was developed in an effort to motivate the public about the importance of satellite technology. The picosatellite simulator serves to demonstrate the attitude control process of picosatellite using Reaction wheel. Reaction wheel serves to regulate the attitude of the picosatellite simulator through rotation that produces angular momentum. The air suspension system aims to produce minimum frictional force conditions. To mimic the effects of the earth's magnetic field as a reference of the attitude control, a pair of Helmholtz coils are constructed. The Helmholtz coil ring has a diameter of 50 cm with a distance between the ring of 15 to 30 cm. In order to produce the required magnetic field, the ring is wrapped with 150 turns of 0.4mm copper wire. In this system, Bluetooth communication is used to connect users with the picosatellite simulator. This communication link is reinforced with an information security mechanism to prevent hacking by unauthorized parties.
Developing A system to determine impact force in tennis

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Abstract

Introduction: The purpose of this project was to develop a system that could estimate impact force in tennis forehand stroke. Such estimation is critical feedback during training. Method: A tennis racket was used for this study. A strain gauge was embedded into the body of the racket. Changes in strain measurement (analog signal) was converted to digital signal using the AD converter and was synced with the motion capture system. Calibration of the strain gauge was conducted by hanging fixed weights of equal increment on the racket and expressed as a relation of fixed weight mass and strain data (captured on motion capture) using linear regression equation. The equations summation of forces were used to determine the impact force. Results and Discussions: The peak impact resultant force estimates were similar to those reported in the literature. Despite the sampling frequency of 200Hz, data estimated from this study may give a representation of peak resultant impact force as the data were not filtered. Conclusion: The system developed in this study may be suitable to estimate peak resultant impact forces. Coaches could simply use the data gathered and in future, synchronize with an app on mobile devices to establish impact force directly and instantaneously with acceptable accuracy.
Detection of Hg$^{2+}$ ions using silver nanoparticles as colorimetric indicator

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Keywords: silver nanoparticles, colorimetric, Hg$^{2+}$ detection, biosynthesis, Diospyros discolor.

ABSTRACT. Detection of the heavy metal presence in an environment requires a facile and simple system. Silver nanoparticles (AgNPs) have the ability as a colorimetric indicator related to their unique characteristics of its LPSR properties. In this research, biosynthetically AgNPs using Diospyros discolor leaf extract used as a colorimetric indicator for detecting Hg$^{2+}$ ions. The solution color changes that occur when detecting the analyte was observed. The characterization was performed using a UV-Vis spectrophotometer to study changes in the LSPR spectrum of silver nanoparticles when detecting the presence of Hg$^{2+}$ ions. In addition, the characterization with Transmission Electron Microscope (TEM) was carried out to determine the shape and size of the nano-article. The results obtained indicate that there was a tendency for the solution color change from brown to clear when AgNPs interact with Hg$^{2+}$ ions at certain concentration ranges. This result showed that without modification the AgNPs tend to be selective and sensitive to the presence of Hg$^{2+}$ ions.

Figure 1. Silver nanoparticles used for the detection of Hg$^{2+}$ ions with various concentrations started to show solution discoloration from brownish to clear solution.

References
A Simple Paper-Based Color Change Label Using Plant Extracts for Ammonia Gas Detection

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Keywords: ammonia detection, color change, paper-based label, colorimetry.

ABSTRACT. Paper and plant extracts are materials that is cheap and easy to find everywhere, has great potential to be used as a portable, low-cost and biodegradable label for the application of chemical compounds detection. In this paper, we have explored potential methods for the label to detect ammonia gas, an indicator of meat spoilage, with the colorimetric principle. By immersing paper with plant extracts that are sensitive to ammonia, in this case, is anthocyanin from Ruellia simplex flower extract, the detection of ammonia at various concentrations can be achieved. Ammonia concentration used is 0; 0.005%; 0.025%; 0.1%, 0.25% and 0.5%. Color change images on the label when detection is scanned by a flatbed scanner. ImageJ software is used to quantify the color changes. Ammonia detection at various concentrations results in a color change from red to yellow on the paper label. Paper-based labels with discoloration that can be captured visually by the consumer's eyes are considered as promising approaches to determine the freshness of meat.

Fig.1 The color change of paper label with ammonia solution concentration 0 - 0.5% w/v for 0 - 4 hours

Fig.2. Changes in the Green color intensity of paper label when detecting ammonia vapor

References


New Insight Of The Implication Blood Pressure Detection Differences Using Aneroid Sphygmomanometer And Digital Blood Pressure On Medical Examination

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Keyword: digital blood pressure, blood pressure classification

The quality of medical devices is an important things to establish the anamnesis, diagnosis and also treatment of patient. Arterial pressure measurement as one of the first indicators in the Hypertension Management Guidelines requires the accuracy as well as their function. Error in the detection of blood pressure should not occur during measurement because the errors will also make failure in determining the diagnosis and therapy for hypertensive patient, related on their hypertensive classification. Clinicians requires accurate medical measurement in order to monitor patients, diagnose diseases and deliver treatments. The failure of detection will certainly have diverse effects. Preliminary studies have shown that differences in results that are generated by two types of blood pressure devices, aneroid sphygmomanometers and digital blood pressure. The differences higher 2 to 3 mmHg using digital blood pressure than aneroid sphygmomanometer. This difference led a new insight to the accuracy of blood pressure devices that are widely used in medical circles and the implications of these different values for the determination of blood pressure classification. Therefore, it is necessary for medical staff to get information about the accuracy of blood pressure devices and its critical parameters in determining blood pressure, it is also necessary for a regulation on a blood pressure classification based on the type and level of accuracy of measuring instruments.
Long-Term Change in Characteristics of Cloud Vertical Structures Over Indonesian from Radiosonde Observations

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Keywords: Cloud vertical structures, climate change, radiosonde, Indonesia

ABSTRACT. Cloud vertical structures, including cloud-base and cloud tops heights, cloud thickness and vertical distribution of the multi-layer cloud affect the radiation balance of the Earth’s atmospheric system. Cloud radiative forcing (CRF), especially those induced by interactions between aerosols and clouds, contributes to uncertainties in weather forecasts and climate predictions. The characteristics of clouds have changed and will continue to change from the climate changes, including changes in cloud height, cloud cover, and morphology. This work investigates cloud vertical structures in Indonesia using long-term observations of radiosondes (~30 years). The cloud base height (CBH) is identified based on relative humidity (RH) threshold of 84% following the identification proposed by several previous studies. At least 3% of jumps in RH can be seen from adjacent lower levels and the minimum CBH is set at 600 m above ground level (AGL) to avoid noise caused by drizzle or rain under the clouds. The vertical distributions of cloud tops, bases, and cloud occurrence show a preponderance of low-level cloudiness (Fig. 1). Detailed description of characteristics of cloud vertical structures over Indonesian will be presented in the conference.

References
Simple Gold Nano Particles Production Method by Ablated Laser: Diameter Modification

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Keywords: gold nanoparticles, ablated laser, diameter

ABSTRACT. Recently, an improved interest in gold nanoparticles (AuNPs) with an interesting phenomenology such as plasmon resonance, has been aroused. There are many methods to synthesized AuNPs. We have successfully fabricated AuNPs base on laser ablation method. The pulsed Nd:YAG laser ablated at 1064 wavelength to a pure gold plate. The frequency was adjusted in low range to produce low energy density laser beam. Three different solution (aqueous, polyvinyl alcohol and polyethylene glycol) was applied to modify AuNPs diameter. The modified nanoparticles diameter was observed by mean UV-Vis spectroscopy exhibit different absorption peak wavelength. For comprehensive discussion, the spectrum was compared to simulation tool on MATLAB. Interestingly, AuNPs diameters have been modified by using different solution

Figure 2. a) AuNPs spectrum measured by UV-Vis and b) spectrum simulation using MNPBEM.

References

ECG CALIBRATION SIGNAL DATABASE CONSTRUCTION BASED ON IEC 60601-2-25 USING MATLAB

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Keywords: accuracy, calibration, ECG, IEC 60601, standard, testing.

ABSTRACT. ECG machines should be calibrated and tested to assure their accuracy. IEC 60601-2-25 standard describes signals for calibrating ECG amplitudes and frequencies. The problem is this standard does not clearly describe the formulas of the calibration signals nor the complete database of these signals. The aim of this study is to get a database of ECG calibration signals for testing based on IEC 60601-2-25 standard clause 201.12.1.101. Data are constructed with a series of sinus function in Matlab software. The data are visually and statistically compared with the data from commercial ECG tester. Data has been constructed for 3 different lead of 12 ECG calibration data. Four ECG calibration data with elevation or depletion ST segment were excluded from this study. This study demonstrates that these ECG calibration signals are slightly visually different but statically aren’t significantly different. The more convex form of P and T segments potentially make wider intervals measurements, while the narrower ends of the R and S segments potentially result in lower amplitude. This data can be used by designers or manufactures, but for the testing laboratory is recommended using a commercial product.

Figure 1. Comparison of constructed database and commercial database of CAL10000 database Lead I

References
Influence of the liquid injection hole to ripple frequency of the QCM sensor

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Abstract. The liquid injection is one of the crucial roles in the used of QCM sensors in a liquid application. Liquid sample injection should be controlled. As the liquid injected onto the QCM sensor surface using peristaltic pump, a short pressure pulse exists. The short pulse affect the stability of the resonance frequency of the QCM sensor. The pulsation flow of the peristaltic pump leads to a ripple resonance frequency of the QCM sensor. Resonance frequency measurement of the QCM sensor in the reaction cell injected using the peristaltic pump has been measured. Different injection holes size was made to observe the effect to the sensor stability. The result showed that frequency of the QCM sensor has a ripple frequency as the liquid injected using the peristaltic pump. It was observed that bigger injection hole at the exit flow resulted in a smaller ripple frequency. Further investigation is required to get the smallest ripple frequency during the liquid injection using the peristaltic pump.
Design of Negative Pressure Wound Therapy (NPWT) to Accelerate Diabetic Ulcer Healing

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Abstract. Design of a microcontroller based-NPWT (Negative Pressure Wound Therapy) to accelerate diabetic ulcer healing has been conducted. This study aims to design an NPWT device equipped with negative pressure setting as well as therapy duration to absorb diabetic ulcer fluid. In this NPWT device, the negative pressure was regulated by a ballvalve which then was read by the MPX5050DP sensor and processed by the microcontroller. The setting duration of the therapy was also available in this device and as programmed in the microcontroller. In this study, experimental rabbits were used and conditioned to suffer from diabetic ulcers. The therapy performed was a pressure with the magnitude of -75 to -80 mmHg for 5 hours. This device has a high degree of accuracy in absorbing the fluid of diabetic ulcers, the magnitude is 99.5 %, while the therapy duration has a 100 % accuracy.

Keywords: negative pressure wound therapy, NPWT, negative pressure
Cholesterol Electrochemical Sensor Based on Molecularly Imprinted Polymers (MIPs) Modified Screen Printed Electrode (SPE)

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Abstract
Molecularly Imprinted Polymers (MIP) are generally a more stable material for sensing application. The high selectivity and sensitivity of MIPs for sensors can be achieved if the template molecule is imprinted in the polymer and this makes them an ideal alternative as a recognition element for sensors. A new electrochemical sensor based on molecularly imprinted polymeric microspheres (MIPs) modified carbon screen-printed electrodes (SPEs) for the rapid detection of cholesterol. Hydrophobic MIPs were synthesized using photopolymerization in emulsion form. The MIP microsphere specific to the cholesterol, prepared via a facile photopolymerization technique, were coated onto the modified SPE. The presence of cholesterol in biological samples could be detected with the sensor via absorption of cholesterol into the deposited MIPs. The sensor response was monitored by cyclic voltammetry of the reduction and oxidation solution of K₃Fe(CN)₆ at optimal conditions. The linear sensor response could detect the concentrations of cholesterol from 0.1 ppm to 100 ppm, with a detection limit of 0.10 ppm. The sensor based on MIP microspheres and modified electrode demonstrated a stability more than 20 days.

Keywords: MIP, Sensor, Cholesterol, Square wave voltammetry (SWV), Screen-printed electrode.
A high voltage electrostatic filter for particulate matter PM$_{2.5}$ capture applied in motor vehicle exhaust system

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Abstract. Increasingly strict air pollution regulations along with global warming issue have peeked the interest in cleaner emission emitted by motor vehicle. In line with this, this study was aimed to develop a particulate filtering system based on an electrostatic principle for particulate matter with the diameter less than $2.5 \mu m$, as known as a fine particle, and to test the performance of the filter. The filter consists of aluminum anodes and cathodes as the electrostatic electrodes. These electrodes were placed into the filter frame and installed on a motor vehicle muffler. The test was conducted to estimate the filter performance by measuring particle concentrations before and after using the filters. The filter was tested under four different electrostatic voltages: $V_1$ 100 Volt, $V_2$ 200 Volt, $V_3$ 300 Volt, and $V_4$ 400 Volt. The results show that the filter can reduce fine particle concentrations with the best efficiency of 50%, 60%, 62%, and 68%, respectively for $V_1$, $V_2$, $V_3$, and $V_4$. Filter performance was directly influenced by the applied voltage and the time of the test.
Design of Water Height Detector Model in Runway Based on Internet of Things

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Abstract. The runway of an aircraft is designed to keep it dry even if it rains to avoid hydroplaning. Hydroplaning is a plane slip on the runway due to standing water. In accordance with regulations from the Direktorat Bandara, Ditjen Perhubungan Udara NO. KP 212 in 2017, the operational requirement for runways to be able to serve landings and aircraft flights is when there is a maximum of 3 mm of standing water on the runway surface. The design of the water level detector model on the runway uses the Arduino Mega 2560 as a microcontroller which processes and sends the detected data to the thingspeak via the internet network. Performance specifications for water level detector models are water level sensor designs, U detector pipes, runways, electronic circuits. The water level sensor is a touch sensor that is designed and printed on a PCB board with vertical strip designs. Detected data will be processed in Arduino Mega 2560 and typed into the thingspeak page using the internet network. Data output can be accessed via a PC connected to the internet network. The results of comparison with standard tools found the average percentage of errors for the vertical sensor strip design was 4.98\%. From the comparison results, the average percentage of accuracy for the vertical sensor strip design is 95.01\% with precision of 84.77\%.
A Radiochromic Paper Label Using Red Cabbage Acid Extract

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Keywords: red cabbage, indicator label, radiochromic, gamma ray

Abstract—Gamma-ray irradiation is needed for sterilization to prevent nosocomial infections due to microorganisms. In practical applications, a device that can measure doses in a simple, direct, and inexpensive manner such as a radiochromic indicator label is very necessary. This paper reports the results of research on paper labels for radiochromic indicators made from extracts of red cabbage dyes to detect doses of gamma-rays. This dye was extracted by maceration method. The indicator label was made by soaking a cellulose paper in the dyes extract which has a pH of 2 in a certain time. The prepared indicator label was tested by gamma-ray irradiation in the range from 0 to 40 kGy. This indicator label has a pale violet red color before irradiating, then after irradiated with gamma-rays changes to an antique white color with increasing dose of irradiation. This indicator was scanned using Flatbed Scanner then the color was analyzed with ImageJ software. The results of RGB analysis for the label color changes show that optical density of the green component of the RGB has a higher sensitivity to gamma-ray irradiation compared to the red and blue components. The results of this experiment concluded that the indicator labels made using dyes from red cabbage can be used properly as a gamma ray dosimeter.