An Improved Indoor RSSI Based Positioning System Using Kalman Filter and MultiQuad Algorithm

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***Abstract*—The object position plays an important role in many applications of wireless sensor network (WSN) and Internet of Things (IoT). Hence, positioning system is the main concern of many researchers to achieve the highest accuracy especially in indoor environments. However, RSSI-based indoor positioning system can be easily affected by physical obstacle of the environment which can make it unstable and fluctuate. High instability of RSSI is directly influenced to the estimated position performance obtained from distance calculation with path loss exponent (PLE) value. In this paper, we propose improved indoor positioning system using Kalman filter (KF) for reducing inconsistent of RSSI transmission from Bluetooth low energy (BLE) as the wearable device in each unit of time and MultiQuad algorithm formed by multilateration and quadratic weighted combination as the estimated position determination. Using a combination of KF and MultiQuad algorithms is capable proven to increase the accuracy of estimated position up to 90.32% with mean square error (MSE) 1.15 m. This combination algorithm has capability to reduce error of estimated position compared with only using conventional multilateration reached high error estimation up to 6.99 m.**

Keywords — Indoor Positioning System; RSSI; KF; MultiQuad, MSE

I. INTRODUCTION

Recently, development of Wireless sensor network (WSN)and Internet of Things (IoT)system have significantly increased in various area applications. Several WSN and IoT applications are enabled by location-based services (LBS) such as health-care facilities, emergency services, in-home asset tracking, logistics monitoring, security, navigation and so on [1,2]. Positioning systems as the related part of LBS are used to determine any wanted target regardless of its current position [3]. In outdoor environment have been provided precise location information by global positioning system (GPS) [4-6]. Despite the high accuracy of GPS technology, it cannot properly operate inside building due to the strong signal attenuation from the satellite to indoor environment [7]. Therefore, indoor positioning system (IPS) became a challenging and potential research area by providing high accuracy result.

Some frequently parameters used for indoor positioning are based on the Received Signal Strength Indicator (RSSI), Time of Arrival (ToA), Time Difference of Arrival (TDoA) and Angle of Arrival (AoA), among which RSSI-based parameters are usually adopted since the other parameters often require complex additional hardware, advanced synchronization mechanisms [2,8]. RSSI-based for indoor positioning system is feasible solution that estimated directly the distance based on intensity of signal from transmitter device and its path loss exponent (PLE) value [9]. There are several technologies that can transmit signal parameters as the reference, such as Radio-frequency identification (RFID), Wi-Fi, Bluetooth low energy (BLE), ZigBee, Long Range Area (LoRA), etc. When compared to the others, BLE is the most often found in several modern wearable devices as well as smartphone, smart watch, tablet, earphone, and etc. Furthermore BLE as the personal network standard is easy to deploy, require low power consumption and cheap [3,10]. So for long term development, BLE technology is suitable for RSSI-based indoor positioning implementation in various applications.

However, RSSI-based is easily affected by disturbance from the environment such as shadowing, multipath fading, non-line of sight, time varying, and interferences from other near operating frequency devices which will significantly influence to the positioning accuracy [11]. In order to solve the problem of RSSI-based indoor positioning system, many advances algorithm have been proposed to reduce the variability and inconsistency level from RSSI measurement. Using machine learning techniques in the form of ANN, KNN or DNN algorithm have been proposed at [5,12] required long computation time in that training and modeling process. Particle swarm optimization (PSO), Weiner Filter and Gaussian Filter which used complex mathematical calculation, were already researched at [8,13-15] still required long process for estimating the position. Hence, the election of suitable algorithm for indoor positioning system will greatly affect to not only accuracy but also processing time adjusted to the requirement system. Several researchers at [1,3,6,7,11,16] have been proven Kalman filter (KF) algorithm was successful decreased the fluctuated RSSI measurement

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and achieved better accuracy result. To get more optimal result, KF algorithm should be combined with several other algorithms, such as fingerprinting [1,6], weighted [3], trilateration or multilateration [7,11,16].

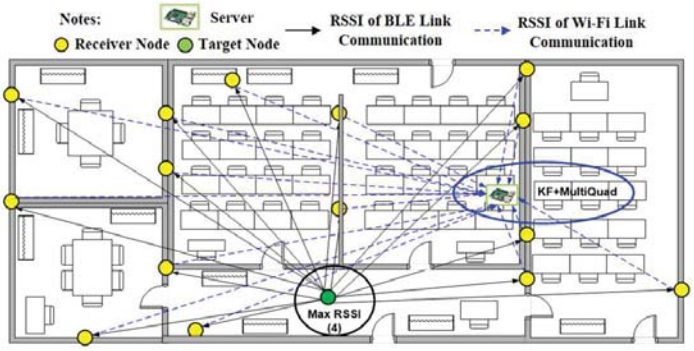

Fig.1. Improved indoor positioning system using KF and MultiQuad algorithm

In this paper, we propose improved indoor positioning system using combination from KF and MultiQuad algorithm. The target node using ESP32 will transmit RSSIs of BLE protocol continuously to the 15 receiver node as the reference. The contribution of this paper is to propose a combination of different algorithm for achieving high accuracy with easy calculation process so that it can be implemented to the limited device specification and also non-line of sight (NLOS) environment as shown at Fig.1. The processing algorithm of KF and MultiQuad conducted at Raspberry Pi server node. The outlier measurement RSSI will be refined using KF algorithm first based on 10 seconds invariant times. Then the estimated position will be calculated using multilateration based its four maximum RSSIs value. The final estimated position will be repaired using quadratic algorithm which is added a weighted value to its reference node in accordance with quadratic estimated distance calculation.

II. ADOPTED ALGORITHM

In this section, we describe the adopted algorithms which are used in improved indoor positioning system. Those are KF algorithm which is used to smooth fluctuating RSSI measurement, and multilateration as an initial estimate of the position calculation.

A. Kalman Filter Algorithm

Kalman filter (KF) as a recursive algorithm is optimal in the sense of minimizing the error noise measurement and linearity the model. KF consists of mathematical equations in the form of predictor-corrector type estimator that was repeated when a new measurement is available. RSSI measurements along with high levels of noise, and uniform model, were requiring at smoothing the randomness data for improving the accuracy. Inconsistent data of RSSI measurement in same unit of time are directly influenced to the distance and position estimation. Therefore we adopted the KF algorithm for filtering the RSSI of BLE transmission in time steps.

In KF algorithm of this system is reducing the noise of RSSI measurement over 10 seconds' time steps. There are three phases of KF algorithm: *initialization, prediction and update* [1,3,6,7,11,16].

1) Initialization State

There are some variables which are used in KF algorithms; those are state vector (x_k), observation state (z_k) that was RSSI data measurement and noise covariance P_0. The initialization variables can be described as follows:

$$x_k = [RSSI_{t_0}] \tag{1}$$

The value of z_k is used RSSI at the next time at same position measurement which is included with measurement noise:

$$z_k = H.x_k + noise \rightarrow \lfloor RSSI_{t_1} \rfloor \tag{2}$$

The noise covariance is obtained from the raw data of RSSI measurement in time duration.

$$P_0 = [\sigma^2{}_{RSSI_{t=0,1,\ldots,n}}] \tag{3}$$

2) Predict State

In this step will be predicted variable that has been declared in initialization state. In this system is assumed, there isn't input function. It makes F matrix as *identity matrix*. *The predict state* can be calculated with this following equation:

$$x_k = [RSSI_{t-1}].F \rightarrow F = 1 \tag{4}$$

$$P_k = F * P_0 + Q \rightarrow Q = P_0 \tag{5}$$

P_k is information state that related with *covariance* information data before and Q is *matrix covariance.*

3) Update State

Update state is calculated from multiplying each state with *Kalman gain* (K_k). The value of K_k will be influenced to the estimated result in the range of $0 \geq K_k \leq 1$. When the K_k close to *1*, KF will focus more on the measurement data, it means that the estimated error is small. While K_k is close to *0*, KF will emphasize the estimated data; it means that the estimated error is large.

The declaration value of K_k is influenced by the updating noise or covariance matrix (P_k, S_k). *Covariance matrix* value S_k is calculated by combination of *covariance matrix* P_k from *update state* which is added with *noise variance* of RSSI estimation R_k derived as:

$$S_k = H.P_k. + R_k \rightarrow R_k = \sigma^2{}_{RSSI_{t=0,1,\ldots,n}}; H = 1 \tag{6}$$

The value of K_k is derived as:

$$K_k = P_k.S_k^{-1} \rightarrow \frac{P_k}{(H.P_k + R_k)} \tag{7}$$

According the *update state*, the value of P_0 that has been declared before is derived as:

$$P_0 = (P_k - K_k * H) * P_k \tag{8}$$

It is also influence to the *observation matrix* that can be calculated as follows:

$$y_k = z_k - x_k \rightarrow x_k = [RSSI_{t+1}] \tag{9}$$

The *posterior state* which is estimation result from KF algorithm as the filtered RSSI:

$$x_k = x_k + K_k.y_k \tag{10}$$

B. Multilateration Algorithm

Multilateration is an extension algorithm of trilateration which estimate the target node based on its distance measurement to more than three reference nodes. The distance is determined from RSSI measurement between target node transmissions to the reference nodes.

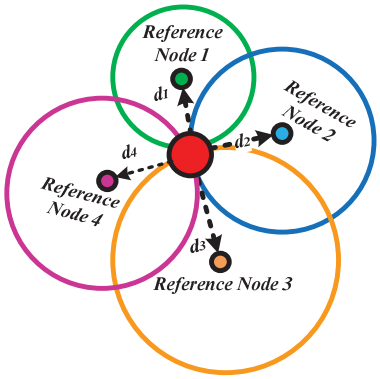

Fig. 2. Multilateration algorithm illustration

In multilateration algorithm, there are several nodes that can be used for positioning the location. In this paper, we used four references nodes (x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4) estimated the target node (x_{multi}, y_{multi}) as central circle by intersecting their four circle, as shown at Fig.2. Target node is assumed placed on the intersection point, while distance from each reference nodes to the target node are represented as d_i *(i=1, 2, 3, 4 ..., n)*. The estimated position was calculated its position (x_{multi}, y_{multi}) using following matrix formulas [2]:

$$A = \begin{bmatrix} 2(x_1 - x_4) & . & 2(y_1 - y_4) \\ 2(x_2 - x_4) & . & 2(y_2 - y_4) \\ 2(x_3 - x_4) & . & 2(y_3 - y_4) \end{bmatrix}$$

$$X = \begin{bmatrix} x_{multi} \\ y_{multi} \end{bmatrix} \quad (11)$$

$$B = \begin{bmatrix} x_1^2 + y_1^2 - x_4^2 - y_4^2 - d_1^2 + d_4^2 \\ x_2^2 + y_2^2 - x_4^2 - y_4^2 - d_2^2 + d_4^2 \\ x_3^2 + y_3^2 - x_4^2 - y_4^2 - d_3^2 + d_4^2 \end{bmatrix}$$

According to the equation (11), it will be formed a relationship calculation as follows:

$$A.X = B \quad (12)$$

So that *matrix X* can be defined as the estimated position using this formula respectively:

$$X = (A^T A)^{-1} A^T B \quad (13)$$

III. Proposed Indoor Positioning System

In this section, we describe RSSI measurement scenario which is consist of the measurement location, node deployment and the coordinate position to get distance estimation based on PLE value. The distance estimation is used to determine position of target node of indoor positioning scheme.

A. Measurement Scenario

In this phase, there are three measurement phase scenario to get RSSI data using BLE from ESP32 module as the target node and reference nodes. There are 15 reference nodes placed on 2.5 m height, and a mobile target node move to the specified point with 1.5 m height as shown at Fig.3. The measurement scenarios are taken on indoor laboratory of Surabaya University with full of obstacles like chair, table, cupboard, wall and several laboratory tools. Furthermore, there are also some Wi-Fi access points which also can affect to the RSSI measurement. First measurement scenario is determining PLE value based on distance modification. Target node as the transmitter move every 0.5 m distance in line of sight (LOS) due to the room dimension is not too big. While the reference node as the receiver stay in one position by adjusting the distance to the target node.

The second scenario is using same distance in 0.5 m and different position among the reference node and target node. The goal of this scenario is determining the deviation standard which is formed by noise variance of RSSI measurement. This measurement data can be used for noise input data of KF algorithm at equation (5). The last scenario is implementing the improved positioning system by measuring RSSI BLE transmission from target node at specified position to the all reference nodes.

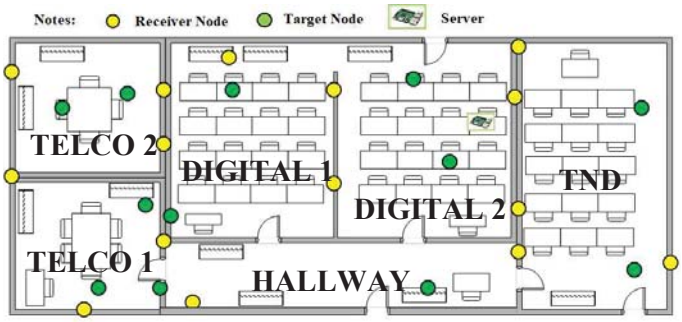

Fig. 3. Observation area of improved indoor positioning system (Implemented on University of Surabaya Laboratory)

According to the result of measurement phase from 1st and 2nd scenarios, RSSI data are used to determine the Path loss exponent (PLE) value. Then, the target node estimated distanced will be determined using log-normal propagation loss model which one used PLE value and RSSI measurement data from 3rd scenario given as [17]:

$$RSSI = -(10n\log_{10}(d) + A) \quad (14)$$

n is the PLE value that is influenced by *d* distance from transmitter node and *A* the *RSSI* at 0.5 meter distance as reference data. From eq. (13) PLE measurement value based on real condition is derived as [17]:

$$n = \frac{A + RSSI}{-(10\log_{10} d)} \quad (14)$$

The result of PLE value calculation is different for each room due to the diverse obstacle environment condition. The

estimated distance calculation should be adapted the target position room. This PLE value data as listed at TABLE I. will be used for references data at implementation phase of proposed indoor positioning system.

TABLE I. PLE VALUE OF EACH ROOM

Rooms Name	PLE Value
Telco 1	2.18
Telco 2	2.76
Digital 1	1.9
Digital 2	2.77
TND	2.56
Hallway	3.01

Based on the PLE value, it can be used to determine distance estimation that is derived from eq. (13-14) as follow [17]:

$$d = 10^{-\left(\frac{RSSI+A}{10n}\right)} \quad (15)$$

B. Improved Indoor Positioning System Algorithms

After determining the PLE value, the estimated position will be calculated using three algorithms combination. Those algorithms are KF for filtering RSSI measurement, multilateration for estimating position and quadratic weighted for improving the multilateration result, as shown at Fig.4. The target node is transmitted RSSI for 10 seconds to the 15 deployed reference nodes at each specified position. Then the measured RSSI from each reference node is forwarded to the server node. There is one router for expanding the coverage area of server node, so the communication between each reference node to the server node still affordable.

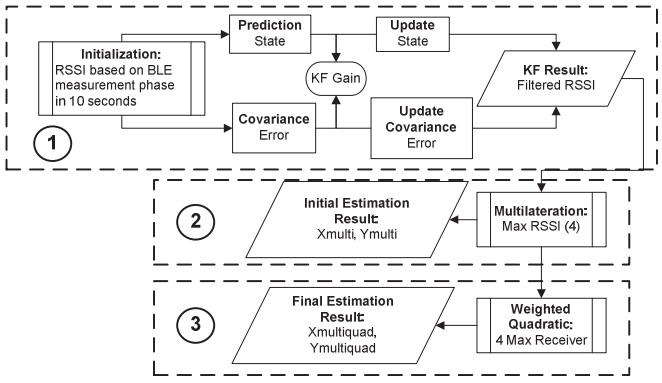

Fig. 4. Proposed algorithm of improved indoor positioning system

The measured RSSI from each reference node will be smoothed using KF algorithm at the server node. Then, the filtered RSSI will be selected four strongest RSSI data from each reference node. The strongest RSSI data will be converted into estimated distance using PLE value as listed in TABLE I. The initial estimated positions (x_{multi}, y_{multi}) are calculated using multilateration based on four estimated distance results. The estimated resulted from multilateration will be improved using quadratic weighted calculation which is adopted from [14].

Basically, the main concept of quadratic weighted is adding multiplier factor to the reference node. As well as multilateration algorithm, the quadratic weighted factors are multiplied to the reference nodes which have four strongest RSSI measurements. Therefore reference nodes are not only send the measured RSSI data, but also their coordinate information to the server node as the additional parameter for calculating the quadratic weighted algorithm. According to the equation (16-17), there are five *weighted value* calculations, as follow:

$$w_1 = \frac{1}{d_1 + d_2 + d_4} \; ; \; w_2 = \frac{1}{d_1 + d_3 + d_4}$$

$$w_3 = \frac{1}{d_2 + d_3 + d_4} \; ; \; w_4 = \frac{1}{d_1 + d_2 + d_3} \quad (16)$$

$$w_5 = 2.65 * \left(\frac{1}{d_1} + \frac{1}{d_2} + \frac{1}{d_3} + \frac{1}{d_4}\right) \quad (17)$$

The weighted values are calculated using estimated distance from four strongest RSSI measurement data. Finally, the final estimation $(x_{multiquad}, y_{multiquad})$ can be obtained from weighted value multiplication to each reference node coordinate $(x_{R=1,2,..n}, y_{R=1,2,..n})$, as shown to this following equation:

$$x_{multiQuad} = \left(\frac{(x_{R1} * w_1) + (x_{R2} * w_2) + (x_{R3} * w_3) + (x_{R4} * w_4)}{w_5}\right)$$

$$y_{multiQuad} = \left(\frac{(y_{R1} * w_1) + (y_{R2} * w_2) + (y_{R3} * w_3) + (y_{R4} * w_4)}{w_5}\right) \quad (18)$$

Each estimation result from multilateration and quadratic weighted algorithm is compared to the real position using mean square error value (MSE):

$$MSE = \sqrt{(x_{real} - x_{estimation})^2 + (y_{real} - y_{estimation})^2} \quad (19)$$

IV. EXPERIMENTAL RESULTS AND DISCUSSION

There are several experiments carried out to analyze each algorithm performance at this implementation system. In this section, we evaluate the error estimation result (MSE) of our proposed indoor positioning system using KF-MultiQuad, and also comparing the result with only using conventional multilateration.

A. Experimental Parameters & Estimated Position Result

In this paper, we were implemented the system at laboratory of Surabaya University. The communication between target node and references node was using BLE protocol with broadcast and distributed scheme. While the communication between each reference node to the server node is using UDP Wi-Fi protocol with centralized scheme.

The relevant parameters and spesifications of this experimental system are listed in TABLE II.

TABLE II. EXPERIMENTAL PAREMETERS AND SPECIFICATIONS

Parameters	Value	Remarks
Operating Frequency	2.4 GHz ISM Band	BLE HM-10 (1 Target Node)
RF Power	23 dBm	
Device specification	ESP32 (BLE & Wi-Fi)	15 Reference Nodes
	Raspberry Pi 3B (Wi-Fi)	1 Server Node
	Mikrotik 951G-2HND (Wi-Fi)	1 Server Node Extension Device

KF algorithm was succeeding smoother the RSSI of BLE transmission as shown at Fig.5. RSSI was measured at same place with some difference distance in 1 meters, 2 meters and 3 meters distances for 25 seconds. Before using KF algorithm, RSSI data at the same position of 1 meters distance was randomly fluctuated from -72 dBm up to -84 dBm. While using KF algorithm the RSSI data almost stable around -73 dBm. It proved that KF algorithm can be reduced well the noise from RSSI measurement.

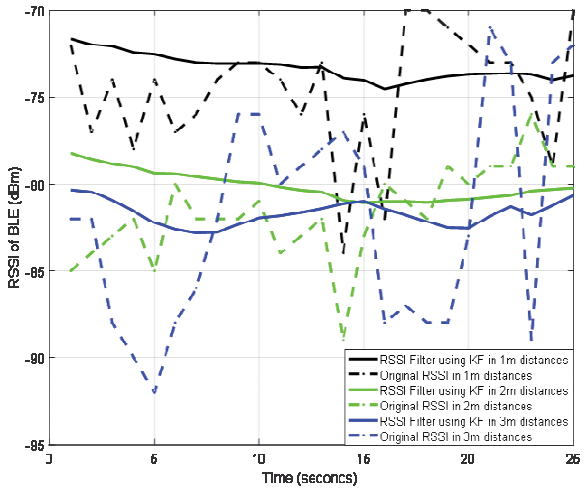

Fig. 5. Filtered RSSI measurement result using KF algorithm

Then, the filtered RSSI can be used for estimating the distance and position of this system. As shown at Fig. 6, filtered RSSI was directly influenced to the estimated position result. Without using KF algorithm, the fluctuated RSSI in 10 seconds measurement were only averaged. This condition can be directly affected to the estimated distance calculation due to the randomness of unfiltered RSSI data. Using only conventional multilateration algorithm was blown away from the real position of the target node. Although adding the quadratic weighted to the unfiltered RSSI, the estimated position were still looks far deviated from the actual position.

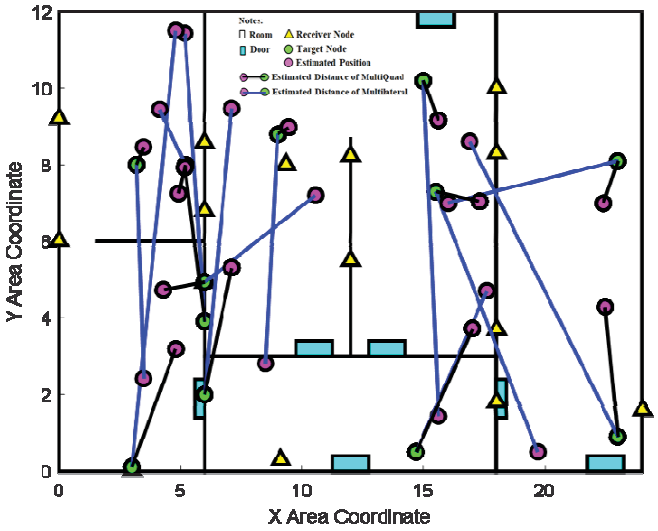

Fig. 6. The comprehensive experiment without using KF algorithm

It's different with using filtered RSSI measurement data as shown at Fig.7, the estimated position were getting closer to the real position. The estimated position of filtered RSSI result was not so far as the unfiltered RSSI result, especially in using multiquad algorithm which was almost same to the real position.

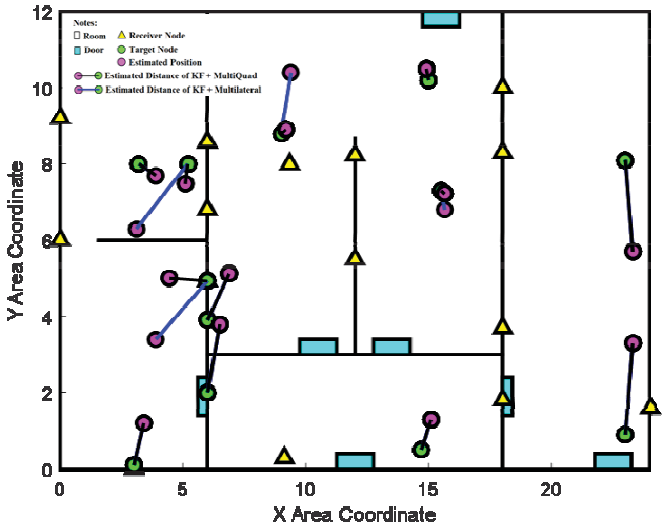

Fig.7. The comprehensive experiment using proposed combination algorithm

B. Discussion

This research evaluates the error estimation (MSE) using multilateration method and adding quadratic weighted method in indoor positioning system. Both of them are comparing with filtered RSSI and unfiltered RSSI using KF algorithm. Regarding to the estimated position result, we will analyze the error position in overall data using CDF (cumulative distribution function) graphic as well, as illustrated at Fig.8.

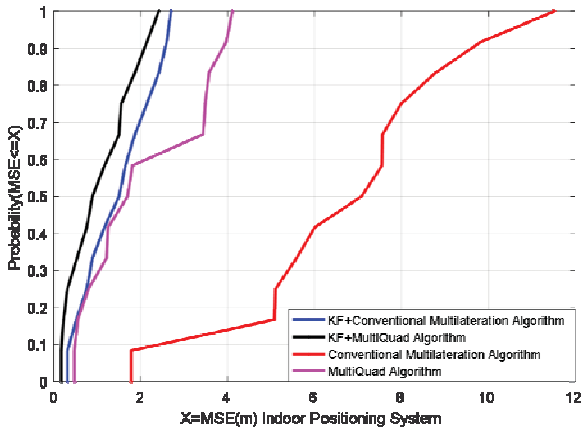

Fig. 9. Pareto chart of MSE average system

This graph is used to know the worst performance of MSE value based on cumulative probability distribution for each algorithm. The best performance with smallest MSE value is achieved by KF+MultiQuad algorithm or the combination from KF, multilateration and quadratic weighted algorithm. It estimated error ranges are between 0.17 m to 1.17 m. While without using KF algorithm in combination of multilateration and quadratic weighted algorithm has 0.31 m up to 2.59 m error estimation performance. It shows that using KF algorithm as the RSSI smoother very influenced to the estimated error performance. Evidently, using quadratic weighted addition also can be reduced the error estimation performance as shown that getting lower error in 0.47 m up to 4.11 m than using only conventional multilateration algorithm.

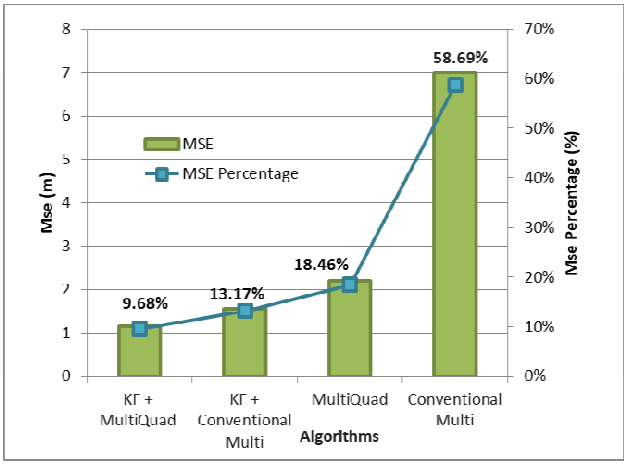

Fig. 10. Pareto chart of MSE average system

In the form of Pareto chart (Fig.9.), it can be seen that the average MSE value and percentage from the average MSE value for each method. The combination of multilateration and quadratic weighted algorithm using filtered RSSI from KF algorithm obtains 1.15 m MSE average system and 9.68% MSE percentage. While using unfiltered RSSI from KF at multilateration and quadratic weighted combination was increased twice up at 18.46 % MSE percentage. Then, using only conventional multilateration algorithm raised high MSE percentage at 58.69%. It proves that combination several algorithms can be repaired the estimated position performance than using only single algorithm. This condition also proves that adding KF algorithm can reduce noise measurement effectively in RSSI based for indoor positioning system.

V. Conclusion

In this paper, we propose improved indoor positioning system based on several combinations from KF, multilateration and weighted algorithms. KF algorithm is used for reducing the noise from RSSI transmission of BLE module. The estimated position is calculated using four strongest filtered RSSI and also multiplied with quadratic weighted to its node reference coordinate. The comparative analysis show that using filtered RSSI and multiquad algorithm combination could improve MSE of position estimation up to 6 times better than using unfiltered RSSI in multilateration algorithm only.

In the future work, we will modify the combination algorithm based on derivatives of Kalman Filter algorithm that provided in this paper, moreover it could improve the accuracy and also make dynamic scheme in all indoor environments.

References

[1] Angele C.E, Ohara K.R., Elder O., and Joao L.R., "Kalman Filtering-Aided Hybrid Indoor Positioning System with Fingerprinting and Multilateration", VTC2020-Spring, pp:1-5, 2020, IEEE Xplore

[2] Tong Li, Sijie Ai, Shigeyuki T., and Yuriko H., "Comparison of Multilateration Methods Using RSSI for Indoor Posituioning System", 58th SICE, pp:371-375, 2019, IEEE Xplore

[3] Lailal A., Xiaoying K., and Kumbesan S., " Improve Indoor Positioning Accuracy Using Filtered RSSI and Beacon Weight Approach in iBeacon Network", 19th ISCIT, pp:42-46, 2019, IEEE Xplore.

[4] Pavel P., et. All, "Collaborative Indoor Positioning Systems: A Systematic Review", Sensors 2021, 21(3), 1002, 39 pages, 2021

[5] Zhishu S., Tiehua Z., Atshuhi T., and Jiong J., "When RSSI encounters deep learning: An Area localization scheme for pervasive sensing systems", Journal of Network and Computer Applications, Vol. 173 Issue 2021, 13 pages, 2020, Elsevier.

[6] Didi S., et. All, "Tracking a moving user in indoor environments using Bluetooth low energy beacon", Journal of Biomedical Informatics, Vol. 98 Issue 2019, 9 pages, 2019, Elsevier.

[7] Eslam E., Bassem A. A., and Ayman W., " Improve Performance of Indoor Positioning System using BLE", 14th ICCES, pp:234-238, 2020, IEEE Xplore

[8] M. Usman A., Soojung H., Sangjoon P., and Yongwan P., " Harvesting Indoor Positioning Accuracy by Exploring Multiple Features From Received Signal Strength Vector", IEEE Access, Vol. 7, pp: 55110-52121, 2019.

[9] Mostafa K. A., Seyed M. F., Hamid R. H., and Motjaba K., "A hybrid adaptive approach to improve position tracking measurements", KCIS ICT Express, 7 pages, 2020, Elsevier.

[10] M. Nagah A., Hussein M. E., M. H. Abd El A., and Hesham E., " An Enhanced Indoor Positioning Technique Based on a Novel Received Signal Strength Indicator Distance Prediction and Correction Model", Sensors 2021, 21(719), 26 pages, 2021

[11] Yan W., Junhui W., and Jie L., "A Wireless Sensor Networks Positioning Method in NLOS Environment Based on TOA and Parallel Kalman Filter", 19th ICCT, pp:446-450, 2019, IEEE Xplore

[12] Matteo D' A., et. All, " IoT Indoor Localization with AI Technique", IEEE International Workshop on Metrology for Industry 4.0 and IoT., pp: 654-658, 2020, IEEE Xplore.

[13] Anna K., Machiel S. B., Rui M.S.F., and Janusz B., " Noise-Dependent Adaption of the Wiener Filter for the GPS Position Time Series", Math Geosci 51, pp: 53-73, 2019, Springer.

[14] Hiying W., et. All, "A quadratic weighted centroid algorithm for tunnel personnel positioning", International Journal of Distributed Sensor Networks, Vol. 16(4), 12 pages. 2020, SAGE.

[15] Xiona Z., Shufang Z., and Shuaiheng H., "Low-Power Indoor Positioning Algorithm Based on iBeacon Network", Hindawi Complexity, Vol. 2021, 10 pages, 2021.

[16] Aries P., et. All, "Implementation of Kalman Filter Method for Tracking Position of Alzheimer's Patients", ICON-SONICS, pp: 136-140, 2017, IEEE Xplore.

[17] Rafina D. A., Prima K., and Amang S., " Cluster-Based PLE Areas for Mobile Cooperative Localization in Indoor Wireless Sensor Network", 8th ICITEE, pp: 1-6, 2016, IEEE Xplore.

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Foreword

Assalamualaikum Warahmatullahi Wabarakatuh

It is my great pleasure and honor as Director of Politeknik Elektronika Negeri Surabaya (PENS) to welcome all of you to the International Electronics Symposium (IES) 2021, which is held at Surabaya, Indonesia on September 29-30, 2021. Moreover, I would like to welcome all the keynote speakers and discussion panelists. I am sure you will find this conference to an excellent forum for innovative and technical discussion.

Since the first IES in 1998, this is the 23rd conference organized by PENS as an annual event. The conference is grew up year by year and this 2021 event is the eight year of IES to be an international symposium and we still maintain a great collaboration with Institute of Electrical and Electronics Engineers (IEEE) Indonesia section as technical sponsor. IES 2021 contains two tracks: International Electronics Symposium on Engineering Technology and Applications (IES-ETA) and International Electronics Symposium on Knowledge Creation and Intelligent Computing (IES-KCIC). Participants from all over Indonesia and our neighborhood countries will find the symposium a perfect venue.

This symposium would have not been possible without the contributions and hard works of the keynote and invited speaker, all the authors and reviewers, the advisory committee as well as chair persons, Technical Committee and Organizing Committee. Allow me to take this opportunity to express my sincere appreciation to all of you.

The symposium may become the "Bridge to the Future" for the participant for stepping advanced in science and technology with aiming at providing original concept and powerful methodologies for solving variety of social and industrial problems such as environment, energy, medical, security and etc. "Bridge to the Future" as stated in our institution's slogan also means that we are the way for the people who headed to the future of advance technologies.

In conjunction with the symposium, we also held 2 workshops which are (1) Hands-on Workshop on Internet of Things, and (2) Hands-on Workshop on Artificial Intelligence, and 2 panel discussions which are (1) Panel Discussion on Internet of Things, and (2) Panel Discussion on Artificial Intelligence and 5D Systems.

Foreword

I do expect this symposium will give essential contributions to the development on the aspects of researches, academics, and industries nationally and globally. I hope that all participants have fruitful and technical discussions and enjoy the symposium.

See you on next IES 2022.

Wassalamualaikum Warahmatullahi Wabarakatuh...

Surabaya, September 29-30, 2021

Aliridho Barakbah, S.Kom., Ph.D.
Director of Politeknik Elektronika Negeri Surabaya (PENS)

Welcome Message from General Chair of IES 2021

Assalamualaikum Wr. Wb.

On behalf of the 23nd International Electronics Symposium (IES) 2021, I would like to welcome you all to this prestigious and high-quality conference. IES is one of the primary IEEE forums in Indonesia for publication and technical exchange of the latest research and innovation and brings together academia and industry to share and evaluate the technology related to Electronic and Computer. In this opportunity, I would like to express my sincere gratitude to our honourable Keynote Speakers, Director of Politeknik Elektronika Negeri Surabaya, IEEE Indonesia Section representative, Advisory Committee, Technical Program Committee, Steering Committee, and Organizing Committee for their support and efforts so that this event can be successfully conducted. This year, IES 2021 is conducted in Surabaya, Indonesia, from September 29-30th, 2021. And in respect to the Covid-19 pandemic, IES 2021 is held on a hybrid conference, that is an on-site conference (physical presence) and an online option (virtual participation). As the same as before, IES 2021 also conducts two sub-conferences, namely International Electronics Symposium on Engineering Technology and Applications (IES-ETA) and International Electronics Symposium on Knowledge Creation and Intelligent Computing (IES-KCIC).

This year, we have prepared a comprehensive program consists of several keynote speeches delivered by Prof. Minoru Okada (Nara Institute of Science and Technology, Japan), Prof. Dr.-Ing. Ulrich Rueckert (Bielefeld University, Germany), Dr. Ir. Titon Dutono, M.Eng (Politeknik Elektronika Negeri Surabaya, Indonesia), Dr. Denny Setiawan, ST. MT. (Ministry of Communication and Information Technology, Republic of Indonesia), and Mr. Bayu Hanantasena (Indosat Oreedo, Indonesia). The conference has received 294 submitted papers. 69 papers for IES-ETA and 47 papers for IES-KCIC have been accepted by the committee for oral presentation. 29 papers are presented on-site (offline) and 87 papers are presented online. This means that the acceptance rate of this conference about 39%. The participant for IES 2021 are from Indonesia, Japan, USA, UK, Australia, South Korea, Morocco, India, and Thailand. All accepted and presented papers will be included within the IES 2021 Proceedings. These papers on various topics are divided into 8 parallel sessions in the conference.

Welcome Message from General Chair of IES 2021

Finally, I would also like to thank the management of Politeknik Elektronika Negeri Surabaya, and the IEEE Indonesia section for their great assistance and support. Without all of their support, IES 2021 would not have been possible. Enjoy IES 2021 and the heroic city of Surabaya.

Wassalamualaikum Wr. Wb.
Mochammad Zen Samsono Hadi (IES 2021 General Chair)

1. Official Language

The official language of IES 2021 is English. All presentations including Q&A will be delivered in English.

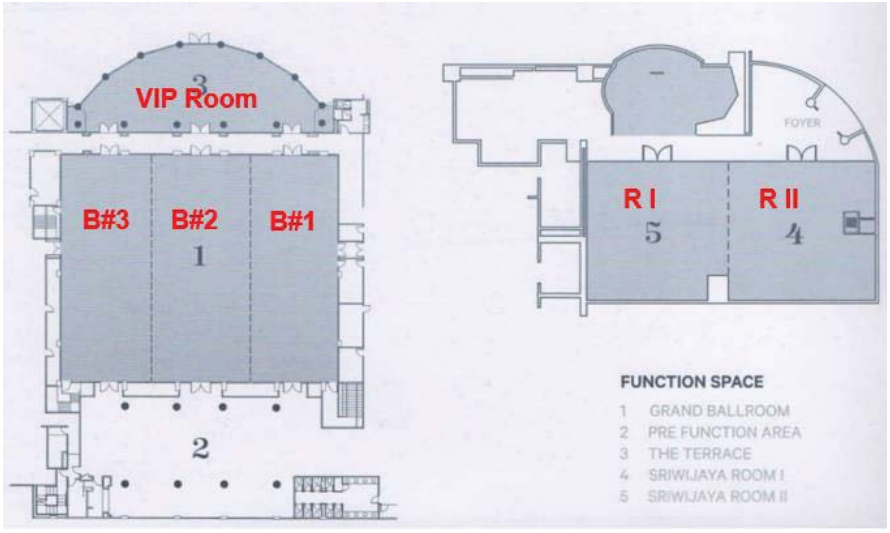
2. Guideline for Participants

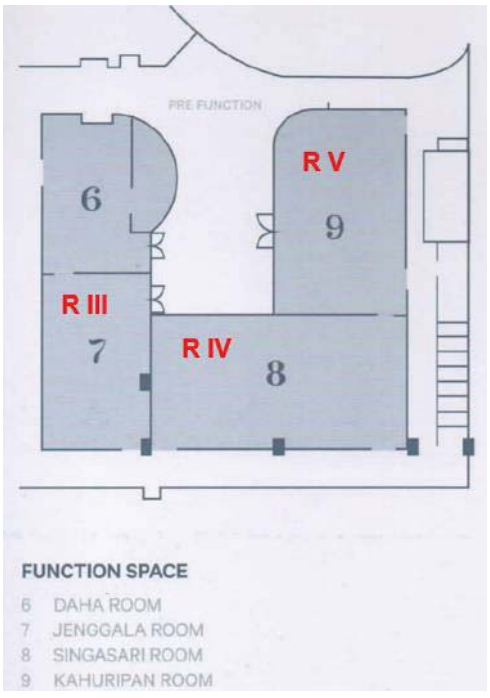
- Conference Venue
  IES 2021 will be held on hybrid conference, that is on-site conference (physical presence) in Sheraton Hotel Surabaya and an online option (virtual participation) by using Zoom.
- On-site Conference Venue
  On-site conference will be held in Sheraton Surabaya Hotel & Towers. Embong Malang Street Number 25-31, Kedungdoro, Tegalsari districts, Surabaya City, Jawa Timur 60261. Phone: (031) 5468000
- Online Conference Venue
  Online conference will be held by using Zoom.
  ZOOM Event will be opened 30 minutes before the event (08.00 Western Indonesia Time, Jakarta Time). Link to join will be sent through email.
- Registration
  Time of Registration: 08.00 – 08.30 (Local Time Jakarta, GMT + 7), Wednesday, September 29th 2021

3. Guideline for Presenters and Session Chair/Moderator

- International Electronics Symposium (IES) 2021 will be held on hybrid conference, that is on-site conference (physical presence) in Sheraton Hotel Surabaya and an online option (virtual participation) by using Zoom.
- Regarding this situation, the guidelines about how to do physical presentation and virtual presentation can be accessed in this link: https://ies.pens.ac.id/2021/guidelines-for-presenter/.
- Author needs to attend both dry run and parallel session. Dry run and parallel session in virtual conference will be held using Zoom. Both dry run and Parallel Session, the IES Committee are using English Language and recoding during session progress.
- During parallel session, the presenters and session chairs are asked to keep to the paper sequence as shown in the Final Program. By following the predefined schedule, participants can switch between sessions without missing the particular papers of interest.
- The presentation time for each presenter is 15 minutes including Q&A. The session chairs should allow the presenter for a 10 minutes presentation and leave 5 minutes for discussions. All presenters are requested to report their attendance to the session chair 10 minutes before the session begins.

Maps and Location for On-site Conference





Note:

- **Grand Ballroom (No.1) :** Opening Ceremony and Keynote Speaker – B#1,B#2,B#3
- **Pre Function Area (No.2) :** Lunch and Poster Session
- **Kalingga Room (No.3) :** VIP Room
- **Sriwijaya Room I (No.5) :** Paralel Session – Room 1
- **Sriwijaya Room II (No.4) :** Paralel Session - Room 2
- **Jenggala Room (No.7) :** Paralel Session – Room 3
- **Singasari Room (No.8) :** Paralel Session – Room 4
- **Kahuripan Room (No.9) :** Paralel Session – Room 5

- **No. 1 - 5: First Floor**
- **No. 6 - 9: Second Floor**

Conference Room IES 2021

A. Opening ceremony

Zoom Virtual Conference for Online Participants
Grand Ballroom (1), Sheraton Hotel for Offline Participants

B. Seminar Room

Wednesday, September 29th, 2021
Parallel Session 01 (Online)

Location	:	Room I
Moderator	:	Dr. Nu Rhahida Arini
Track	:	Power Engineering and Energy Technology
Topic	:	IES-ETA 1
Location	:	Room II
Moderator	:	Iwan Syarif, Ph.D.
Track	:	Electronics Systems and Electrics Technology
Topic	:	IES-ETA 2
Location	:	Room III
Moderator	:	M. Udin Harun Al Rasyid, Ph.D.
Track	:	Telecommunication Engineering Technology
Topic	:	IES-ETA 3
Location	:	Room IV
Moderator	:	Dr. Bima Sena Bayu Dewantara
Track	:	Robotics Technology and Control Systems
Topic	:	IES-ETA 4
Location	:	Room V
Moderator	:	Achmad Basuki, Ph.D.
Track	:	Knowledge Base and Engineering
Topic	:	IES-KCIC 1

Wednesday, September 29th, 2021
Parallel Session 02 (Online)

Location	:	Room I
Moderator	:	Dr. Nu Rhahida Arini
Track	:	Power Engineering and Energy Technology
Topic	:	IES-ETA 5
Location	:	Room II
Moderator	:	Dr. Arif Irwansyah
Track	:	Robotics Technology and Control Systems
Topic	:	IES-ETA 6
Location	:	Room III
Moderator	:	Dr. Mike Yuliana
Track	:	Telecommunication Engineering Technology
Topic	:	IES-ETA 7
Location	:	Ballroom #1
Moderator	:	Dr. M. Agus Zainuddin
Track	:	Computational Intelligence
Topic	:	IES-KCIC 2
Location	:	Ballroom #3
Moderator	:	Dr. Idris Winarno
Track	:	Applied-Computing Sciences
Topic	:	IES-KCIC 3

Conference Room IES 2021

Thursday, September 30th, 2021
Parallel Session 03 (Online)

Location	:	Room I
Moderator	:	Dr. Prima Kristalina
Track	:	Telecommunication Engineering Technology
Topic	:	IES-ETA 8
Location	:	Room II
Moderator	:	Dr. Reesa Akbar
Track	:	Robotics Technology and Control Systems
Topic	:	IES-ETA 9
Location	:	Room III
Moderator	:	Dr. Setiawardhana
Track	:	Robotics Technology and Control Systems
Topic	:	IES-ETA 10
Location	:	Room IV
Moderator	:	Dr. Tita Karlita
Track	:	Computational Intelligence
Topic	:	IES-KCIC 4
Location	:	Room V
Moderator	:	Dr. Rika Rohana
Track	:	Intelligent Multimedia Systems
Topic	:	IES-KCIC 5
Location	:	Ballroom #1
Moderator	:	Dr. Eng. Hary Oktavianto
Track	:	Applied-Computing Sciences
Topic	:	IES-KCIC 6
Location	:	Ballroom #2
Moderator	:	Riyanto Sigit, Ph.D.
Track	:	Applied-Computing Sciences
Topic	:	IES-KCIC 7
Location	:	Ballroom #3
Moderator	:	Sritrusta Sukaridhoto, Ph.D.
Track	:	Applied-Computing Sciences
Topic	:	IES-KCIC 8

Thursday, September 30th, 2021
Parallel Session 04 (Offline)

Location	:	Room I
Moderator	:	Dr. Prima Kristalina
Track	:	Power Engineering and Energy Technology
Topic	:	IES-ETA 11
Location	:	Room II
Moderator	:	Dr. Reesa Akbar
Track	:	Electronics Systems and Electrics Technology
Topic	:	IES-ETA 12
Location	:	Room III
Moderator	:	Dr. Setiawardhana
Track	:	Telecommunication Engineering Technology
Topic	:	IES-ETA 13
Location	:	Room IV
Moderator	:	Dr. Tita Karlita
Track	:	Telecommunication Engineering Technology
Topic	:	IES-ETA 14
Location	:	Room V
Moderator	:	Dr. Rika Rohana
Track	:	Robotics Technology and Control Systems
Topic	:	IES-ETA 15
Location	:	Ballroom #1
Moderator	:	Dr. Eng. Hary Oktavianto
Track	:	Computational Intelligence
Topic	:	IES-KCIC 9
Location	:	Ballroom #3
Moderator	:	Sritrusta Sukaridhoto, Ph.D.
Track	:	Applied-Computing Sciences
Topic	:	IES-KCIC 10

C. Registration and Information

Zoom Virtual Conference for Online Participants
Pre-Function Area (2), Sheraton Hotel for Offline Participants

Rundown of International Electronics Symposium 2021
Date: Wednesday, September 29th, 2021
Time Zone: Local Time Jakarta (GMT + 7)
Venue: Sheraton Hotel, Surabaya
Wireless Technologies and Intelligent Systems for Better Human lives

<table>
<tr><th>Time</th><th colspan="4">Wednesday, September 29th 2021</th></tr>
<tr><td>08.00 - 08.30</td><td colspan="4">Registration</td></tr>
<tr><td>08.30 - 09.00</td><td colspan="4">Opening Ceremony :
IES General Chairman: Mochammad Zen Samsono Hadi, Ph.D.,
IEEE Indonesia Section: Dr. Ing. Wahyudi Hasbi,
PENS Director: Alirido Barakbah, Ph.D.</td></tr>
<tr><td>09.00 - 10.30</td><td colspan="4">Keynote Speech I :
Prof. Minoru Okada (Japan),
Dr. Titon Dutono, M.Eng. (PENS),
Mr. Bayu Hanantasena (Indosat)
Moderator: Dr. I Gede Puja Astawa</td></tr>
<tr><td>10.30 - 10.45</td><td colspan="4">Coffee Break</td></tr>
<tr><td rowspan="3">10.45 - 12.15</td><td colspan="4">Parallel Session 01</td></tr>
<tr><td>Room I
IES-ETA 1:
Online Oral Presentation
(4 papers)</td><td>Room II
IES-ETA 2:
Online Oral Presentation
(6 papers)</td><td>Room III
IES-ETA 3:
Online Oral Presentation
(5 papers)</td><td>Room IV
IES-ETA 4:
Online Oral Presentation
(5 papers)</td></tr>
<tr><td>Room V
IES-KCIC 1:
Online Oral Presentation
(5 papers)</td><td>Preparing
Ballroom #1</td><td>Preparing
Ballroom #2</td><td>Preparing
Ballroom #3</td></tr>
<tr><td>12.15 - 13.15</td><td colspan="4">Lunch</td></tr>
<tr><td rowspan="2">13.15 - 15.15</td><td colspan="4">Workshop Session & Parallel Session 02</td></tr>
<tr><td colspan="2">Room IV
(Offline)
Workshop
Hands-on Artificial Intelligence with Huawei Cloud AI Develop Platform - Modelarts by PT. Huawei Indonesia
(Mr. Randal Wang Feng)</td><td colspan="2">Room V
(Offline)
Workshop
Hands-on Internet of Things with Antares Platform by PT. Telekomunikasi Indonesia
(Mr. Ibnu Alinursafa)</td><td>Ballroom #2
Poster Session
(18 posters)</td></tr>
</table>

Time	Wednesday, September 29th 2021			
	Ballroom #1 (Hybrid) Workshop Panel Discussion on Artificial Intelligence & 5D Systems; **Moderator**: Amang Sudarsono, Ph.D; **Panelist**: Prof. Yasushi Kiyoki (Keio Univ.), Dr. Virach Sonlertlamvanich (Thammasat Univ.), Dr. Shiori Sasaki (Musashino Univ.), Yasuhiro Hayashi, Ph.D (Musashino Univ.), Dr. Maja Pusnik (The University of Maribor), Prof. Dadet Pramadihanto (PENS), Wahjoe Tjatur Sesuluhatien, PhD. (PENS), Dr. Sritrusta Sukaridhoto (PENS), Dr. Tita Karlita (PENS)		**Ballroom #3** (Offline) Workshop Panel Discussion on Internet of Things; **Moderator**: Dr. Reesa Akbar; **Panelist**: Teguh Prasetya, M.T. (PT. Alita Praya Mitra), Andri Yadi (PT. DycodeX Teknologi Nusantara), Dr. I Gede Puja Astawa (PENS), Dr. Agus Indra Gunawan & teams (PENS), Dr. Rahardhita Widyatra Sudibyo (PENS)	
15.15 - 15.45	Coffee Break			
15.45 - 17.00	**Room I** IES-ETA 5: Online Oral Presentation (4 papers)	**Room II** IES-ETA 6: Online Oral Presentation (5 papers)	**Room III** IES-ETA 7: Online Oral Presentation (5 papers)	**Room IV** Workshop Hands-on AI (Continued)
	Room V Workshop Hands-on IoT (Continued)	**Ballroom #1** IES-KCIC 2: Online Oral Presentation (5 papers)	**Ballroom #2** Poster Session (Continued)	**Ballroom #3** IES-KCIC 3: Online Oral Presentation (5 papers)

Note for offline participants:

Room I: Sriwijaya Room I
Room II: Sriwijaya Room II
Room III: Jenggala Room
Room IV: Singasari Room
Room V: Kahuripan Room
VIP Room: Kalingga Room

Rundown of International Electronics Symposium 2021
Date: Thursday, September 30th, 2021
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Wireless Technologies and Intelligent Systems for Better Human lives

Time	Thursday, September 30th 2021			
08.00 - 09.00	Registration			
09.00 - 10.30	**Parallel Session 03**			
	Room I IES-ETA 8: Online Oral Presentation (4 papers)	**Room II** IES-ETA 9: Online Oral Presentation (5 papers)	**Room III** IES-ETA 10: Online Oral Presentation (4 papers)	**Room IV** IES-KCIC 4: Online Oral Presentation (5 papers)
	Room V IES-KCIC 5: Online Oral Presentation (5 papers)	**Ballroom #1** IES-KCIC 6: Online Oral Presentation (5 papers)	**Ballroom #2** IES-KCIC 7: Online Oral Presentation (5 papers)	**Ballroom #3** IES-KCIC 8: Online Oral Presentation (5 papers)
10.30 - 10.45	Coffee Break			
10.45 - 12.15	**Parallel Session 04**			
	Room I IES-ETA 11: Offline Oral Presentation (5 papers)	**Room II** IES-ETA 12: Offline Oral Presentation (4 papers)	**Room III** IES-ETA 13: Offline Oral Presentation (5 papers)	**Room IV** IES-ETA 14: Offline Oral Presentation (5 papers)
	Room V IES-ETA 15: Offline Oral Presentation (3 papers)	**Ballroom #1** IES-KCIC 9: Offline Oral Presentation (4 papers)	**Ballroom #2** No Session	**Ballroom #3** IES-KCIC 10: Offline Oral Presentation (3 papers)
12.15 - 14.15	Lunch and Preparing Ballroom			
14.15 - 15.45	**Keynote Speech II :** Prof. Dr.-Ing. Ulrich Rueckert (Germany), Dr. Denny Setiawan, ST. MT. (Ministry of Communication and Information Technology, Indonesia) **Moderator**: Dr. Arif Irwansyah			
15.45 - 16.00	Coffee Break			
16.00 -16.30	Closing Ceremony (Best Paper Award)			

Note for offline participants:

Room I: Sriwijaya Room I
Room II: Sriwijaya Room II
Room III: Jenggala Room
Room IV: Singasari Room
Room V: Kahuripan Room
VIP Room: Kalingga Room

Session : Parallel Session 01
Location : Room I
Moderator : Dr. Nu Rhahida Arini
Date : Wednesday, September 29th 2021
Track : Power Engineering and Energy Technology
Topic : IES-ETA 1

No	Time	Paper ID	Paper Title	Authors
1	10.45 - 11.00	1570732253	The Analysis of Blade Vibrations at a High Pressure Steam Turbine during Thermal Power Plant Start-up Condition	Zulkifli Al Rasyid Sampoerna, Nu Arini and Achmad Bahrul Ulum (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	11.00 – 11.15	1570732273	Digital Implementation of Space Vector PWM for Three Phase Inverter with Simplified C-Block PSIM Utilization	Muhammad Rizani Rusli (PT. Garda Energi Nasional Indonesia, Indonesia); Mochamad Ari Bagus Nugroho (Garda Energi Nasional Indonesia, PT., Indonesia); Mentari Putri Jati (Universitas Negeri Yogyakarta, Indonesia); Angga Wahyu Aditya (Polytechnic State of Balikpapan, Indonesia); Melinda Badriatul Fauziah (Electronics Engineering Polytechnic Institute of Surabaya, Indonesia); Handri Toar (Politeknik Negeri Batam & Politeknik Elektronika Negeri Surabaya, Indonesia); Taufik Taufik (California Polytechnic State University, San Luis Obispo, USA)
3	11.15 – 11.30	1570732775	Combining Stand Alone PV Rooftop, Small Scale PHS, Rainfall Storage Systems for Increasing Electric Power Production based on Hybrid Pumping Technique	Akhmad Musafa (Institut Teknologi Sepuluh Nopember, Indonesia & Universitas Budi Luhur, Indonesia); Ardyono Priyadi (ITS, Indonesia); Vita Lystianingrum, Margo Pujiantara and Sjamsjul Anam (Institut Teknologi Sepuluh Nopember, Indonesia); Mauridhi Hery Purnomo (Institut of Technology Sepuluh Nopember, Indonesia)

No	Time	Paper ID	Paper Title	Authors
4	11.30 – 11.45	1570739089	Modeling and Simulation of PV System with Self Adaptive Differential Evolution Based MPPT Under Partial Shading Condition	Muhammmad Dliaul Haq (Politeknik Elektonika Negeri Surabaya, Indonesia); Evi Nafiatus Sholikhah, Novie Ayub Windarko and Diah Yanaratri (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 01
Location : Room II
Moderator : Iwan Syarif, Ph.D.
Date : Wednesday, September 29th 2021
Track : Electronics Systems and Electrics Technology
Topic : IES-ETA 2

No	Time	Paper ID	Paper Title	Authors
1	10.45 - 11.00	1570745416	Homecare and Hospital Stroke Therapy comparison using EEG analysis	Mi'rojful Mei Hartanti, Adhi Dharma Wibawa and Mauridhi Purnomo (Institut Teknologi Sepuluh Nopember, Indonesia)
2	11.00 – 11.15	1570748935	Development of nitrogen fertilization dose prediction on rice field based on leaf color chart	Alima Fahmi Rahmawati (Politeknik Elektronika Negeri Surabaya, Indonesia); Hendhi Hermawan, Rika Rokhana (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	11.15 – 11.30	1570750410	Intelligent System of Natural Disaster Victim Detection using Naïve Bayes Classifier	Agiel Fahreza Aliek, Mochammad Zen Samsono Hadi and Nur Mubtadai (Politeknik Elektronika Negeri Surabaya, Indonesia); Ahmad Zainudin (Kumoh National Institute of Technology, Korea (South))
4	11.30 – 11.45	1570750588	Improvement of Smoker Prediction System Based on Hyperspectral Image with Hybrid Deep Learning Model	Annisa Nuraini (University of Indonesia, Indonesia); Adhi Harmoko Saputro (Universitas Indonesia, Indonesia)
5	11.45 – 12.00	1570750871	Smart Parking System Based on Haar Cascade Classifier and SIFT Method	Rahmat Fauzi Yulianto, Arif Irwansyah, Niam Tamami (Politeknik Elektronika Negeri Surabaya, Indonesia)
6	12.00 – 12.15	1570751047	Determining Global Position from Local Position in Military Force Position Tracking Application	Muhammad Refa Utama Putra (Politeknik Elektronika Negeri Surabaya, Indonesia); Ali Husein Alasiry, Hary Oktavianto (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 01
Location : Room III
Moderator : M. Udin Harun Al Rasyid, Ph.D.
Date : Wednesday, September 29th 2021
Track : Telecommunication Engineering Technology
Topic : IES-ETA 3

No	Time	Paper ID	Paper Title	Authors
1	10.45 - 11.00	1570738683	Evaluation of the PTS PAPR Reduction Technique with the Hammerstein-Wiener Predistortion Model in Amplify-and-Forward (AF), Decode-and-Forward (DF) Relaying Systems over Asymmetric Channels	Muhammad Naufal Saniar and Nabila Primaswari Anggraini (Politeknik Elektronika Negeri Surabaya, Indonesia); Arifin Arifin, Yoedy Moegiharto (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	11.00 – 11.15	1570738991	Performance of Joint PAPR Reduction Iterative Clipping and Filtering (ICF) and Predistortion in OFDM Systems Using Software Defined Radio	Abdurrahman Syarif (Politeknik Elektronika Negeri Surabaya, Indonesia); Arifin Arifin, Nihayatus Sa'adah, I Gede Puja Astawa and Yoedy Moegiharto (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	11.15 – 11.30	1570740506	Optimized wideband steerable antenna array using an 8x8 Butler matrix	Nadia Chater (National School of Applied Sciences, Morocco); Tomader Mazri (University of Ibntofail & ENSA Kenitra, Morocco); Mohammed Benbrahim (University Ibn Tofail, Kenitra Morocco); Anas Charkaoui (University Mohamed Ben Abdellah, Morocco)
4	11.30 – 11.45	1570748656	Implementation and Analysis of IoT Communication Protocols for Crowdsensing and Crowdsourcing in Health Application	Ata Amrullah, M. Udin Harun Al Rasyid, Idris Winarno (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	11.45 – 12.00	1570754100	Harmful Interference Mitigation in Sub-10 MHz Aeronautical Allocation Band	Titon Dutono (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 01
Location : Room IV
Moderator : Dr. Bima Sena Bayu Dewantara
Date : Wednesday, September 29th 2021
Track : Robotics Technology and Control Systems
Topic : IES-ETA 4

No	Time	Paper ID	Paper Title	Authors
1	10.45 - 11.00	1570724517	Fork agv: estimation of combined magnetic sensor with vision guide applied on automatic mobile transporter for navigation and accurate positioning	Mohamad Nasyir Tamara (Politeknik Elektronika Negeri Surabaya & EEPIS, Indonesia); Anhar Risnumawan (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	11.00 – 11.15	1570732882	Ball Position Transformation with Artificial Intelligence Based on Tensorflow Libraries	Setiawardhana Setiawardhana and Bima Sena Bayu Dewantara (Politeknik Elektronika Negeri Surabaya, Indonesia); Rudy Dikairono (Institut Teknologi Sepuluh Nopember, Indonesia); Afis Asryullah Pratama (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	11.15 – 11.30	1570743761	ROS Based Multi-Data Sensors Synchronization for Robot Soccer ERSOW	Khoirul Anwar, Iwan Kurnianto Wibowo, Bima Sena Bayu Dewantara, Mochamad Mobed Bachtiar and Muhammad Abdul Haq (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	11.30 – 11.45	1570748851	Vision-Based Positioning Estimation on the ERSOW Robot Soccer by Utilizing Unique Landmarks in the Field with a Computational Process using GPU	Rohmad Rifai, Mochamad Mobed Bachtiar and Iwan Kurnianto Wibowo (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	11.45 – 12.00	1570749197	Detecting Human Attendance using 1-Dimensional Foot Signal from Laser Range Sensor	Muhammad Dafa Geraldine Putra Malik, Bima Sena Bayu Dewantara and Dadet Pramadihanto (PENS, Indonesia)

Session : Parallel Session 01
Location : Room V
Moderator : Achmad Basuki, Ph.D.
Date : Wednesday, September 29th 2021
Track : Knowledge Base and Engineering
Topic : IES-KCIC 1

No	Time	Paper ID	Paper Title	Authors
1	10.45 - 11.00	1570739003	Text Mining in Healthcare for Disease Classification using Machine Learning Algorithm	Ghulam Asrofi Buntoro (Institut Teknologi Sepuluh Nopember & Universitas Muhammadiyah Ponorogo, Indonesia); Adhi Dharma Wibawa (Institut Teknologi Sepuluh Nopember, Indonesia); Mauridhi Hery Purnomo (Institut of Technology Sepuluh Nopember, Indonesia)
2	11.00 – 11.15	1570749948	TraEx: Traditional Arts & Crafts Event Recommendation System with Lifetime Experience for Regional Revitalization	Leo Urata and Shiori Sasaki (Musashino University, Japan)
3	11.15 – 11.30	1570752272	User Experience Design for Virtual Exhibition Platform Using Lean Startup Method	Verent Flourencia Irene, Umi Saadah and Desy Intan Permatasari (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	11.30 – 11.45	1570736984	Implementation of SUMO Simulation for Comparison of CVRP	Yohanes Yohanie Fridelin Panduman, Sritrusta Sukaridhoto and Muhammad Agus Zainuddin (Politeknik Elektronika Negeri Surabaya, Indonesia); Rizqi Putri Nourma Budiarti (Universitas Nahdlatul Ulama Surabaya, Indonesia)
5	11.45 – 12.00	1570738517	Performance Analysis of Driver Abnormal Behavior Classification System Using Enhanced Multi-Layer Perceptron	Rizki Rachmadi, Amang Sudarsono and Tri Budi Santoso (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)

Session : Parallel Session 02
Location : Room I
Moderator : Dr. Nu Rhahida Arini
Date : Wednesday, September 29th 2021
Track : Power Engineering and Energy Technology
Topic : IES-ETA 5

No	Time	Paper ID	Paper Title	Authors
1	15.45 – 16.00	1570739302	Optimal Generation Scheduling Considering Distributed Generator for Cost Minimization based on Adaptive Modified Firefly Algorithm	Sujono Sujono (Department of Electrical Engineering Institut Teknologi Sepuluh Nopember Surabaya, Indonesia); Ardyono Priyadi (ITS, Indonesia); Margo Pujiantara and Sjamsjul Anam (Institut Teknologi Sepuluh Nopember, Indonesia); Naoto Yorino (Hiroshima University, Japan); Mauridhi Purnomo (Institut Teknologi Sepuluh Nopember, Indonesia)
2	16.00 – 16.15	1570749472	A 5 Watts Magnetic Resonance Wireless Power Transfer with Enhanced Transmission Distance Capability	C. Bambang Dwi Kuncoro (National Chin-Yi University of Technology, Taiwan); Tunggul Nugroho (Institut Teknologi Harapan Bangsa, Indonesia); Arvanida Feizal Permana (National Chin-Yi University of Technology, Taiwan)
3	16.15 – 16.30	1570751107	Mapping Detection Of DC Series Arc Fault Based on Fast Fourier Transform	Mochammad Zulfikar Trysnawan Nashrulloh, Eka Prasetyono and Dimas Okky Anggriawan (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	16.30 – 16.45	1570751156	Analysis The Effect of Inlet Duct and Transition Zone Angle Variations on Flow Characteristics and Heat Transfer on Vertical Type Heat Recovery Steam Generator	Ikhsan Mahardhika Utama, Fifi Hesty, Rif'ah Amalia and Setyo Nugroho (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS))

Session : Parallel Session 02
Location : Room II
Moderator : Dr. Arif Irwansyah
Date : Wednesday, September 29th 2021
Track : Robotics Technology and Control Systems
Topic : IES-ETA 6

No	Time	Paper ID	Paper Title	Authors
1	15.45 – 16.00	1570750142	Forward Kinematics with 7-DoF Full-Arm Analysis on "T-FLoW" 3.0 Humanoid Robot	Wirayuda Dewandhana (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS) & Robotics and Intelligence System Center(RoISC), Indonesia); Kevin Ilham Apriandy (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS) & EEPIS Robotics Research Centre (ER2C), Indonesia); Bima Sena Bayu Dewantara (Politeknik Elektronika Negeri Surabaya, Indonesia); Dadet Pramadihanto (PENS, Indonesia)
2	16.00 – 16.15	1570750474	Color Based Object Segmentation on Wheeled Goalkeeper Robot	Rifqi Amalya Fatekha, Bima Sena Bayu Dewantara and Hary Oktavianto (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	16.15 – 16.30	1570750645	Fuzzy Social Force Model for Healthcare Robot Navigation and Obstacle Avoidance	Akhmad Thalibar Rifqi (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS), Indonesia); Bima Sena Bayu Dewantara (Politeknik Elektronika Negeri Surabaya, Indonesia); Dadet Pramadihanto (PENS, Indonesia); Bayu Sandi Marta (Politeknik Elektronika Negeri Surabaya, Indonesia)

No	Time	Paper ID	Paper Title	Authors
4	16.30 – 16.45	1570750737	Improved Damped Least Squares Inverse Kinematics with Joint limits for 7-DOF "T-FLoW" Humanoid Robot Manipulator	Muhammad Ramadhan Hadi Setyawan (Politeknik Elektronika Negeri Surabaya, Indonesia); Dadet Pramadihanto (PENS, Indonesia); Raden Sanggar Dewanto (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS), Indonesia); Bayu Sandi Marta (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	16.45 – 17.00	1570750793	ERISA Robot's Walking Trajectory Control using Pixy CMUcam5 to Locate the Target Position	Mawaddah Sekar Rahmawati and Arif Irwansyah (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia); Eko Henfri Binugroho (Politeknik Elektronika Negeri Surabaya, Indonesia); Ali Husein Alasiry (Politeknik Elektronika Negeri Surabaya & Electronics Engineering Polytechnic Institute of Surabaya, Indonesia); Novian Fajar Satria and Dwi Kurnia Basuki (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 02
Location : Room III
Moderator : Dr. Mike Yuliana
Date : Wednesday, September 29th 2021
Track : Telecommunication Engineering Technology
Topic : IES-ETA 7

No	Time	Paper ID	Paper Title	Authors
1	15.45 – 16.00	1570749442	Implementation of Fuzzy Tsukamoto Algorithm on Smart Node Sensors for Air Quality Monitoring	Nurul Istiqomah, Mike Yuliana and Tri Budi Santoso (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	16.00 – 16.15	1570750223	Design of Covid-19 Tracing System based on Bluetooth Low Energy	Mochammad Fahmi Ali, Mochammad Zen Samsono Hadi and Rahardhita Sudibyo (Politeknik Elektronika Negeri Surabaya, Indonesia); Hendy Briantoro (Okayama University, Japan)
3	16.15 – 16.30	1570750638	Gender Classification Based Speaker's Voice using YIN Algorithm and MFCC	Mirza Ardiana, Titon Dutono and Tri Budi Santoso (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	16.30 – 16.45	1570751043	An Improved Indoor RSSI Based Positioning System Using Kalman Filter and MultiQuad Algorithm	Rafina Destiarti Ainul (University of Surabaya, Indonesia); Susilo Wibowo, Djuwari Djuwari and Martin Siswanto (Universitas Surabaya, Indonesia)
5	16.45 – 17.00	1570751188	Design and Implementation of Smartphone-Controlled Programmable Audio Equalizer	Andi Mei Prasetyo Isworo (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia); Ardik Wijayanto, Hary Oktavianto (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 02
Location : Ballroom #1
Moderator : Dr. M. Agus Zainuddin
Date : Wednesday, September 29th 2021
Track : Computational Intelligence
Topic : IES-KCIC 2

No	Time	Paper ID	Paper Title	Authors
1	15.45 – 16.00	1570739329	Comparison of Optical Flow Methods: Study About Left Ventricular Tracking in Multi View Echocardiographic Images	Mohamad Walid Asyhari (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia); Riyanto Sigit and Bima Sena Bayu Dewantara (Politeknik Elektronika Negeri Surabaya, Indonesia); Anwar Anwar (Kementerian Ketenagakerjaan, Indonesia)
2	16.00 – 16.15	1570748654	Emotion Recognition from Speech using Convolutional Neural Network and Combination of Four Speech Features	Yulistia Khoirotul Aini, Tri Budi Santoso and Titon Dutono (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	16.15 – 16.30	1570748680	Blood Cells Classification for Identification of Acute Lymphoblastic Leukemia on Microscopic Images Using Image Processing	Shelly Oktia Heriawati, Tri Harsono and Mochamad Mobed Bachtiar (Politeknik Elektronika Negeri Surabaya, Indonesia); Yetti Hernaningsih (Dr Soetomo General Academic Hospital, Indonesia)
4	16.30 – 16.45	1570749675	Employing Machine Learning with Optimized SVM Parameter to Detect Water Pipe Leakage	Kurniawan Saputra (Politeknik Elektronika Negeri Surabaya, Indonesia); M. Udin Harun Al Rasyid (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Mochammad Zen Samsono Hadi (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	16.45 – 17.00	1570750029	Automatic Detection of Retinal Diseases in Optical Coherence Tomography Images using Convolutional Neural Network	Arinal Haq, Arna Fariza and Nana Ramadijanti (Politeknik Elektronika Negeri Surabaya, Indonesia)

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Session : Parallel Session 02
Location : Ballroom #3
Moderator : Dr. Idris Winarno
Date : Wednesday, September 29th 2021
Track : Applied-Computing Sciences
Topic : IES-KCIC 3

No	Time	Paper ID	Paper Title	Authors
1	15.45 – 16.00	1570732458	Improving the accuracy of predicting disease risk scores using SOM clustering based on noisy feature	Endang Sri Rahayu (Institut Teknologi Sepuluh Nopember & Universitas Jayabaya, Indonesia); Eko Mulyanto Yuniarno (Institut Teknologi Sepuluh November, Indonesia); I Ketut Eddy Purnama (Institut Teknologi Sepuluh Nopember, Indonesia); Mauridhi Hery Purnomo (Institut of Technology Sepuluh Nopember, Indonesia)
2	16.00 – 16.15	1570732557	Identifying Precautionary Measures for High-Risk Disease from Doctor's Answer Text Using LDA	Safitri Juanita (Institut Teknologi Sepuluh Nopember, Indonesia & Universitas Budi Luhur, Indonesia); Diana Purwitasari and I Ketut Eddy Purnama (Institut Teknologi Sepuluh Nopember, Indonesia); Mauridhi Hery Purnomo (Institut of Technology Sepuluh Nopember, Indonesia)
3	16.15 – 16.30	1570732851	Development of Sandbox English Conversation Training Applications with Atomic Design	Reza Fauzi Augusdi (Politeknik Elektronika Negeri Surabaya, Indonesia); Andhik Ampuh Yunanto (Politeknik Elektronika Negeri Surabaya & Institut Teknologi Sepuluh Nopember, Indonesia); Desy Intan Permatasari (Politeknik Elektronika Negeri Surabaya, Indonesia); Aliv Faizal Muhammad (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia)

No	Time	Paper ID	Paper Title	Authors
4	16.30 – 16.45	1570739601	Public Perception of COVID-19 Vaccine by Tweet Sentiment Analysis	Xuanzhou Yang (Musashino University, Japan); Virach Sornlertlamvanich (Thammasat University, Japan & Musashino University, Japan)
5	16.45 – 17.00	1570745792	A Heterogeneous Hybrid Cloud Storage Service Using Storage Gateway with Transfer Acceleration	Jamal Abdul Nasyir and Idris Winarno (Politeknik Elektronika Negeri Surabaya, Indonesia); M. Udin Harun Al Rasyid (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)

Session : Parallel Session 03
Location : Room I
Moderator : Dr. Prima Kristalina
Date : Thursday, September 30th 2021
Track : Telecommunication Engineering Technology
Topic : IES-ETA 8

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570751223	Implementation of RSSI Generated Channel Probing for Air Quality Monitoring System Based on LoRaWAN	Farel Juliansyah, Mochammad Zen Samsono Hadi and Mike Yuliana (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	09.15 – 09.30	1570751794	Key Agreement Algorithm for V2I Communication Based on Differential Technique	Rachmadani Yusuf Pratama (Politeknik Elektronika Negeri Surabaya & Nexwave, Indonesia); Mike Yuliana (Politeknik Elektronika Negeri Surabaya, Indonesia); Aries Pratiarso (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)
3	09.30 – 09.45	1570751861	Particle Swarm Optimization Based UHF Band Rectangular Loop Antenna for Unmanned Aerial Vehicle Application	Mohamad Ridwan (Politeknik Elektronika Negeri Surabaya & Institut Teknologi Sepuluh Nopember, Indonesia); Farida Gamar and Maretha Ruswiansari (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	09.45 – 10.00	1570736189	An Implementation of Secure Vehicle-to-Vehicle Communication Using Shared Key Generation with Kano Method	Amang Sudarsono (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Mike Yuliana (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 03
Location : Room II
Moderator : Dr. Reesa Akbar
Date : Thursday, September 30th 2021
Track : Robotics Technology and Control Systems
Topic : IES-ETA 9

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570750826	Improvement of the Processing Speed of The Robot's Vision System Using Robot Operating System	Erna Alfi Nurrohmah, Iwan Kurnianto Wibowo, Mochamad Mobed Bachtiar and Muhammad Mukhtarul Lathief (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	09.15 – 09.30	1570750884	A Development of Mobile Robot Based on ROS2 for Navigation Application	Phuwanat Phueakthong and Jittima Varagul (Suranaree University of Technology, Thailand)
3	09.30 – 09.45	1570750917	Walking Gait Learning for T-FLoW Humanoid Robot Using Rule-Based Learning	Faiz Ulurrasyadi (PENS, Indonesia); Raden Sanggar Dewanto (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS), Indonesia); Ali Ridho Barakbah (Politeknik Elektronika Negeri Surabaya, Indonesia); Dadet Pramadihanto (PENS, Indonesia)
4	09.45 – 10.00	1570751038	Quadruped Robot Balance Control For Stair Climbing Based On Fuzzy Logic	Alvin Teguh Budi Antok, Adytia Darmawan (Politeknik Elektronika Negeri Surabaya, Indonesia); Ali Husein Alasiry, Hendhi Hermawan (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Aldifa Julian and Ibnu Kresno Wibowo (Politeknik Elektronika Negeri Surabaya); Eko Henfri Binugroho, Bayu Sandi Marta and Andre Faqih Ilham Suparman (Politeknik Elektronika Negeri Surabaya, Indonesia)

No	Time	Paper ID	Paper Title	Authors
5	10.00 – 10.15	1570751094	Implementation of IMU-based Balanced Motion using ROS for EROS Humanoid Soccer Robot	Muhammad Yahya Indranuddin Muhammad Yahya Indranuddin and Anhar Risnumawan (Politeknik Elektronika Negeri Surabaya, Indonesia); Eru Puspita, Ali Husein Alasiry, Choirul Anwar Maulana and Rizky Alfadin (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 03
Location : Room III
Moderator : Dr. Setiawardhana
Date : Thursday, September 30th 2021
Track : Robotics Technology and Control Systems
Topic : IES-ETA 10

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570751136	FLoW-Vision: Object Recognition and Pose Estimation System based on Three-Dimensional (3D) Computer Vision	Vardyansyah Cahya Pratama Harsetya Putra (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS) & Robotics and Intelligent System Center (RoISC), Indonesia); Kevin Ilham Apriandy (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS) & EEPIS Robotics Research Centre (ER2C), Indonesia); Dadet Pramadihanto and Ali Ridho Barakbah (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	09.15 – 09.30	1570751183	Walking Trajectory Control for Humanoid Dancing Robot ERISA based on Field Guardrail	Prishandy Hamami Amrulloh, Ali Husein Alasiry and Eko Henfri Binugroho (Politeknik Elektronika Negeri Surabaya, Indonesia); Ardik Wijayanto, Novian Fajar Satria and Dwi Kurnia Basuki (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	09.30 – 09.45	1570751979	Position and Orientation Control of Three Wheels Swerve Drive Mobile Robot Platform	Eko Henfri Binugroho and Yudha Sadewa (Politeknik Elektronika Negeri Surabaya, Indonesia); Prishandy Hamami Amrulloh and Rahardhita Sudibyo (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	09.45 – 10.00	1570752184	Wall Following and Obstacle Avoidance Control in Roisc-v1.0 (Robotic Disinfectant) using Behavior Based Control	Yudha Sadewa and Eko Henfri Binugroho (Politeknik Elektronika Negeri Surabaya, Indonesia); Dadet Pramadihanto, Achmad Fauzi and Agung Purwanto (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 03
Location : Room IV
Moderator : Dr. Tita Karlita
Date : Thursday, September 30th 2021
Track : Computational Intelligence
Topic : IES-KCIC 4

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570750627	Mobile Based Offline Handwritten Signature Forgery Identification using Convolutional Neural Network	Lu'lu'il Ayunin Fakhiroh, Arna Fariza and Arif Basofi (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	09.15 – 09.30	1570750974	Smart Odontogram: Dental Diagnosis of Patients Using Deep Learning	Excel Daris Fadhillah, Pravasta Caraka Bramastagiri, Riyanto Sigit, Sritrusta Sukaridhoto and Bima Sena Bayu Dewantara (Politeknik Elektronika Negeri Surabaya, Indonesia); Arya Brahmanta (Universitas HangTuah Surabaya, Indonesia)
3	09.30 – 09.45	1570750977	Intersection Cylindrical Feature Recognition Algorithm for Counterbore and Countersink Geometry Application	Yogi Muldani Hendrawan (Politeknik Manufaktur Bandung); Rian Muttaqin, Andri Pratama and Herman Budi Harja (Politeknik Manufaktur Bandung, Indonesia); M. Udin Harun Al Rasyid and Idris Winarno (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	09.45 – 10.00	1570751002	Recognition of Food Material and Measurement of Quality using YOLO and WLD-SVM	Bima Sena Bayu Dewantara, Azifah Devy, Mochamad Mobed Bachtiar and Setiawardhana Setiawardhana (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	10.00 – 10.15	1570751241	Multi-Class Image Classification Based on MobileNetV2 for Detecting the Proper Use of Face Mask	Rika Rokhana (Politeknik Elektronika Negeri Surabaya, Indonesia); Wiwiet Herulambang (Universitas Bhayangkara Surabaya, Indonesia); Rarasmaya Indraswari (Institut Teknologi Sepuluh Nopember, Indonesia)

Session : Parallel Session 03
Location : Room V
Moderator : Dr. Rika Rohana
Date : Thursday, September 30th 2021
Track : Intelligent Multimedia Systems
Topic : IES-KCIC 5

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570747989	Design And Development of Human Anatomy Learning Platform for Medical Students Based On Augmented Intelligence Technology	Evianita Dewi Fajrianti and Sritrusta Sukaridhoto (Politeknik Elektronika Negeri Surabaya, Indonesia); M. Udin Harun Al Rasyid (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Rizqi Putri Nourma Budiarti (Universitas Nahdlatul Ulama Surabaya, Indonesia); Ilham Achmad Al Hafidz and Naufal Adi Satrio (Politeknik Elektronika Negeri Surabaya, Indonesia); Ardiman Firmanda (Politeknik Elektronika Negeri Surabaya & Politeknik Negeri Batam, Indonesia)
2	09.15 – 09.30	1570749355	Animation of Mathematics Learning For Vocational High School About Geometry Transformation Using Participatory Design	Elisa Willy Santoso, Widi Sarinastiti and Irma Wulandari (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	09.30 – 09.45	1570749426	PIECES Framework Method To Measure The Effectiveness Of Obesity Explainer Animation Videos	Zakiyyatul Miskiyyah (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia); Widi Sarinastiti and Sritrusta Sukaridhoto (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	09.45 – 10.00	1570750630	A Color and Composition-based Image Retrieval System by Image-Query Drawing Method with Color-Impression Database	Himawari Otsuka, Yasuhiro Hayashi and Yasushi Kiyoki (Musashino University, Japan)

No	Time	Paper ID	Paper Title	Authors
5	10.00 – 10.15	1570750850	Design of Collaborative WebXR for Medical Learning Platform	Ilham Achmad Al Hafidz and Sritrusta Sukaridhoto (Politeknik Elektronika Negeri Surabaya, Indonesia); M. Udin Harun Al Rasyid (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Rizqi Putri Nourma Budiarti, Rachma Rizqina Mardhotillah and Rizki Amalia (Universitas Nahdlatul Ulama Surabaya, Indonesia); Evianita Dewi Fajrianti and Naufal Adi Satrio (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 03
Location : Ballroom #1
Moderator : Dr. Eng. Hary Oktavianto
Date : Thursday, September 30th 2021
Track : Applied-Computing Sciences
Topic : IES-KCIC 6

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570745894	Development of Vulnerable Web Application Based on OWASP API Security Risks	Muhammad Idris (Politeknik Negeri Batam, Indonesia); Iwan Syarif (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Idris Winarno (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	09.15 – 09.30	1570748970	Classification of Colon Polyp on Endoscopic Image Using Support Vector Machine	Nova Angelia Eriyanti, Riyanto Sigit and Tri Harsono (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	09.30 – 09.45	1570749343	Classification of Brain Tumor on Magnetic Resonance Imaging Using Support Vector Machine	Uswatun Hasanah, Riyanto Sigit and Tri Harsono (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	09.45 – 10.00	1570749762	Data Analytics for Medical Record Data of Covid-19 Patient with Descriptive & Predictive Mining	Alvintha Maharani Hanafiah and Ali Ridho Barakbah (Politeknik Elektronika Negeri Surabaya, Indonesia); Tita Karlita (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia); Tri Hadiah Muliawati (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	10.00 – 10.15	1570749955	Source-Oriented POV Visualization for Multidimensional Analysis of International Conflicts and Terrorist Incidents with 5D World Map System	Shiori Sasaki and Yuto Miyamoto (Musashino University, Japan)

Session : Parallel Session 03
Location : Ballroom #2
Moderator : Riyanto Sigit, Ph.D.
Date : Thursday, September 30th 2021
Track : Applied-Computing Sciences
Topic : IES-KCIC 7

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570749961	Implementation of Liquid Animation Techniques for Developing Renewable Energy Motion Graphics	Anisa Rayinda Sari, Hestiasari Rante and Nu Arini (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	09.15 – 09.30	1570750109	Animated Video Using Duik Bassel Rigging Toolset on Tuberculosis Education	Gallan Romansyah Putra, Hestiasari Rante and Moh Hasbi Assidiqi (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	09.30 – 09.45	1570750199	Formalin Fish Detection System Based on Digital Image Processing	Ika Roikhanah, Tri Harsono and Heny Yuniarti (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	09.45 – 10.00	1570750200	Glaucoma Detection Based on Cup-to-Disc Ratio in Retinal Fundus Image Using Support Vector Machine	Dinda Ayu Yunitasari, Riyanto Sigit and Tri Harsono (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	10.00 – 10.15	1570750231	Animated Company Profile Video Using Puppet Pin Rigging for Character Movement	Winalda Rachmawan, Hestiasari Rante and Muhammad Agus Zainuddin (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 03
Location : Ballroom #3
Moderator : Sritrusta Sukaridhoto, Ph.D.
Date : Thursday, September 30th 2021
Track : Applied-Computing Sciences
Topic : IES-KCIC 8

No	Time	Paper ID	Paper Title	Authors
1	09.00 - 09.15	1570750646	Portable Device-Based Medical Service System for DICOM To PNG Conversion	Yudha Dewansyah Putra, Riyanto Sigit and Heny Yuniarti (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	09.15 – 09.30	1570750787	Action Recognition with Spatiotemporal Analysis and Support Vector Machine for Elderly Monitoring System	Mahaputra Ilham Awal, Luqmanul Hakim Iksan, Rizky Zull Fhamy, Dwi Kurnia Basuki and Sritrusta Sukaridhoto (Politeknik Elektronika Negeri Surabaya, Indonesia); Kazuyoshi Wada (Tokyo Metropolitan University, Japan)
3	09.30 – 09.45	1570750840	Media Information of Generalized Anxiety Disorder in Adolescent Through Animation Explainer	Sherina Kusuma Putri and Widi Sarinastiti (Politeknik Elektronika Negeri Surabaya, Indonesia); Citra Murdaningtyas (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia)
4	09.45 – 10.00	1570750889	Vulnerability Mapping of Toddler Pneumonia in East Java, Indonesia, Using the K-medoids Clustering Algorithms	Linda Lailatus Sa'idah (Politeknik Elektonika Negeri Surabaya, Indonesia); Arif Basofi and Arna Fariza (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	10.00 – 10.15	1570751187	Spatial Mapping of Tubercolusis Vulnerability in Tuban District, Indonesia, Using Hierarchical Clustering	Amalia Kusumaningtyas, Arif Basofi and Arna Fariza (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 04
Location : Room I
Moderator : Dr. Prima Kristalina
Date : Thursday, September 30th 2021
Track : Power Engineering and Energy Technology
Topic : IES-ETA 11

No	Time	Paper ID	Paper Title	Authors
1	10.45 – 11.00	1570732546	Modified Critical Trajectory Algorithm to Determine the Critical Clearing Time for Unbalanced Fault	Isa Hafidz (Institut Teknologi Sepuluh Nopember, Indonesia); Ardyono Priyadi (ITS, Indonesia); Margo Pujiantara and Sjamsjul Anam (Institut Teknologi Sepuluh Nopember, Indonesia); Naoto Yorino (Hiroshima University, Japan); Mauridhi Hery Purnomo (Institut of Technology Sepuluh Nopember, Indonesia)
2	11.00 – 11.15	1570750224	Numerical Study Analysis of The Effect of Trailing Edge Thickness of Low-Pressure Steam Turbine Stator on Steam Condensation	Gilang Muhammad, Lohdy Diana and Achmad Bahrul Ulum (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	11.15 – 11.30	1570750426	Thermal Characteristics of Tube Economizer with Serrated Fin	Aldila Sukarno Putri, Rif'ah Amalia (Politeknik Elektronika Negeri Surabaya, Indonesia); Teguh Hady Ariwibowo, Fifi Hesty (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	11.30 – 11.45	1570750664	Design of Steam Power Plant Condenser Machine Maintenance Using RCM (Reliability Centered Maintenance) Methods with RCPS Implementation	Alif Wahyu Syahnanda and Prima Dewi Permatasari (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia); Hendrik Elvian Gayuh Prasetya (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	11.45 – 12.00	1570750844	Experimental Analysis of Artificial Equilateral Triangle Solar Air Heater Using Zig-zag Channel	Arrad Ghani Safitra, Lohdy Diana, Fifi Hesty and Cantika Putri Rahayu (Politeknik Elektronika Negeri Surabaya, Indonesia)

Session : Parallel Session 04
Location : Room II
Moderator : Dr. Reesa Akbar
Date : Thursday, September 30th 2021
Track : Electronics Systems and Electrics Technology
Topic : IES-ETA 12

No	Time	Paper ID	Paper Title	Authors
1	10.45 – 11.00	1570751224	Numerical Analysis of a Shell and Tube Heat Exchanger Using Computational Fluid Dynamics Software	Rudi Gustian Simangunsong (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Rif'ah Amalia (Politeknik Elektronika Negeri Surabaya, Indonesia); Dendy Satrio (Institut Teknologi Sepuluh Nopember, Indonesia)
2	11.00 – 11.15	1570739178	Early Detection of Cow Pregnancy Based on Volume Control of Cow Urine Using Fuzzy Logic Method	Novita Isnainin Darma Arshad (Politeknik Elektronika Negeri Surabaya, Indonesia); Kemalasari M Syah (Indonesia, Indonesia); Eru Puspita (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia)
3	11.15 – 11.30	1570749515	Electronic Speed Controller with Fuzzy Logic and Load Cell for Electric Skateboard	Zainul Abidin and Taufik Soesilo (Universitas Brawijaya, Indonesia); Rusmi Ambarwati (University of Brawijaya, Indonesia)
4	11.30 – 11.45	1570749829	Covid-19 Symptom Detection System in Public Area using Fuzzy Logic Method	Abdillah S. Nursam (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Mochammad Zen Samsono Hadi (Politeknik Elektronika Negeri Surabaya, Indonesia); Prima Kristalina (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)

Session : Parallel Session 04
Location : Room III
Moderator : Dr. Setiawardhana
Date : Thursday, September 30th 2021
Track : Telecommunication Engineering Technology
Topic : IES-ETA 13

No	Time	Paper ID	Paper Title	Authors
1	10.45 – 11.00	1570739030	High Gain Microstrip Square Patch Array Antenna 4 x 4 Elements 2.3 GHz for 5G Communication in Indonesia	Budi Aswoyo (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia); Anggara H Putra (Trenggalek, Indonesia)
2	11.00 – 11.15	1570739039	Application of Joint PAPR Reduction and Predistortion Technique in AF Relaying System with Relay Selection Strategy	Annisa Anggun Puspitasari, Ummi Ainun Nadhiroh, Mareta Dwi Nor Habibah and Galuh Setya Palupi (Politeknik Elektronika Negeri Surabaya, Indonesia); Mohamad Ridwan, Yoedy Moegiharto (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	11.15 – 11.30	1570739094	Performance of a Joint PAPR Reduction Clipping and Filtering (CF) Scheme and Predistortion Techniques in Amplify and Forward (AF) Relaying System with Relay Selection Strategy	Mareta Dwi Nor Habibah, Galuh Setya Palupi, Annisa Anggun Puspitasari and Ummi Ainun Nadhiroh (Politeknik Elektronika Negeri Surabaya, Indonesia); Mohamad Ridwan, Yoedy Moegiharto (Politeknik Elektronika Negeri Surabaya, Indonesia)
4	11.30 – 11.45	1570739593	Analysis of Key Generation Which Extracted from RSS for Handover System in V2I Communication	Isna Yaumirrahma Saniyyah and Mike Yuliana (Politeknik Elektronika Negeri Surabaya, Indonesia); Amang Sudarsono (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)
5	11.45 – 12.00	1570750023	Students Trajectory Pattern Finding Scheme Based on RSSI Geolocation as a Part of Smart Campus	Restry Ridha Hastari and Mike Yuliana (Politeknik Elektronika Negeri Surabaya, Indonesia); Prima Kristalina (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)

Session : Parallel Session 04
Location : Room IV
Moderator : Dr. Tita Karlita
Date : Thursday, September 30th 2021
Track : Telecommunication Engineering Technology
Topic : IES-ETA 14

No	Time	Paper ID	Paper Title	Authors
1	10.45 – 11.00	1570751955	Network Performance Evaluation of Container Server-based LoRaWAN IoT for Field Worker Monitoring System	Gerda Iswari, Rahardhita Sudibyo and Haryadi Amran Darwito (Politeknik Elektronika Negeri Surabaya, Indonesia); Md Manowarul Islam (Jagannath University, India)
2	11.00 – 11.15	1570751957	Design of Weight and Height Measurement System Based Wireless Communication	Sifaul Warohmatulilla (Politeknik Elektronika Negeri Surabaya, Indonesia); Haniah Mahmudah (EEPIS, Indonesia); Mochammad Zen Samsono Hadi (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	11.15 – 11.30	1570751970	A Smart Water Reservoir Control System for IoT Smart Environment	Farah Maulidina, Haryadi Amran Darwito and Rahardhita Sudibyo (Politeknik Elektronika Negeri Surabaya, Indonesia); Mohamad Ridwan (Politeknik Elektronika Negeri Surabaya & Institut Teknologi Sepuluh Nopember, Indonesia)
4	11.30 – 11.45	1570751110	Wireless Sensor Network for Battery Monitoring Uses Head Clustering Method and Sleep Scheduling	Muhammad Adamu Islam, Mochammad Zen Samsono Hadi and Rahardhita Sudibyo (Politeknik Elektronika Negeri Surabaya, Indonesia)
5	11.45 – 12.00	1570751104	Energy Efficiency with Sleep Schedule for SAR Team Communication	Mohammad Alfi Rizzi and Mochammad Zen Samsono Hadi (Politeknik Elektronika Negeri Surabaya, Indonesia); Prima Kristalina (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)

Session : Parallel Session 04
Location : Room V
Moderator : Dr. Rika Rohana
Date : Thursday, September 30th 2021
Track : Robotics Technology and Control Systems
Topic : IES-ETA 15

No	Time	Paper ID	Paper Title	Authors
1	10.45 – 11.00	1570730971	Simulation of Robot Swarm Cooperation using V-REP Simulator: Case Study Mobile Trash Bin Robot	Bima Sena Bayu Dewantara, Setiawardhana Setiawardhana and Bayu Sandi Marta (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	11.00 – 11.15	1570744399	3D Object Detection and Recognition Based on RGBD Images for Healthcare Robot	Ikmalil Birri (Electronic Engineering Polytechnic Institute of Surabaya (EEPIS) & Robotics and Intelligence System Center (RoISC), Indonesia); Bima Sena Bayu Dewantara (Politeknik Elektronika Negeri Surabaya, Indonesia); Dadet Pramadihanto (PENS, Indonesia)
3	11.15 – 11.30	1570750547	Development of Visual Data Acquisition Systems of Household Objects	Muhammad Attamimi (Institut Teknologi Sepuluh Nopember, Indonesia); Kelvin Liusiani (Institute Technology of Sepuluh Nopember, Indonesia); Astria Nur Irfansyah, Djoko Purwanto and Rudy Dikairono (Institut Teknologi Sepuluh Nopember, Indonesia)

Session : Parallel Session 04
Location : Ballroom #1
Moderator : Dr. Eng. Hary Oktavianto
Date : Thursday, September 30th 2021
Track : Computational Intelligence
Topic : IES-KCIC 9

No	Time	Paper ID	Paper Title	Authors
1	10.45 – 11.00	1570740212	BiLSTM-CNN Hyperparameter Optimization for Speech Emotion and Stress Recognition	Agustinus Bimo Gumelar (Institut Teknologi Sepuluh Nopember, Indonesia); Eko Mulyanto Yuniarno (Institut Teknologi Sepuluh November, Indonesia); Derry Pramono Adi (Universitas Narotama, Indonesia); Adri Gabriel Sooai (Universitas Katolik Widya Mandira, Indonesia); Indar Sugiarto (University of Manchester, United Kingdom (Great Britain)); Mauridhi Hery Purnomo (Institut of Technology Sepuluh Nopember, Indonesia)
2	11.00 – 11.15	1570748841	Performance Enhancement of Multi-Camera Handoff Scheme using ANFIS Method	Atik Apprinda Paramita (Politeknik Elektronika Negeri Surabaya, Indonesia); Prima Kristalina (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia); Bima Sena Bayu Dewantara (Politeknik Elektronika Negeri Surabaya, Indonesia)
3	11.15 – 11.30	1570749500	Comparison of Neural Network and Random Forest Classifier Performance on Dragon Fruit Disease	Anita Jaquiline Lado and Adri Gabriel Sooai (Universitas Katolik Widya Mandira, Indonesia); Paulina Aliandu (Widya Mandira Catholic University, Indonesia); Yovinia Siki, Natalia Magdalena Rafu Mamulak, Paskalis Andrianus Nani, Sisilia Mau, Patrisius Batarius, Frengky Tedy, Emerensiana Ngaga, Alfry Aristo Jansen SinlaE and Emiliana Metan Meolbatak (Universitas Katolik Widya Mandira, Indonesia); Yulianti Paula Bria (Monash University, Australia); Nurul Zainal Fanani (Politeknik Negeri Jember, Indonesia); Umi Laili Yuhana and Agustinus Bimo Gumelar (Institut Teknologi Sepuluh Nopember, Indonesia)

No	Time	Paper ID	Paper Title	Authors
4	11.30 – 11.45	1570750880	Monitoring Violations of Social Distancing COVID-19 On Standing Queues with Euclidean Distance Method	Indira Ayu Puspita and Reesa Akbar (Politeknik Elektronika Negeri Surabaya, Indonesia); Arif Irwansyah (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia)

Session : Parallel Session 04
Location : Ballroom #3
Moderator : Sritrusta Sukaridhoto, Ph.D.
Date : Thursday, September 30th 2021
Track : Applied-Computing Sciences
Topic : IES-KCIC 10

No	Time	Paper ID	Paper Title	Authors
1	10.45 – 11.00	1570752016	Design and Implementation of Real-time Pothole Detection using Convolutional Neural Network for IoT Smart Environment	Ilham Dwi Pratama (Politeknik Elektronika Negeri Surabaya, Indonesia); Haniah Mahmudah (EEPIS, Indonesia); Rahardhita Sudibyo (Politeknik Elektronika Negeri Surabaya, Indonesia)
2	11.00 – 11.15	1570748937	Development of Text Classification Based on Difficulty Level in Adaptive Learning System using Convolutional Neural network	Imamah Imamah (Institut of Technology Sepuluh Nopember, Indonesia); Arif Djunaidy and Umi Laili Yuhana (Institut Teknologi Sepuluh Nopember, Indonesia); Mauridhi Hery Purnomo (Institut of Technology Sepuluh Nopember, Indonesia)
3	11.15 – 11.30	1570752117	Distributed Online Computer-Based Test System for English Exam	Muhajirin Ida Ilyas (Politeknik Elektronika Negeri Surabaya & PT. Digital Entropy Venture, Indonesia); Wiratmoko Yuwono, Idris Winarno and Akhmad Alimudin (Politeknik Elektronika Negeri Surabaya, Indonesia)

Poster Exhibition Session IES 2021

Location: Ballroom #2, Sheraton Hotel

No	Author	Title
1	Andi Afief Akbar Ashariansyah, Nu Rhahida Arini, Achmad Bahrul Ulum	Numerical Analysis of Centrifuge Pump Impellers to Improve the Feedwater Pump Efficiency
2	Anggara Hadhy Putra, Budi Aswoyo	High Gain Microstrip Square Patch Array Antenna 4x4 Elements 2.3 GHz for 5G Communication in Indonesia
3	Dimas Okky Anggriawan, Endro Wahjono, Indhana Sudiharto, Aji Akbar Firdaus, Dianing Novita Nurmala Putri, Anang Budikarso	Identification of Short Duration Voltage Variations Based on Short Time Fourier Transform and Artificial Neural Network
4	Dimas Okky Anggriawan, Mochammad Zulfikar T. Nashrullah, Eka Prasetyono	Mapping Detection of DC Series Arc Fault Based on Fast Fourier Transform
5	Luqmanul Hakim Iksan, Mahaputra Ilham Awal, Rizky Zull Fhamy, Dwi Kurnia Basuki, Sritrusta Sukaridhoto, Kazuyoshi Wada	Action Recognition Platform for Monitoring Elderly Dementia Patients
6	Elisa Willy Santoso, Widi Sarinastiti, Irma Wulandari	Animation of Mathematics Learning for Vocational High School About Geometry Transformation Using Participatory Design
7	Haniah Mahmudah, Okky Puspitorini, Ari Wijayanti, Nur Adi Siswandari	Activity Detection System for Driving Safety Support Intelligent Transportation System
8	Hestiasari Rante, Cahya Miranto	Development of Interactive Virtual Reality Platform for Batik Exhibition
9	Indra Ferdiansyah, Era Purwanto, Arif Sudaryanto, HANAMOTO Tsuyoshi	V/Hz SVPWM Inverter for Speed Control AC Motor Drive
10	Khoirul Anwar, Iwan Kurnianto Wibowo, Bima Sena Bayu Dewantara, Mochamad Mobed Bachtiar, Muhammad Abdul Haq	Multi-Data Sensors Synchronization in Robot Soccer ERSOW
11	Mochamad Mobed Bachtiar, Fernando Ardilla, Abdi Alghifara Felinanda	Simple Communication UAV Using GCS Android Based
12	Moh. Zikky, Kholid Fathoni, Miftakhul Firdaus, Ashafidz Fauzan Dianta	Virtual Reality Simulator for Cardiopulmonary Resuscitation (CPR) as Lifesaving Method in Many Emergencies Patients
13	Nofria Hanafi, Ni'am Tamami, Eko Budi Utomo	Design of Talon V Tail Unmanned Aerial Vehicle Earo PENS for Optimizing Maneuvering of UAV Aircraft on 8 Trajectory Model