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PROGRAMME

Thursday, October 26

Thursday, October 26 9:00 - 10:45

Aerospace and Electronic Systems - 1

Room #1 (09:00 - 10:45)

Chair session : Muhammad Arif Saifudin

Room #1

Onsite: Nusa Penida Room # 1

9:00 ***Development of heaterless hollow cathode for low-power Hall thruster.....1***

Wei Cheng Wang, Yi-Lung Huang and Jordan H Hsieh (National Cheng Kung University, Taiwan); Heri Juwantono (National Cheng Kung University & ZAP Lab, Taiwan); Yueh-Heng Li (National Cheng Kung Univerity, Taiwan)

In response to the unavailability of a stable electron source in our laboratory, we focus on the development and construction of a hollow cathode. Throughout the course of this research endeavor, we successfully engineered a heaterless hollow cathode capable of delivering a current ranging at least from a minimum of 0.5A to 2A. Our research paper presents the cathode's structural configuration and recorded breakdown voltages observed at various flow rates from 35 sccm to 50 sccm. Additionally, we provide precise measurements through the oscilloscope of both keeper and anode voltages during stable operation to understand the designed cathode's operational characteristics. Furthermore, the paper encompasses simulation results, offering the estimation of inner pressure and electric field distributions at the cathode's orifice. These simulations significantly provided the initial experimental parameters of the cathode like ignition stable operation flow rate and keeper voltage. Within the purview of our research, we have also delineated the ignition process and experimental setup for the heaterless hollow cathode while cataloging several challenges encountered throughout the experimental phase.

9:15 ***Design of the Faraday cup for a multi-layer insulator vacuum arc thruster characterization.....8***

Ping-Han Huang (National Cheng Kung University, Taiwan); Yueh-Heng Li (National Cheng Kung Univerity, Taiwan); Tsung-Ying Yang (National Cheng Kung University, Taiwan); Ta-Yen Huang (Taiwan Space Agency, Taiwan); Jordan H Hsieh (National Cheng Kung University, Taiwan); Heri Juwantono (National Cheng Kung University & ZAP Lab, Taiwan)

The vacuum arc thruster is an electric propulsion system utilized in space. This thruster's design incorporates a thin layer of graphite between the cathode and anode, enabling the thruster's ignition voltage in vacuum to be lower than 1 kV. However, the experiment revealed that if the graphite layer is applied too thinly, the thruster's lifespan decreases. On the other hand, if it's too thick, it causes a direct short circuit between the two electrodes, rendering the thruster inoperable. Therefore, this study proposes a multi-layer insulation design to replace the insulation layer in the vacuum arc thruster and the graphite layer covering it. This insulation layer utilizes the physical phenomenon of triple junction, where graphite and polytetrafluoroethylene (Teflon) adhere to each other. This design facilitates the easier generation of plasma at the interface of two different materials, ensuring stable operation of the thruster. Furthermore, the study also devises a rapid Faraday cup for measuring the vacuum arc thruster. This measurement system is better suited for pulse-type plasma sources, as it reduces signal reflection by considering impedance matching within the measurement system itself. By comparing the signals from the thruster discharge and the Faraday cup reception, the time of flight (TOF) method is then employed to calculate the plasma plume velocity. The experiment involves altering the distance between the thruster and the Faraday cup, analyzing plasma and flow velocities at different positions, and correcting the measurement results. Ultimately, in combination with erosion rates, the study determines the thrust magnitude of the thruster.

9:30 ***Design and Development of Prototype Low Power Glow Discharge Hollow Cathode for Plasma Thruster.....14***

Heri Juwantono (National Cheng Kung University & ZAP Lab, Taiwan); Yueh-Heng Li (National Cheng Kung Univerity, Taiwan); Wei Cheng Wang and Ping-Han Huang (National Cheng Kung University, Taiwan)

A low-power glow discharge hollow cathode neutralizer is presently under development at the ZAP Lab, Department of Aeronautics and Astronautics, National Cheng Kung University, Taiwan. This neutralizer cathode operates based on glow-discharge DC plasma generation, without the inclusion of thermionics material. The glow discharge hollow cathode design exhibits robustness and compactness while consuming relatively low power. Notably, the cathode functions effectively at a discharge voltage range of approximately 860-915V with a current of 0.05A, maintaining stable operation within the 200-300V voltage range. Moreover, the cathode successfully accommodates gas propellant feed rates varying from 1 to 10 standard cubic centimeters per minute (sccm) of

Argon. Furthermore, the cathode demonstrates the capability to operate even with orifice power cut off and effectively ignite the ion thruster.

9:45 ***Relation analysis of the thrust efficiency and other parameters of pulsed plasma thrusters.....19***

Tsung-Ying Yang (National Cheng Kung University, Taiwan); Yueh-Heng Li (National Cheng Kung Univerity, Taiwan); Ping-Han Huang and Sheng-Wen Liu (National Cheng Kung University, Taiwan)

A pulsed plasma thruster (PPT), a kind of electric propulsion system, is one of the CubeSats' most widely used thrusters. What features a PPT is its high specific impulse that can operate even in low power conditions. Meanwhile, trim sizes, simple structure, and longer lifetimes are PPT's advantages as well. Compared with other electric propulsion systems, though, PPT's thrust efficiency is almost the lowest (approximately 10%). On the other hand, the thrust formation of a PPT constitutes not only the electromagnetic force (the Lorentz force) but also electrostatic force, electrothermal force, and neutral gas. For analyzing such a complicated discharge mechanism, we utilize the parallel type of a PPT to be our prototype since different configurations of electrodes and thrusters will affect the thrust composition. With the PPT discharges, we can obtain the theoretical values of impulse bit. Simultaneously, the specific impulse and the thrust efficiency can be derived with the measurement of the average mass consumption after hundreds to thousands of discharge times. In addition, we alter the number of segmented electrodes and the main discharge energy to shed light on PPT's discharge mechanism. Furthermore, the relationship between power conversion efficiency and its energy losses is worthy of clarification and discussion. All things considered, these results could provide several reliable design guidelines for PPTs in the future.

10:00 ***Free-Space Method for Measurement of Dielectric Properties at Microwave Frequencies.....23***

Yih-Chien Chen (Lunghua University of Science and Technology, Taiwan); Dyan Eko Wahyu Priyatno (Lunghwa University of Science and Technology, Taiwan)

Industries need a better understanding of the materials to shorten design time. The accurate measurement can provide valuable information to properly use the material for solid design or monitoring processes. Every material has a unique electrical characteristic that depends on its dielectric properties. This paper presents the free-space measurements to determine the dielectric properties of the material under test. The main objective was to measure the dielectric properties of different materials at microwave frequencies. The frequency range in this measurement setup is 8 - 12 GHz (X band). The measurement setup includes a Vector Network Analyzer, horn antennas, calibration kit, and simulation software to determine the dielectric properties of the material under test. In this work, the transmission coefficient (S-parameter) was measured to obtain the amplitude and phase of the material under test. This study developed an extraction procedure by simulation. The measurement setup was remodeled in the HFSS simulation according to all parameters used in the measurement setup settings. Simulations are used to extract the dielectric properties of the material under test from measurement results. The extraction result was tabulated and compared with the reference from another study.

10:15 ***Assessment Of Composite Radome Impacts on The Signal Transmission Of The 2,4 Ghz Frequency Band.....27***

Purwoko Nyaman (Organisasi Riset Penerbangan dan Antariksa & Badan Riset dan Inovasi Nasional (BRIN), Indonesia); David Natanael Vicarneltor (National Research and Innovation Agency (BRIN), Indonesia); Herry Purnomo (Aeronautics and Spaces Research Organization, Indonesia & National Research and Innovation Agency, Indonesia); Muhammad Johan Rifa'i and Ara Gradiniar Rizkyta (National Research and Innovation Agency, Indonesia); Mahfud Ibadi (National Research and Inovation Agency, Indonesia); Muhamad Setianto (BRIN, Indonesia); Rika Andiarti (National Research and Innovation Agency (BRIN) & Research Organization for Aeronautics and Space, Indonesia); Muhammad Yunus (Research Center for Polymer Technology - National Research and Innovation Agency (BRIN), Indonesia); Aang Azhari (National Research and Innovation Agency, Indonesia); Nayla Najati (Research Center for Satellite Technology, BRIN, Indonesia)

Optimal performance from the radome at 2.4 GHz can be achieved by choosing the right material. The avionics system is mounted on a radome made of Quartz, Glass, Aramid composite using an Epoxy Araldite LY 5052 matrix and made using the vacuum bag manufacturing method. To determine the effect of the type of material that the signal can penetrate properly, a dielectric constant test of various types of composite materials was carried out at a frequency of 50 Hz using the ASTM D150 standard. Verification of the signal penetration strength was carried out for the composite radome by means of a transmission test using a signal generator at 3 power levels of 0 and 10 dBm and a directional antenna in the anechoic chamber. The test results show that the quartz fiber composite has the lowest dielectric constant value and has the best signal penetrating ability. This shows that the value of the dielectric constant affects the signal permeability of the material.

10:30 ***Robust Controller Design for Planar Rocket with Thrust Vectoring Control.....32***

Joshua Levin Kurniawan, Octavianus Bagaswara Adi and Patrisius Bagus Alvito Baylon (Institut Teknologi Bandung, Indonesia); Yazdi Jenie and Ony Arifianto (Bandung Institute of Technology, Indonesia)

Thrust vectoring is a technology in the aerospace industry that enables an aircraft or rocket to change the magnitude and direction of thrust provided which improve maneuverability, control, and stability. In order to fully utilize the capabilities of thrust vectoring, a capable control system mechanism is essential. This includes implementing a robust controller that can effectively handle uncertainties and disturbances, including changes in the plant configuration within a certain range. The primary focus of this research paper is the development of a robust control system for 3-DOF thrust vectoring, employing the μ-synthesis technique. The study revolves around iteratively designing a robust controller to meet specific performance criteria. The key design requirements include stability, noise attenuation, disturbance rejection, and precise tracking of step changes in the X and Z directions. The controller design must also consider physical actuator constraints, with a maximum gimbal deflection angle of 0.5 radians and a delta thrust limit of 10 Newtons to ensure safety and feasibility. The Simulink simulation analyzes the closed-loop response of a nonlinear plant to tracking commands in both X and Y directions. The simulation result shows that the system remains stable under various uncertainties. The controller effectively tracks commands despite noise, wind gusts, and uncertainties in density, thrust source, and horizontal center of gravity keeping the delta thrust and gimbal deflection angle within specified limits. Simulation results demonstrate its robustness, ensuring stability and reliability for real-world applications.

Thursday, October 26 9:00 - 10:15

Aerospace and Electronic Systems - 2

Room #2 (09:00 - 10:15) virtual

Chair session : Nayla Najati

Room #2 *(Link Zoom)*

Please choose Breakout Room 2

9:00 ***Electromagnetic Shielding Performance of Twill Carbon Fiber Reinforced Polymer with Free Space Metho.....39***

Sri Ramayanti (BRIN, Indonesia); Poki Agung Budiantoro (Research Center of Satellite Technology - BRIN, Indonesia); Ahmad Fauzi (BRIN, Indonesia); Ery Fitrianingsih (LAPAN - BRIN, Indonesia); Eriko Nasemudin Nasser (National Institute of Aeronautics and Space, Indonesia); Widodo Slamet (Badan Riset dan Inovasi Nasional & Center for Satellite Technology, Indonesia); Anshari Akbar (National Institute of Aeronautics and Space, Indonesia); Moedji Soedjarwo and Dwiyanto Dwiyanto (BRIN, Indonesia)

EMI shielding means blocking electromagnetic radiation by using the material reflection and or absorption. Recently, carbon fiber materials have become alternative shielding materials because they have unique properties, such as being lightweight, having high strength and stiffness, and having excellent electrical conductivity. This paper will study the performance analysis of twill CFRP with thickness variation as shielding material for electronic device applications in UHF, L- Band, and S-Band frequencies. EMI test was performed with the free-space method in the anechoic chamber. The S21 and S22 parameters give similar trends, which result in coarse fluctuation in UHF and L-Band frequency and stable curves in S-Band frequency. The absorption loss of CFRP with 2mm thickness has a higher value, while the reflection loss of both materials is the same. The values of average 〖SE〗_T CFRP 1mm and 2mm thickness are -33.8 and -33.7 dB, respectively, which cannot satisfy the criteria value for electronic device applications.

9:15 ***Parametric Study of Sawtooth Serration Geometry for Noise Reduction in HTOL Propellers.....45***

Budiman Apri Utomo and Pande N.D. Sugiana (Bandung Institute of Technology, Indonesia); Jessica Athalia Moelia Sapoetra (ITB, Indonesia); Alfiedo A Pongrante and Firman Hartono (Bandung Institute of Technology, Indonesia)

Recently, the development of UAVs, or drones, has intensified, but one major challenge that surfaces is the noise generated by their propellers. To overcome this issue, it is essential to explore the concept of low-noise propellers constructed with sawtooth serration on their trailing edges as a promising solution. This paper investigates the effects of sawtooth serration on UAV propellers, specifically in the context of horizontal take-off and landing configurations. Using ANSYS Fluent, extensive testing will be conducted to determine the most effective serration geometry for the propeller. The outcome of this research aims to contribute to the development of quieter and more efficient UAVs, addressing the noise reduction challenge and fostering innovations in UAV technology. From the simulation result, the highest noise intensity reduction is approximately 3.101% lower than the non-serration propeller.

9:30 ***Design of a cubesat constellation for monitoring hot spots in Indonesian forest areas.....51***

Mohammad Sutarto (National Research and Innovation Agency (BRIN), Indonesia); Muazam Nugroho (National Research and Innovation Agency, Indonesia); Mohammad Mukhayadi (Research Organisation for Aeronautics and Space, LAPAN - BRIN, Indonesia); Rommy Hartono (National Research and Innovation Agency (BRIN) & Research Center for Satellite Technology, Indonesia); Ahmad Hadi Syafrudin (National

Research and Innovation Agency, Indonesia); Tri Meidiansyah and Sartika Salaswati (National Research and Innovation Agency (BRIN), Indonesia); Kamirul Kamirul (The National Research and Innovation Agency, Indonesia); Suraduita Mupasanta (National Research and Innovation Agency, Indonesia); Dede Ardianto (National Institute of Aeronautics and Space, Indonesia)

This paper describes the design of a CubeSat constellation for hot spot monitoring mission in Indonesia's forest, starting from a literature review, selecting the LWIR (Long Wavelength Infrared) sensor as the main payload that is well-suited for capturing thermal radiation emitted by hot spots, to the exploration of satellite orbits. There are two proposed orbit scenarios: The first scenario consists of one CubeSat at altitude of 560 km and 11 degrees inclination, while the other proposed a design of four satellite constellations on sun-synchronous orbit with 560 km altitude, 97 degrees inclination and variations of 90 degrees mean anomaly for every CubeSat. The CubeSat mission is supported by two ground station systems, located in Biak and Bogor to ensure routine daily monitoring. From the simulation results, each target area can be covered at least once a day by at least one satellite. The research demonstrates that CubeSat technology, when strategically employed, can play a pivotal role in enhancing forest fire monitoring capabilities.

9:45 ***Power Board Engineering Model Design of A4/NEO-1 Satellite Multispectral Camera.....57***

Mukhamad Fajar Amiludin (National Research and Innovation Agency, Indonesia); A. Hadi Syafrudin (National Institute of Aeronautics and Space, Indonesia); Gafur Hasan Zam Bahari (National Research and Innovation Agency, Indonesia); Khairunnisa Khairunnisa (National Research and Innovation Agency (BRIN), Indonesia); Suraduita Mupasanta (National Research and Innovation Agency, Indonesia)

Currently, the Research Center for Satellite Technology is developing multispectral line scanner camera. It consists of several subsystems and requires different power rails, posing various challenges. The power board is one of the three boards in this camera responsible for supplying and monitoring power, board temperature, driving heaters, and stepper motors to maintain heater temperature and adjust lens focus points. The engineering model of the power board has been developed and tested. The voltage regulator, signal conditioning, multiplexer, and driver are functioning well. Two types of voltage regulators are utilized: switching and linear, both providing outputs that are closely matched the set values where the difference between actual and desired output voltage regulator is less than 1%. The output of the signal conditioning aligns with theoretical expectations. The error is less than 9% from full range ADC. The multiplexer output is also satisfactory, with a minor acceptable error that is under 4%. However, further development and testing are required for temperature and current sensors. Additionally, inrush current remains an issue in this engineering model. Nevertheless, the engineering model shows potential for development into a flight model.

10:00 ***Optimal Control Design of Slow Dominant Transient Response for Longitudinal Missile Dynamics.....64***

Idris Eko Putro (Universitas Indonesia & National Research and Innovation Agency, Indonesia); Aries Subiantoro and Abdul Halim (Universitas Indonesia, Indonesia); Robertus Triharjanto (Research Organization of Aeronautics and Space, Indonesia & BRIN, Indonesia); Syafiie Syafiie (Syiah Kuala University, Indonesia)

The missile dynamic characteristics inherit nonlinear behavior and fast velocity changes from subsonic to high supersonic. Accordingly, the missile's responses to the control command must be very fast. Therefore, the autopilot system needs rigorous design to ensure the missile still maintains its performance during flight. Missile control characteristics with a dominant pole close to the origin of the S-Plane tend to have a very slow transient response. This characteristic is unacceptable because the control command is no longer compatible with the intended flight condition since the dynamics have already changed. This paper designs an optimal controller for a missile using Linear-Quadratic Regulator (LQR) and Model Predictive Control (MPC) approach subject to slow transient response in longitudinal dynamic. The flight control analysis covers boost phase, after-boost phase, and terminal phase. The dynamics of every phase are presented by linear models derived from the nonlinear 6 degrees of freedom (DOF) equation of motion. The LQR technique is modified by adding an integral and compensator to speed up the settling time dynamic response. The result revealed that the LQR control cannot reduce the settling time. The other technique, LQR with integrator and compensator, seems promising since this technique has been quite successful in reducing the settling time. However, this modified compensator LQR generates a huge fin deflection up to 874 degrees, making it unrealistic for the actuator. On the other hand, MPC control offers satisfying results. It successfully shortens the settling time while maintaining the control input does not exceed the allowable deflection.

Geoscience and Remote Sensing - 1

Room #3 (09:00 - 10:15) virtual

Chair session : Suraduita Mupasanta

Room #3 *(Link Zoom)*

Please choose Breakout Room 3

9:00 ***Evaluation of Very-high Resolution Satellite Image Compression to Support Agriculture Monitoring....72***

Danang Surya Candra (BRIN, Indonesia); Kurnia Ulfa (Research Center for Remote Sensing & National Research and Innovation Agency, Indonesia); Fadillah Halim Rasyidy (BRIN, Indonesia); Yohanes Fridolin Hestrio (National Research and Innovation Agency, Indonesia); Yudhi Prabowo (Research Center for Hydrodynamics Technology, Indonesia); Mulia Inda Rahayu (Center for Data and Information, Indonesia)

Recently, the need for detailed images such as very high-resolution satellite imagery has been increasing, but there is an issue of heavy processing for the image as the size of the file is very big. To address this issue, this study aims to evaluate the image compression method in terms of decreasing the size of the imagery. To assess the reliability of the method in preserving the quality of the compressed image, Structural Similarity Index, Peak Signal-To-Noise Ratio, and Universal Quality Index were applied to the compressed image. The results show that the compressed image successfully decreased up to 95% in the quality value of 5 and the method can preserve the quality of the compressed images very well.

9:15 ***Determining the Precision of Spectral Patterns Arising from Atmospheric Correction Utilizing MODTRAN-FLAASH and 6S Approaches on High-Resolution SPOT-6 Imagery 78***

Sartika Sartika (Research Center Of Remote Sensing & BRIN, Indonesia); Galdita Aruba Chulafak (National Research And Innovation Agency - BRIN, Indonesia); Fanny A Putri (National Research and Innovation Agency (BRIN)); Danang Surya Candra (BRIN, Indonesia); Athar Abdurrahman Bayanuddin (Indonesian National Institute of Aeronautic and Space, Indonesia); Kurnia Ulfa (Research Center for Remote Sensing & National Research and Innovation Agency, Indonesia); Ahmad L. Hadiyanto (National Research and Innovation Agency (BRIN), Indonesia)

High-resolution SPOT-6 imagery plays a crucial role in spatial and regional analysis, as well as land monitoring. However, atmospheric disturbances in scene images lead to suboptimal information extraction. Hence, the atmospheric correction process is essential during the initial processing of SPOT images. Unfortunately, the atmospheric correction of high-resolution images has not been extensively studied. In this paper, we compare the accuracy of the radiation transfer model technique by assessing the MODTRAN-FLAASH and 6S algorithms on high-resolution SPOT-6 images within Semarang city. RMSE values from both algorithms are calculated for nine different objects: Grass, Red Floor Tiles, Granite Tiles, Brick Tiles, Paving Blocks, Marble, Water, Mangroves, and Garbage Piles. The RMSE values obtained from the MODTRAN-FLAASH and 6S methods are nearly identical for each object. Based on the average RMSE value, it is evident that the MODTRAN-FLAASH algorithm yields a lower average RMSE value than the 6S algorithm. Consequently, the MODTRAN-FLAASH approach is recommended for the SPOT image atmospheric correction process.

9:30 ***Assessment of the potential use of Sentinel-1 C-band SAR sigma-naught and gamma-naught features to support rice monitoring activities.....85***

Dandy Aditya Novresiandi, Andie Setiyoko, Novie Indriasari and Kiki Winda Veronica (National Research and Innovation Agency, Indonesia); Marendra Eko Budiono (BRIN Indonesia National Research and Innovation Agency, Indonesia); Dianovita Dianovita (National Research and Innovation Agency, Indonesia); Qonita Amriyah (Center for Data and Information, Indonesia); Mokhamad Subehi (Ministry of Agriculture, Indonesia)

The availability of the dense time series of the cloud-free, publicly accessible Sentinel-1 C-band SAR data allows the development of large-scale, continuous remote sensing (RS)-based rice monitoring activities. This study examines backscatter values derived using ground-range radar cross-section (sigma-naught) and slant-range perpendicular radar cross-section (gamma-naught) on both polarization channels as features for classifying the rice transplanting period on rice fields in Subang Regency, Indonesia. Accordingly, those features were analyzed, compared, and evaluated to classify the rice transplanting period using supervised classification methods, including Classification and Regression Trees, Support Vector Machine, Random Forest, and Gradient Boosting classifiers. Overall, the gamma-naught features produced higher backscatter values over a rice-growing cycle, i.e., ranging from 5.8 to 8.8 percent and from 9.2 to 15.8 percent higher for VH and VV channels, respectively, than that generated by sigma- naught. Furthermore, overall accuracy (OA) and kappa coefficient (K) of gamma-naught features were superior to those derived by sigma-naught in all observed classification methods. Subsequently, the accuracy increment is higher in K than in OA, ranging from 3.2 to 18.6 percent and from 5.1 to 41.1 percent for OA and K, respectively. To conclude, the gamma-naught features have much higher potential than sigma-naught in classifying the rice transplanting period, further aiding SAR-supported RS-based rice monitoring activities.

9:45 ***Accuracy Assessment of Haze Removal of SPOT 6/7 Imagery using Haze Index Algorithm Based on Machine Learning Classification.....90***

Heri Yuli Sulyantara (National Research and Innovation Agency, Indonesia); Mulia Inda Rahayu (National Research and Innovation Agency BRIN, Indonesia); Kurnia Ulfa (Research Center for Remote Sensing &

National Research and Innovation Agency, Indonesia); Andie Setiyoko and Orbita Roswintiarti (National Research and Innovation Agency, Indonesia); Sastra Kusuma Wijaya (Departemen Fisika, FMIPA UI & University of Indonesia, Indonesia); Abdul Haris (University of Indonesia, Indonesia)

Multispectral optical remote sensing imagery in tropical regions such as Indonesia is often suffer from haze and cirrus contamination. This will affect to a reduction in image quality and accuracy of data interpretation. To mitigate these issues, a haze removal method has been developed employing the haze index algorithm which is based on reflectance values of the blue and red bands of SPOT 6/7 imagery. However the method must be tested to find out whether the result is sufficient for further implementation or not. The efficacy of the method was determined by testing the data with image interpretation using machine learning classification method to judge the efficiencies of the haze removal algorithm on SPOT 6/7 imagery. Experimental results indicate that the algorithm is proficient in information extraction using haze-free SPOT 6/7 data that has been processed using this method. Therefore, data processed with haze removal based on haze index algorithm can be beneficial for remote sensing applications.

10:00 ***Flood Hazard Modelling in Jakarta Using Geomorphic Flood Index.....96***

Khofat Suryana, Ariel Yehezkiel, George Salim and Edy Irwansyah (Bina Nusantara University, Indonesia)

To prevent and minimize flood damage and causes, crucial information like the location or area that are exposed to flood is needed. DEM (Data Elevation Model) will be processed to obtain more data such as Flow Accumulation and Flow Direction and more by using ArcGIS Pro, which then will be used in the Geomorphic Flood Area plugin's for calculation and prediction in QGIS (Quantum Geographic Information System). Data that will be used in this paper are gathered from Demnas for the Data Elevation Model, which in this case is using Interferometric Synthetic Aperture Radar as their topographic mapping technique. The goal of this research is to utilize said available plugin and obtain the depiction of flood prone areas in Jakarta, while comparing the accuracy of the Special Capital Region of Jakarta's flood history data, with the processed one.

Thursday, October 26 10:15 - 11:30

Aerospace and Electronic Systems - 3

Room #2 (10:15 - 11:30) virtual

Chair Session : Sri Ramayanti

Room #2 *(Link Zoom)*

Please choose Breakout Room 2

10:15 ***Investigation of Battery Errors and Their Impact on State of Charge Estimation in NEO Satellite.....103***

Muhammad Taufik (BRIN, Indonesia); Deddy Amin (Satellite Technology Center National Institute of Aeronautics & Space LAPAN, Indonesia); Adelia Revani Sastaviyana (National Research and Innovation Agency, Indonesia); Aditya Bayu Erwindu (BRIN, Indonesia)

NEO Satellite is a multi-mission satellite developed by Research Center for Satellite Technology (PRTS), BRIN, with its main mission being earth observation. It carries payload consisting of a multi-spectral imager, Automatic Identification System (AIS) sensor, magnetometer sensor, and infrared camera. To support its mission, the satellite is equipped with two 12Ah Li-Ion battery packs. In order to ensure the proper functioning of the batteries, an investigation and analysis of the State of Charge (Soc) are conducted. The estimation of Soc is often inaccurate due to common errors, which typically affect the Soc estimation, such as current measurement error and current integration error. This paper presents an investigation into battery errors and their effects on Soc estimation, as well as the Coulomb Counting (CC) method for estimating Soc. The obtained results show a linear increase in the deviation of the estimated Soc value from the actual Soc value, which is caused by the errors.

10:30 ***Analysis of WRC-23 Agenda Item 7A Case Study: Starlink - OneWeb Satellite Constellation.....109***

Nayla Najati (Research Center for Satellite Technology, BRIN, Indonesia); Satriya Utama (National Research and Innovation Agency, Indonesia); Wahyudi Hasbi (National Research & Innovation Agency (BRIN), Indonesia)

WRC-23 Agenda Item 7 topic A is intended to define the orbit tolerances on the space station of non-GSO FSS (Fixed Satellite Service), BSS (Broadcasting Satellite Service), or MSS (Mobile Satellite Service) systems. This study examines the variation of orbital characteristics, for the Starlink satellite constellation and OneWeb satellite constellation during their operation in orbit, which encompasses 3,286 satellites from the Starlink constellation out of a total of 4,378, and it also examined 503 satellites from the OneWeb constellation out of a total of 636. The results of this study show a relatively small variation in orbital tolerance for three orbital elements (inclination, altitude of perigee, and altitude of apogee) of the satellites in the two constellations.

10:45 ***Investigating LAPAN-A3 Satellite X-Band Data Transmission Interference in Orbital Approaches.....113***

Wakhid Abdurrokhman, Satriya Utama and Patria Rachman Hakim (National Research and Innovation Agency, Indonesia); Nayla Najati (Research Center for Satellite Technology, BRIN, Indonesia); Nur Salma Yusuf Hasanah and Dicka Ariptian Rahayu (National Research and Innovation Agency, Indonesia)

Satellite communication in the X-band frequency range has become essential for high data rate transmissions in various applications. However, the growing number of operational satellites sharing this frequency range within Earth's orbit raises concerns about the potential for interference. The LAPAN-A3 satellite, a remote sensing platform, utilizes X-band transmission for relaying data from multiple payloads. The X-band transmission system on the LAPAN-A3 operates at a frequency of 8,200 MHz with a data rate of 105 Mbps. However, the X-band transmission encounters intermittent disruptions due to interference from other satellites. This research aims to address the issue of interference in LAPAN-A3's X-band transmission by employing an orbital approach. Specifically, it focuses on identifying satellites with the potential to interfere with LAPAN-A3's X-band transmission within the frequency range of 8000-8500 MHz. In instances of interference, this study calculates two parameters for each satellite under consideration. The first parameter involves the vector position dot product between LAPAN-A3 and the respective satellite. The second parameter pertains to the time fraction during which the satellite resides above the horizon when LAPAN-A3 is transmitting data. Higher values for both parameters indicate an elevated likelihood of interference with LAPAN-A3's transmission.

11:00 ***Attitude Determination of LAPAN-A3 Satellite based on Magnetometer and Sun Sensor.....117***

Suraduita Mupasanta, Satriya Utama, Nur Salma Yusuf Hasanah and Wakhid Abdurrokhman (National Research and Innovation Agency, Indonesia); Khairunnisa Khairunnisa (National Research and Innovation Agency (BRIN), Indonesia); Patria Rachman Hakim, Mukhamad Fajar Amiludin, Dicka Ariptian Rahayu, Muazam Nugroho and Amrullah Abdul Qadir (National Research and Innovation Agency, Indonesia)

The primary objective of a remote sensing satellite is to provide precise data information about the earth surface to the ground control center. In order to avoid severely disrupted or failed imaging operation, attitude determination and control system (ADCS) represent a crucial task. LAPAN-A3, the third satellite developed by LAPAN, was designed for specific experimental mission to observe Indonesian territory. LAPAN-A3 reliance on its star sensor as the main attitude determination due to its accuracy. Nevertheless, star sensor become susceptible to vulnerabilities when facing bright celestial object. This study present alternative approach by utilizing combination of sun sensor and magnetometer. By calculating the matrix rotation between sun and magnetometer data on board satellite with sun position model Almanac and IGRF, the satellite attitude can be accurately determined. From test result, The matrix rotation method enables the computation of quaternions, which in turn allows for the determination of the satellite's yaw, pitch, and roll angles in the North-East-Down (NED) Coordinates system.

11:15 ***Data Collection Platform Design using LEO Satellite-based LoRa for Disaster Management in Indonesia.....124***

Maulana Ali Arifin, Nova Khamsah and Nayla Najati (Research Center for Satellite Technology, BRIN, Indonesia); Wiwit Suryanto and Irawan Prabowo (Gadjah Mada University, Indonesia)

Indonesia's geographical location renders it vulnerable to various natural disasters, including landslides, earthquakes, floods, and tsunamis. While terrestrial sensors have been deployed in multiple provinces to address these challenges, data collection remains a significant obstacle, particularly in remote and inaccessible areas. Communication emerges as a primary concern, hampering the effectiveness of the deployed sensors. Hence, integrating satellite technology, particularly Low Earth Orbit (LEO) satellites, becomes of utmost importance in disaster monitoring, early warning, and mitigation. This paper aims to propose a LoRa-based data collection platform for LEO satellite communication to boost disaster management efforts in Indonesia. The proposed platform incorporates communication architecture design, uplink budget calculation from the modified LoRa terminal to the satellite, and power measurement of the terminal. The link budget calculation of the modified LoRa terminal is presented with several spreading factors assessed within satellite elevation variations from 0° to 90°. The calculation shows that the higher the spreading factor is, the lower the minimum satellite elevation required for communication, up to 0° for spreading factor 11. The RF output power of the modified LoRa terminal is measured to validate the link budget, resulting in a power of 33.13 dB, which complies with link budget requirements for satellite-based LoRa.

Geoscience and Remote Sensing - 2

Room #3 (10:15 - 11:30) virtual

Chair session : Agung Wahyudiono

Room #3 *(Link Zoom)*

Please choose Breakout Room 3

10:15 ***Temporal Variation of MODIS NDVI in the North Coast Java During El Nino and La Nina.....131***

Novie Indriasari and Orbita Roswintiarti (National Research and Innovation Agency, Indonesia); Fadillah Halim Rasyidy (BRIN, Indonesia); Inggit Lolita Lolita Sari (Research Center for Remote Sensing, National Research and Innovation Agency, Indonesia); Kustiyo Kustiyo (National Research and Innovation Agency,

Indonesia); Hengki Muradi (National Research and Innovation Agency (BRIN), Indonesia); Babag Purbantoro (National Research and Innovation Agency, Indonesia); Andy Indradjad (National Agency for Research and Innovation, Indonesia); Tatik Kartika (National Research and Innovation Agency, Indonesia); Mokhamad Subehi (Ministry of Agriculture, Indonesia)

El Nino/Southern Oscillation (ENSO) has been associated with drought and caused the agricultural sector in Indonesia to be vulnerable to climate change. Remote sensing data have been used for crop classification and monitoring for several decades. This study employed the temporal Terra MODIS NDVI imageries from 2001 to 2021 and the Oceanic Nino Index to identify El Nino and La Nina events to visually observed their impact on the paddy growth phase in several irrigated and non-irrigated paddy fields (dryland/rain-fed farming) on the north coast of Java, Indonesia. For the past 21 years, there were 7 El Nino and 11 La Nina events. These phenomena had a more significant impact on the non-irrigated paddy fields than on the irrigated paddy fields. Besides, they caused a shift period in the paddy vegetative phase and NDVI values. This study supports sustainable agricultural management to mitigate crop failure due to climate change.

10:30 ***Spatio Temporal Analysis of Carbon Monoxide Distribution According to The Total of Motor Vehicles in East Java.....138***

Bangun Muljo Sukojo (Institut Teknologi Sepuluh Nopember, Indonesia); Devika Rahma Damayanti Yusuf (Sepuluh Nopember Insitute of Technology, Indonesia); Nadirah Nadirah (National Research and Innovation Agency, Indonesia); Inggit Lolita Lolita Sari (Research Center for Remote Sensing, National Research and Innovation Agency, Indonesia)

The presence of polluting gases or particulates mixed in the air can cause unclean air and degrade its quality. One of the gases that pollutes the air is Carbon Monoxide (CO), which can have an adverse impact to humans and the environment. Fossil fuels (e.g., oil and coal) from transportation propulsion machines contribute as the main CO source. Geospatial information sciences can be applied to identify their distribution to anticipate CO concentration increases. The current study used Sentinel-5P satellite imagery to monitor CO. Sentinel-5P provides information on CO distribution, thus supporting CO monitoring without going to the field. The Google Earth Engine algorithm was applied to process the Sentinel-5P satellite images. This research was conducted in the East Java Province, Indonesia, from 2019 to 2022. The results of this study are several maps of the CO distribution every month and year in the study area. The study showed that the CO concentration experienced an increase in 2020, while in 2021 and 2022, the CO concentration decreased. This is probably due to the COVID-19 pandemic that caused Mojokerto had the highest CO concentration, while Batu City had the lowest concentration all year around during the study period. Pearson's correlation between the CO concentration and the number of motor vehicles was approximately 0.203 (weak). However, Pearson's correlation score might increase if measured locally in each central city in East Java.

10:45 ***Exploiting Sentinel-5P for Spatio-Temporal Analysis of SO2 Volcanic Ash Activity in 2019-2022 at Indonesia Using Earth Engine Platform.....145***

Bangun Muljo Sukojo and Nur Aini Qolbi Fadhilah (Institut Teknologi Sepuluh Nopember, Indonesia); Hartanto Sanjaya (BRIN, Indonesia)

Based on data from MAGMA PVMBG, the Geological Agency of the Ministry of Energy and Mineral Resources, from 2019 until 2022, about 10 volcanoes in Indonesia have erupted, some more than twice. In addition, there are 10% of Indonesian people who live around disaster-prone areas, so they have great potential to be exposed to Sulfur Dioxide pollutants due to volcanic ash. Therefore, a spatiotemporal analysis was carried out on SO2 concentrations due to volcanic eruptions in Indonesia for the 2019-2022 period using Sentinel-5P imagery data with the help of a cloud-based application, Google Earth Engine. The analysis was carried out during pre-eruption, eruption, and post-eruption to find out the differences and distribution of concentrations. The processed data and other supporting information will be presented in the form of visualization maps, diagrams, tables, and Google Earth Engine Apps. The research method is carried out by classification and sampling with the object of research focused on 5 volcanoes spread across the national scope, namely Mount Agung, Mount Semeru, Mount Ibu, Mount Anak Krakatau, and Mount Sinabung. The image used is Sentinel-5P with the advantage of temporal resolution, which can acquire daily data. The concentration values of SO2 in volcanic eruption areas ranged from -0.0009 to 0.002 mol/m2 with varying value in each affected area. Correlation tests for the processed results showed that BMKG parameters (wind speed, temperature, humidity, and rainfall) influence the distribution of SO2 in the five studied volcano areas.

11:00 ***A Light-Weight ANN Model for Landslide Detection: A Case Study of Idukki, India.....152***

Shweta Vincent (Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Karnataka, India); Babitha Ganesh (Manipal Institute of Technology, Manipal Academy of, India); Sameena Pathan (Manipal Institute of Technology Manipal, India); Vishwajeet Kulkarni, Parth Sirohi and Tushar Agarwal (Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, India); Silvia García (Investigator of the Engineering Institute, National University of Mexico, Mexico)

This article presents a light-weight ANN model for the creation of a landslide susceptibility map (LSM) for the district of Idukki in the South Indian state of Kerala. The landslide conditioning factors (LCF) considered for the creation, training, validation and testing of

the LSM are elevation, slope, aspect, curvature, total wetness index (TWI), stream power index (SPI), rainfall, topographic ruggedness index (TRI), geology, soil type and land use and land cover. The Frequency Ratio (FR) analysis has been carried out on the LCFs and those having the highest Predictive Rate (PR) have been determined as aspect, slope, rainfall and soil type. Once the LSM is created, it is tested using landslide and non-landslide points using the proposed ANN model which yields an accuracy of 83.5%. Future scope in this work is to improve the accuracy of the model by using metaheuristic algorithms for optimization of weights of the ANN model.

11:15 ***Analysis of the Influence of Coastal Sea Surface Temperature in Bali Province on Rainfall on Bali Island Using Data from Weather Observation Stations.....157***

Bangun Muljo Sukojo (Institut Teknologi Sepuluh Nopember, Indonesia); Alifah Ike Agustin (Sepuluh Nopember Institute of Technology, Indonesia); Eko Hadi Santoso (Meteorological, Climatological, and Geophysical Agency, Indonesia)

Rainfall is influenced by several things, one of which is sea surface temperature (SST). Previously, a study was carried out regarding the effect of sea surface temperature on rainfall in Bali waters and obtained negative correlation results or reversed direction. From this study, the initial hypothesis was obtained that the effect of sea surface temperature on rainfall in mainland Bali would be positive. This study aims to determine the effect of coastal sea surface temperature in Bali Province on rainfall on Bali Island by using data from 4 rain posts that are evenly distributed on Bali Island. In addition, this study also aims to prove the initial hypothesis used. From the research that has been done, the results show that the correlation of coastal sea surface temperature in Bali Province to rainfall on Bali Island is 0.7476. This figure shows a positive or unidirectional relationship which proves that the initial hypothesis is true. This means that the higher the sea surface temperature of the coast of Bali Province, the higher the rainfall on the island of Bali. Meanwhile, the effect of the coastal sea surface temperature of the Province of Bali on rainfall on the island of Bali is 55.9%. In addition, the distribution of sea surface temperature values and rainfall values in Bali is also obtained which tends to increase at the beginning and end of the year and tends to decrease in the middle of the year.

Thursday, October 26 10:45 - 11:30

Data Science & Artificial Intelligence; Geoscience and Remote Sensing

Room #1 (10:45 - 11:30)

Chair session : Muazam Nugroho

Room #1

Onsite: Nusa Penida Room # 1

10:45 ***Multiple Sentinel-2 Images Super-Resolution with Google Earth Pro Images.....164***

Shuai Liu (NOVA University of Lisbon, Portugal); José Fonseca and Andre Mora (Uninova, Portugal)

In recent years, the application of neural networks in the field of satellite image super-resolution has become increasingly widespread. This paper aims to explore how to utilize images from two completely different data sources (Sentinel-2 and Google Earth Pro) as training data to surpass the spatial resolution limitation of 10 meters provided by the Sentinel-2 satellite and obtain higher resolution image. The Sentinel-2 satellite offers open data with four bands with spatial resolution of 10 meters and a resampling cycle every 5 days. This provides abundant data that can be used as Low-Resolution (LR) images for research. Adopting a multi-image super-resolution processing approach allows for the full utilization of geographical information contained within different images of the same location captured at shorter time intervals, while also eliminating concerns regarding information loss due to weather-affected low-quality images. Google Earth Pro provides images with a resolution of up to 0.15 meters, allowing the High-Resolution (HR) image resolution to be adjusted according to the needs. In our experiments, HR images with a resolution of 2 meters were used, and through SGNET implementation, a five-fold increase in spatial resolution for Sentinel-2 images was achieved, yielding very satisfactory results.

11:00 ***Development of an Indoor Visual-Based Monocular Positioning System for Multirotor UAV.....171***

Rifqi Widy Himawan, Patrisius Bagus Alvito Baylon and Javensius Sembiring (Institut Teknologi Bandung, Indonesia); Yazdi Jenie (Bandung Institute of Technology, Indonesia)

The limitations of Global Navigation Satellite System (GNSS) in enclosed spaces have prompted the need for alternative methods for determining the position and navigation of Unmanned Aerial Vehicles (UAVs). One potential solution is to employ visual-based sensors and artificial intelligence (AI) algorithms. This study aims to explore the feasibility of a monocular vision-based positioning system for determining the position of a UAV by placing a sensor in a fixed position and feeding the image stream to an AI algorithm to generate the position and navigation solution. The results of this study could have practical applications, particularly inspection hangars where GNSS cannot be used. Automating the inspection process using UAVs could also help reduce the risk of human injury associated with elevated working spaces by improving the safety and efficiency of the inspection process.

11:15 ***Solar Activity and Temporal Dependence of Rate of Change of Ionospheric Total Electron Content in Low-Latitude Region.....178***

Ernest P Macalalad (Mapúa University, Philippines)

Ionospheric plasma irregularities over the Philippines are observed using GNSS receivers in Metropolitan Manila during low and high solar activities. Using high-rate (1 Hz) GNSS data, 5-minute the rate of change of total electron content (ROTI) in TECU/min is calculated. Mean values of ROTI show that > 0.5 TECU/min indicate the presence of ionospheric plasma irregularities and could reach to more than 5 TECU/min during large events. They are typically observed between post-sunset to post-midnight hours (2000-0200LT, 1200-1800UT) and during equinoctial months. The duration of events and month occurrence increases as solar activity increases, where occurrence can extend to summer months. The results has been consistent to previous researched but requires more in-depth analysis by inclusion of parameters related to these irregularities, additional stations and extended observation years to cover the whole of a solar cycle.

Thursday, October 26 13:00 - 14:15

Aerospace and Electronic Systems - 4

Room #1 (13:00 - 14:15) virtual

Chair session : Satriya Utama

Room #1 *(Link Zoom)*

Please choose Breakout Room 1

13:00 ***FPGA Implementation of High-speed Communication End System(ES) Interface for Avionics Application.....182***

Pillutla Narasimhulu (Hyderabad & Indian Institute of Technology (IIT), Hyderabad, India); Shishir Kumar (IIT Hyderabad, India)

With the current trend of rapid development of advanced data transmission technologies in the avionics fields, the avionics buses for future Avionic applications need to cater increased bandwidths to enable the high data transfer rates between sub-systems and the Mission Computer (MC)/On-Board Computer (OBC). Major sub-systems include Inertial Navigation System (INS), Seeker, Target Update Receiver, Warhead, Telemetry and GPS. MC has to acquire the data from these sub-systems and carryout the required computation in Real-time with periodicities of the order of 2.5ms or 5ms with deadlines of the order of 1ms. Safety critical systems like Aircraft, Missile, Launch Vehicles and Satellites require a reliable communication protocol to guarantee their functioning without errors. Thus, Avionics Full Duplex Switched Ethernet (AFDX) shows great potential in on-board avionic systems because of its high-speed performance, redundancy, full-duplex, deterministic, switched and profiled network. Typical data rates are of the order of 10kbps to 1Mbps. The main objective of this paper is design of high-speed communication End System interface for avionics application and its implementation on FPGA.

13:15 ***Beamwidth Optimization of CP Antenna Using Periodic Conducting Structures for Satellite Applications.....186***

Aditya Inzani Wahdiyat, Bagus Bhakti Irawan and Budi Sulistya (National Research and Innovation Agency, Indonesia); Marcellina Ayudha Kristanti Titasari (BRIN, Indonesia); Eriko Nasemudin Nasser (National Institute of Aeronautics and Space, Indonesia); Dwiyanto Dwiyanto (BRIN, Indonesia); Ryan Prasetya Utama (Badan Riset dan Inovasi Nasional, Indonesia); Nashrullah Taufik (National Research and Innovation Agency, Indonesia)

A simple microstrip antenna with periodic grounded conducting post surrounding the antenna to broaden the 3dB beamwidth without sacrificing size and avoid complex feeding network. The combined effect of the number of conducting posts and their height on the antenna parameters was investigated. The results demonstrate that the antenna with conducting posts exhibits a beamwidth of more than 190° in all azimuth axes, with a gain of 1.6dBi.

13:30 ***Wearable Universal Long-Range Hand-Gestured UAV Radio Control.....190***

Lalu Muhamad Alhadad, Hafizh Renanto Akhmad, Achmad Novel, Muchammad Dimas Sakti Widyatmaja, Kevin Ben Loda and Javensius Sembiring (Institut Teknologi Bandung, Indonesia)

Hand gesture control represents an alternative means of human-computer interaction. The focus of this research lies in an interactive medium, which takes the form of a hand controller specifically engineered to steer an unmanned aerial vehicle. This controller boasts remote and versatile capabilities, enhancing the overall experience of UAV flight control. The controller utilizes an Arduino microcontroller, a BNO055 IMU sensor for orientation, and a potentiometer for throttle control. The program implements a finite automaton (FA) for state-based control and communicates with the ExpressLRS receiver using the CRSF protocol. The experimental findings from the developed radio control device demonstrated no delay in responses. The system exhibited responsiveness within a

216 m range despite encountering various obstacles and interference during the tests. It utilized ExpressLRS with a power consumption of 25 mW.

13:45 ***CFD-Based Evaluation of Wingtip Device by Trailing Edge Curve Variation on Low Reynolds UAV.....197***

Jonwin Fidelis Fam, William Nathan Thomas, Dhiyaa Al Dien Faathira, Muhammad Faza Abel Jonggara Marpaung and Ema Amalia (Bandung Institute of Technology, Indonesia)

Wingtip design affects aerodynamic performance from drag reduction and stall performance. To properly optimize the design, it is necessary to explore which parameters affect the performance of the wingtip design. The test model was based on an existing Aksantara 115 UAV twin-boom design. This study investigates the effects of varying trailing edge curve parameters of the wingtip on the aerodynamic performance of the test model. A total of 4 variations were made from the baseline model, each model uses the general equation parameters of a conic section. These models are analyzed by using Computational Fluid Dynamics, employing the Reynolds Averaged Navier Stokes method with the k-ε turbulence method. The angle of attack varied from -8 to 24 degrees with a flow velocity of 20 m/s. The results show that the wingtip device with circular curvature yields the highest aerodynamic efficiency.

14:00 ***An Analysis of SDR-based ADS-B Receiver Performance for a Future Nanosatellite Payload.....204***

Leila Nahiri (Mohammed V & Mohammadia School of Engineers, Morocco); Zouhair Guennoun (Ecole Mohammedia d'Ingenieurs, Morocco & Mohammed V University in Rabat, Morocco); Adnane Addaim (Mohammadia School of Engineering, Morocco)

The Automatic Dependent Surveillance-Broadcast (ADS-B) system has become an important technology of air traffic control in the future. Terrestrial-based ADS-B system serves as an alternative or supplementary system to radars. However, its implementation becomes impractical in remote, polar, and oceanic regions. To bridge this gap, space-based ADS-B emerges as an innovative solution, utilizing satellites to achieve global coverage and address the limitations of ground-based systems. This paper commences by examining the fundamental principle and relevant research concerning space-based ADS-B technology. Then, it presents the deployment of a terrestrial ADS-B receiver utilizing a novel software-defined radio (Totem SDR) platform specifically designed for space applications. The project aims to evaluate the receiver's performance and effectiveness through ground-based testing, with the ultimate goal of integrating it as an SDR payload for an upcoming 3U university nanosatellite mission.

Thursday, October 26 13:00 - 13:45

Data Science & Artificial Intelligence

Room #2 (13:00 - 13:45) virtual

Chair session : Maulana Ali Arifin

Room #2 *(Link Zoom)*

Please choose Breakout Room 2

13:00 ***Differential Evolution and DATCOM Implementation to Enhance Airframe Design Longitudinal Stability.....210***

Joshua Levin Kurniawan, Octavianus Bagaswara Adi and Javensius Sembiring (Institut Teknologi Bandung, Indonesia)

Designing an aircraft can indeed be a complex problem, as the aircraft design process involves numerous interrelated variables. On the other hand, it is also crucial to consider the parameters of aircraft stability to ensure that the flying qualities are suitable for the various phases of the mission flight. This paper introduces a novel approach to optimize airframe design processes by utilizing metaheuristic methods to determine the preliminary airframe design that meets the criteria of longitudinal dynamic stability in accordance with regulations, while also considering the weight of the airframe. Candidate aircraft geometries will be generated using Differential Evolution (DE), a powerful stochastic real-parameter optimization algorithm, integrated with DATCOM to determine the aerodynamic derivative parameters for each design population. Additionally, this method involves the implementation of a Fuzzy Inference System (FIS) to map the result of phugoid damping, short period damping, and airframe weight to the output of quality value. This paper demonstrates that the introduced optimization method, by producing 1,554 and 1,780 generations with 3,300 population for each generation, can generate the most optimal design offspring with a level 1 flight quality (referring to MIL-F-8785C) for both commuter and transport aircraft cases. The result shows quality value improvement 70.4136 and 69.3328 (compared to the first generation) for commuter and transport aircraft cases respectively with 4 seconds of mean evaluation time. Based on the obtained results, it can be concluded that the developed optimization method can serve as a new alternative approach to determining the preliminary design of an airframe.

13:15 ***Regression Forecast Model of 60-Meter Band Channel Performance Index Over Kupang Area.....217***

Adi Purwono (Center for Space Research BRIN Bandung Indonesia, Indonesia)

This paper describes the multivariate time series regression prediction model to forecast the performance of the 60-meter band channel over Kupang area. The frequency band which is used for medium range mode of the upcoming implementation NavDat communication system which extends the legacy of NavTex usability in maritime services by providing digital broadcasting of safety and security information. The hourly Near Vertical Incidence Skywave (NVIS) channel performance index over Kupang area was extracted from Ionosonde observation data. The regression models were implemented to predict 3-hour in advance of the NVIS channel performance. Together, in-situ data of ionospheric disturbance index or ionospheric scintillation index (S4) over Darwin, Australia with corresponding of Kp-index, Dst-index, the sunspot number and F10.7 solar flux data for the period of November 2021 to November 2022 were used as multivariate inputs for learning process. The results suggest that the Random Forrest regression model performed best compare to Extreme Gradient Boosting, Gradient Boosting, Decision Tree and Linear Regression model. The optimum model yields the following, mean square error (MSE) of 0.0011, root mean square error (RMSE) of 0.0326, mean absolute error (MAE) of 0.0238, and the coefficient of determination or prediction error (R2) value of 0.9725, respectively.

13:30 ***IRT and ANN Based System Identification Schemes for Model Based Fault Detection of Nonlinear Systems.....223***

Mohammed Fahad Alwagait (Imam Mohammad Ibn Saud Islamic University (IMSIU), Saudi Arabia); Mohammad Obaidullah Khan (Al Imam Mohammad Ibn Saud Islamic University, KSA, India)

Faults in electrical power transmission systems cause failures and even may cause explosions. It is desired to remove a faulty component immediately to prevent further damage to the system. To address this, a typical technique is devised based on thermal imaging and various artificial neural network algorithms. The faulty element or component will radiate or emit higher energy when compared to normal or healthy conditions, because of the higher current flow rates. The thermal image taken from such defective part of the power system will be more highlighted in the image in contrast with the normal cool background. This drastic change in the grey level values in contrast with the healthy power system's picture hints or predicts a fault in that region. To support this, an exhaustive simulation is implemented using thermal image processing and self-learning neural network algorithms and the simulation results are compared. This analysis is performed through various types of ANN techniques, and comparisons are established between them to report the network with best prediction results on a typical 'Step' dataset and 'Realistic' dataset. A similar low score mean square error MSE is exhibited with these models, and the R-square values are closer to the best score of one in all algorithms discussed. A better graph is obtained in Levenberg-Marquadrdt training Algorithm where most of the predictions fall alongside the target; however, Bayesian regularization gives a better plot than LM with the best fit is being obtained at lesser number of iterations that is in less time.

Geoscience and Remote Sensing - 3

Room #3 (13:00 - 13:45) virtual

Chair session : Mohammad Sutarto

Room #3 *(Link Zoom)*

Please choose Breakout Room 3

13:00 ***The Use of Geographic Information Systems to Support Corn Supply Chains (Case Study: Tuban District).....230***

Bangun Muljo Sukojo and Shinta Angelina (Institut Teknologi Sepuluh Nopember, Indonesia); Lena Sumargana (National Research and Innovation Agency (BRIN), Indonesia)

One of the largest corn producers is Tuban Regency. The growth phase of corn is divided into three phases: germination phase, vegetative phase, and generative phase. Parts of corn can be utilized in the vegetative phase and generative phase with utilization values such as young stems and leaves for animal feed, old leaf stems for green fertilizer or compost, and so on. Accordingly, a supply chain concept through the best route is needed to determine the distribution channel of corn so as to obtain distribution efficiency. This research identifies the growth phase of corn using the NDVI vegetation index as producer data. After obtaining the growth phase of corn, the data was overlayed with end consumer data and analyzed through network analyst tools. The results showed that the growth phase of corn in Palang Subdistrict in May 2022 was mainly late generative, June 2022 was mostly germination or early vegetative, July 2022 mainly was late vegetative, August 2022 was primarily early generative, September 2022 mainly was early generative and late vegetative. Based on the corn growth phase data, a route analysis was conducted. For the late vegetative phase, the best route is UD. Shiranda Farm, with 14.41 km. In the early generative phase, for the best route, Karangagung Market, 5.49 km located in Palang Sub-district. In the final generative phase for the shortest distance with broiler farm 1 located in Gesing Village, Semanding District with 5.51 km.

13:15 ***Flood Disaster Monitoring Application In The National Rice Granary Area Based On Sentinel-1 Imagery (Case Study: Laren Disctrict, Lamongan Regency) 237***

Bangun Muljo Sukojo (Institut Teknologi Sepuluh Nopember, Indonesia); Luthfia Azizah (Sepuluh Nopember Institute of Technology, Indonesia); Hartanto Sanjaya (BRIN, Indonesia)

Natural conditions such as geography, climate, and the form of river flow can cause losses crop failure in the rice field sector due to natural disasters such as floods. The largest rice harvest area in 2021 makes East Java a national rice granary or a large rice-producing area. However, the rice harvest did not provide the same results, in the form of a decreasing amount of rice production in Laren District where the area directly adjacent to the Bengawan Solo River. So it's necessary to monitor rice fields that become national rice barn areas to mitigate and evaluate food security handling. Remote sensing technology with SAR Sentinel-1 helps identify flood inundation areas because the sensor can work in all weather and penetrate clouds during cloud-covered floods. This research uses Sentinel-1 GRD with the change detection method and thresholding 1.1 through the GEE cloud computing platform thrice on March 13, 2019;December 20, 2020;and March 2, 2021. Research uses flood prediction with the Cellular Automata and ANN (CA-ANN) method through the MOLUSCE plugin. The results of flood identification show that the flood position is always in the southern part of the Laren District. Based on the three flood times identified, the three villages with the widest flood ranking are Gelap, Jabung, and Pelangwot Village. The results of flood prediction with CA-ANN showed that the method successfully evaluated the flood distribution area based on the spatiotemporal flood data, which showed that the flood area was still in the southern part of Laren District.

13:30 ***Assessment of Coastline Changes in Dhofar Region in Oman using Remote Sensing and GIS Techniques.....244***

Omar Wazwaz, Mohammed Bait-Suwailam and Yaseen Al-Mulla (Sultan Qaboos University, Oman)

In this research, we present an analysis and study impact of shoreline temporal changes in Dhofar region in Oman using remote sensing and GIS techniques. Satellite imagery data from numerous sensors, including TM, ETM+, and OLI are used to capture the fluctuations of the shoreline and evaluate the hazards associated with coastline erosion. In order to extract accurate shoreline positions and quantify shoreline changes, automatic coastline extraction techniques are used. Based on the measured erosion rate of change, the studied shoreline areas exhibit a stable to moderate erosion rate, where Rakhyut coast has the most erosion rate of -3 m/yr, and Mughsail beach displayed the highest accretion rate with almost 5 m/yr.