

An Analysis on Garbage Removal Process by WSN thorough Global System for Mobile Communication Media

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Abstract

The water transport system was using a scheduling process which arranges locations and routes during running time. It may be analyzed the places which has wastes. A waste caution process was required to give data on the increase of garbage which should be immediately transported. Depend upon these issues, the objective of this study was to analyze the development of an archetype of waste transport process by preceding WSN by Global system for mobile communication. The client process was construct by a radar which was used as a detector for entire garbage, global system of mobile communication module and Arduino small controller. The server process of waste warning transport uses the data base of Gammu, MySQL and PHP. It was identified that the client was capable to give waste information in whole state to the data process server especially at the time of result. The server was capable to demonstrate the output of giving information in the structure of websites. And next, the operator may give the whole information of the waste to be transported instantly to the authority in the way of message from the page of waste transport warning data process.

Key-words: WSN, Waste Transport, Garbage, GSM, ISS, PHP, Environment, Management, IoT.

1. Introduction

The plant cultivation was sought to generate better and more to protect the agriculture at the greatest level on the world [1]. To succeed in the quality process, the plants are irrigated automatically, detected and treated. The operator likes to control and detect the humidity level of soil and also to bring

the nature to the real time process. An output was existed the problems to encounter the way of solution [2]. A process of smart control and remote detecting was a small detector which is assigned to establish automatic wireless control process for greenhouse. This does not obtain be composed of mechanical activator and electrical circuit which are the main technology to provide entire efficiency. Greenhouses are able to provide good detected and controlled environment for the cultivation of plants. Hence the system enhanced and modeled to give energy efficiently [3]. Greenhouse should give through input parameters like humidity of soil, moisture level (%), ratio of light, level of water, carbon di oxide dosage, fire, temperature (C) and rain drops. An automation of wireless greenhouse monitoring and control process was to decrease the consuming of work, time, energy and water [4]. The aim of WSN system was the data processing which was sent to be managed at the processing data center in the way of a server remotely. The processing of data server contains the applications of data system. A data process was a system which gathers information and was processed according to the rules and demands [15-19]. The running WSN communication process was focused to use technology for communication remotely by a module of global system for mobile communication. It was sent through short message service (SMS) [5]. And the standard cellular processes are open and use the SMS services [20-25]. Some methods uses the method of information technique for transmission depend upon the fixed process like leakage of gas data process by short message service communication and transmission of data process from smoke and fire radars to the station of fire data system by global system for mobile communication module [26-31]. The important applications on disaster like flood were a global system for mobile communication depends upon the data process in sending the data of flood height and location. Waste was one of the important application developments that will be analyzed in this paper. It was the growth of the execution of the WSN in the waste management method. The development of this system was unification between the data processing, design of WSN and global system for mobile communication.

2. Literature Survey

This research paper investigates the different strategies developed to focus the IoT and highlights the uses of internet of things and finally provides a general analysis of latest application found with information board over webpages [6]. An overview of the concept for combining client process with internet of things and controls the portrayal point about radar information board and useful examination. This laid the delay evolutions by world 1st trailblazer in making the standard internet of things, high data the useful investigations and implements like sources and norms for making the

application of internet of things [32-37]. To comprehend the vision of IoT, first address different achievements of internet of things which laid in this research. The complexity of high impact executioner process and world combined effort are needed [38-43]. The methods are given in this paper to give more information about internet of things. It actualize for shrewd place to have link with an internet of things.

In smart cities, the garbage management system by internet of things was used to clean the waste. The level of garbage in the dustbins was calculated by the process of ultrasonic radars and transferred through the global system for mobile communication to the control place [7]. The radar gadget was interfaced with global system for mobile communication by Arduino small controller. An interface was constructed to find the garbage compared data for different marked places. This will guide in the powerful management of gathered garbage [8]. Detector level contains IR radar which was used to calculate the garbage level in the dustbin. An output of detector level was given to small controller. 4 IR radars are used to display the different quantity of the garbage volume gathered in the dustbin which was placed in the public place [9]. If the dustbin was filled to the small controller, then transfer the SMS through the module of global system of mobile communication to the control room [38-45]. This room was placed at the receiver where all the process is managed [10,11]. A dustbin was interfaced along with the small controller depend upon the process of IR radars with a main gadgets demonstrating present status of garbage through mobile browser along with a Wi-Fi tab. Therefore the status of the page was altered [46-54]. Thus, energies and human capital with the vision of reinforcing of a smart place was decreased. The paper analyzed a creative DSS for powerful smart cities collection of waste [55-61]. The structure executes the design for sharing information especially in the truck driver to perform active optimization of route and waste collection. The gadget controls unreachable places inside the smart city where waste was collected ineffectively. Cameras for investigation are downloaded to note the disturbed places and give evidence to authority. The waste system thinks to give the smart city to the people along with high QoS [12]. Mansai examined design of garbage system by IOT for smart areas. The waste things level in the dustbin was monitored in the examined system with the help of radar and it will continuously communicate along with the verified room through the module of global system of mobile communication. Small controller was used to link the global system for mobile gadget radar process [13]. The beginning level of radar will stimulated the modem of global system of mobile communication that will aware the official continuously till the garbage was compressed in the bin. When the bin was compressed, the dustbin may be used to provide the SMS by this way. It contains of a GPRS and global system of mobile communication modem with high quality interfaces like USB, callow other gadgets to connect and RS-234. The radar was used to place depth of

waste that occupied at different intervals of time. There are different dustbins placed by the campus or city, these bins are located with very low expense fixed gadgets which support monitor the garbage level in the dustbin and different ID was provided for all bin in the town to create it simple to found the dustbins are full. The component of this project was classified into 2 methods. They are receiver and transmitter. But here the radar, 8123 small controllers and RF transmitter was used that are fixed to the dustbin. The radar was used in the bin to monitor the garbage level in the dustbin that was empty or full. The radar feels the content of dustbins and delivers the signal or the information to the 8123-small controller [14].

The ARM8, GSM and Zigbee are analyzed in this process to make the unified structure for distant management of the dustbins. The radar was placed on community areas in the local dustbins. If the waste hits the level of radar, then the ARM8 regulator will obtain the connected indication. The detector can give the waste to truck driver a suggestion to that dustbin was empty or filled. It also explains the process of SMART DUSTBIN design to the authority of the whole cities waste management system [62-66]. A network radar allowed this smart bin associated by the cellular connection generate many information that was visualized and analyzed in original time to profit insights into the waste all over the city. The main focus of this research was to help many studies about the problems of waste board. Prajakta et al [13]. recommended the saving of garbage designs changed with the model of information collection which subjected to global system of mobile communication module and the arrangement of photo. The method uses a camera which was located at each places where waste was collected close a radar located at the base of the waste.

3. Methods

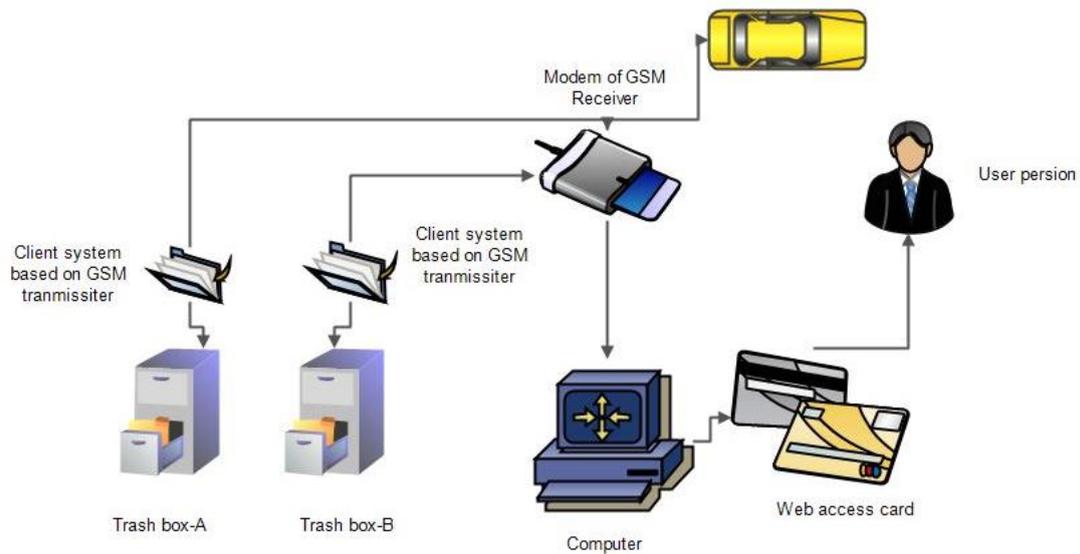
The method for developing data for waste transport depends upon the WSN that was created in many levels. They are system design and system analysis. The structure study focus to create a method portrayal which would be create from the starting period. The model of system focuses to give an outlook of the figure of the whole process in the method of elements.

3.1. Analysis of System

Figure 1 shows the construction of the analysis of system. It begins with the description of data process for aware the waste transport. Location B and A will provide an information or signal to the customer system depend upon the transmitter of global system for mobile communication and the

customer sends information through Short Messaging Service to the RECEIVER MODEM on the ISS. Form the system, the operator may able to realize the entire setting information of the garbage information by a mobile network. The operator creates an short messaging service providing action by the IS which was accessed to the authority.

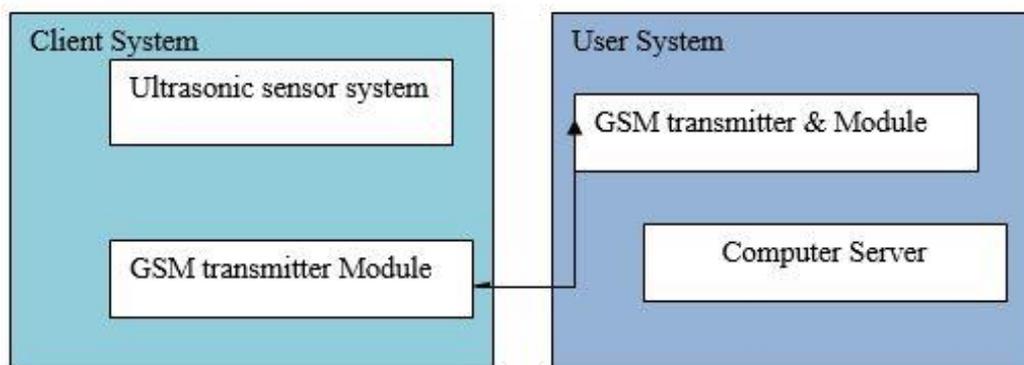
Figure 1 - Warning indication of System of waste transport



3.2. System Model

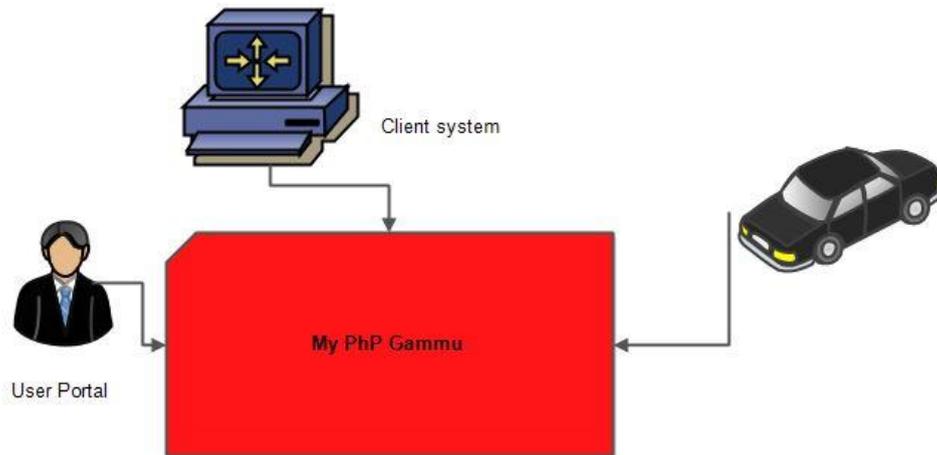
Figure 2 shows the diagram of data process for aware the transport who collects waste. For this process, WSN was used and the diagram was required which explains the element of the garabage. Begin with a client process which has a device as input restrictor, the Arduino small controller as the dispensation restrictor and the result block contains Global system for mobile communication and a PC as a data dispensation method wedge.

Figure 2 - Schematic Diagram of information system for warning waste transport



There are different elements which run data process for aware the transport of garbage by a server in computer. Figure 3 illustrates the element structure stored in the server which was PHP engine, web server, MYSQL as the data base and Gammu as the Short messaging service from the customer. Form the net server of Apache, the worker may easily operate the process. Gammu was used to gain message from the customer and transport the message from the data process to the vehicle authority.

Figure 3 - Detail Explanation of components of server for warning of waste transport



4. Results and Discussions

This paper examined a prototype depend upon the analysis of system and design of system. This was revealed in the fig. 4. The method displays that the archetype of client may transfer data to the important operator and data to the waste vehicle authority by the way of SMS.

Figure 4 - Concentrating results capturing WWT

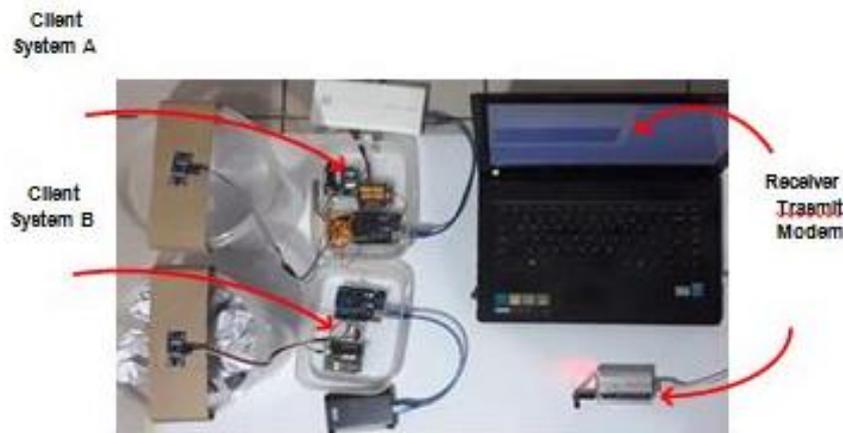
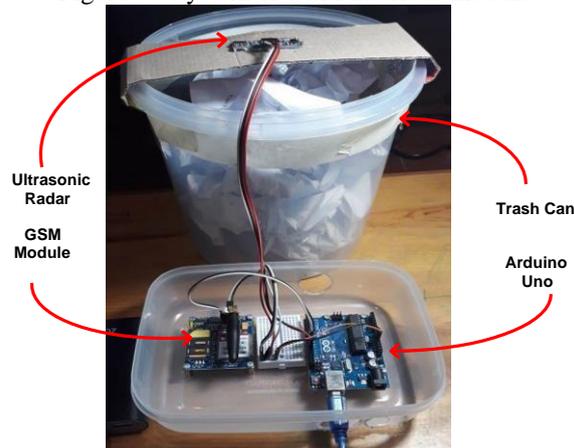


Fig 5 shows the prototype of client method. The client uses the ultrasonic sensor located above the model structure of the waste. The radar was linked to the Arduino small controller. Information was processed through the small controller which was send to the global system for mobile communication to the waste transport server.

Figure 5 - System of GSM interface module



The outputs of sending the condition of entire garbage information are gained by the operator and displayed on the border of data process for waste transport in the way of network. This was shown in the figure 6. There are 4 columns in the web page. They are shipping form from message to the officer, place, status of garbage and time &date.

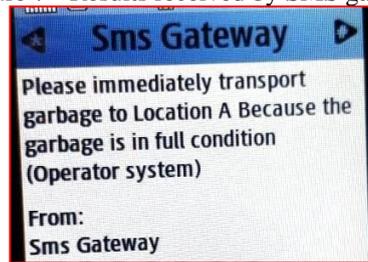
Figure 6 - System of data interface of WWT

The Garbage Transport Warning Information System						
Faculty of Engineering - Universitas Serambi Mekkah						
Menu : Home Logout	Monitoring The Garbage Transport Warning Information System					
	No	Date	Time	Location	Garbage Status	Form SMS
	1	2018-08-09	09:35:00	Location A	GARBAGE FULL	Send SMS
2	2018-08-09	09:43:00	Location B	GARBAGE FULL	Send SMS	

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The structure of short messaging service was sent by the website from the data process threatening the waste transfer through the operator to the officer of waster transport by code messages. Figure 7 shows that code message clearly.

Figure 7 - Results received by SMS gateway



5. Conclusions

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References

- P. Suresh, J. Vijay Daniel, R.H. Aswathy, Dr. V. Parthasarathy, A state of the art reviews on The Internet of Things (IOT International Conference on Science, *Engineering and Management Research (ICSEMR 2014)*).
- Arkady Zaslavsky, Dimitrios Georgakopoulos, Internet of Things: Challenges and State-of-the-art Solutions in Internet-scale Radar Information Management and Mobile Analytics *16th IEEE International Conference on Mobile Data Management*, 2015.
- S. Murugesan, M.V. Suganyadevi, Hybrid renewable energy parameter monitoring and control of smart street light using IoT, *Int. J. Sci. Technol. Res. (IJSTR)* 8 (10) (2019) 645–651, ISSN: 2277-8616.
- S.S. Navghane, M.S. Killedar, Dr. V.M. Rohokale, *IoT Based Garbage and Waste Collection Bin*, May 2016.
- L.A. Guerrero, G. Maas, W. Hogland, Solid waste management challenges for cities in developing countries, *J. Waste Manage*, 2013.

K. Monika, Rao Nikitha, S.B. Prapulla, G. Shobha, *Smart dustbin-an efficient garbage monitoring system*, 2016.

Amr El-Mougy, Mohamed Ibnkahla, Lobna Hegazy, Software-defined wireless network architectures for the internet-of-things, *in: 40th Annual IEEE Conference on Local Computer Networks*, 2015, pp. 804–811.

Javier G. Monroy, Javier Gonzalez, Carlos Sanchez, Monitoring household garbage odors in urban areas through distribution maps, *Sens. IEEE* (2014).

Dr. Debmalya Bhattacharya, Miss Waikhom Reshmi, Miss Kiruthika Priya, Miss. Banu Priya, Analysis and design of an embedded environment informer for waste disposal cleaning, *in: International Conference on Green Computing, Communication and Conservation of Energy*, 2013.

Vikrant Bhor, Pankaj Morajkar, Maheshwar Gurav, Dishant Pandya, Smart garbage management system, *Int. J. Eng. Res. Technol. (IJERT)* 4(03) (March 2015) ISSN:2278-0181 IJERTV4IS031175.

Insung Hong, Sunghoi Park, Beomseok Lee, Jaekeun Lee, DaebeomJeong, Sehyun Park, IoT-based smart garbage system for efficient food waste management. *Sci. World J.* 2014 (2014), Article ID 646953.

Chaitanya More, Darshan Mestry, Parag Kedia, Reshma, Efficient garbage collection using Wsn, *Int. J. Res. Eng. Technol.* eISSN: 2319 -1163- pISSN: 2321-7308., Volume: 05 Issue: 01- Jan-2016.

Satria D Yana S Munadi R and Syahreza S, 2017 Prototype of Google Maps-Based Flood Monitoring System Using Arduino and GSM Module *Int. Res. J. Eng. Technol.* 4, 10 p. 1044– 1047.

Satria D Yana S Munadi R and Syahreza S, 2018 Design of Information Monitoring System Flood Based Internet of Things (IoT) in *Malikussaleh International Conference on Multidisciplinary Studies (MICoMS 2017)* p. 629– 639

Ganesh Babu Loganathan, Praveen M., Jamuna Rani D., “Intelligent classification technique for breast cancer classification using digital image processing approach” *IEEE Xplore Digital Library* 2019, Pp.1-6.

M. Viswanathan, Ganesh Babu Loganathan, and S. Srinivasan, “IKP based biometric authentication using artificial neural network”, *AIP Conference Proceedings* (2020), Volume 2271, Issue 1, pp 030030.

Mohammed Abdulghani Taha and Ganesh Babu Loganathan, “Hybrid algorithms for spectral noise removal in hyper spectral images” *AIP Conference Proceedings* (2020), Volume 2271, Issue 1, pp 030013.

Dr. Idris Hadi Salih, Ganesh Babu Loganathan, ”Induction motor fault monitoring and fault classification using deep learning probabilistic neural network” *Solid State Technology*(2020), Volume 63, Issue 6, PP No. 2196-2213.

Ganesh Babu Loganathan “Design and analysis of high gain Re Boost-Luo converter for high power DC application”, *Materials Today: Proceedings*(2020), Volume 33, Part 1, PP 13-22.

Ganesh Babu Loganathan, Dr.E.Mohan, R.Siva Kumar, “ Iot Based Water And Soil Quality Monitoring System”, *International Journal of Mechanical Engineering and Technology (IJMET)* (2019), Vol.10 Issue No.2, P.No. 537-541.

Suganthi K, Idris Hadi Salih, Ganesh Babu Loganathan, and Sundararaman K, “A Single Switch Bipolar Triple Output Converter with Fuzzy Control”, *International Journal of Advanced Science and Technology*, (2020), Vol. 29, No. 5, (2020), P.No.. 2386 – 2400.

Ganesh Babu Loganathan, "Can Based Automated Vehicle Security System", *International Journal of Mechanical Engineering and Technology (IJMET)* (2019), Vol.10 Issue No.07, P.No. 46-51.

B.K. Patle, Ganesh Babu L, Anish Pandey, D.R.K. Parhi, A. Jagadeesh, A review: *On path planning strategies for navigation of mobile robot, Defence Technology*, Volume 15, Issue 4, August 2019, Pages 582-606.

Dr.A.Senthil Kumar, Dr. Venmathi A R, L. Ganesh Babu, Dr.G. Suresh, "Smart Agriculture Robo With Leaf Diseases Detection Using IOT", *European Journal of Molecular & Clinical Medicine*, Volume 07, Issue 09, PP 2462-2469.

Ganesh Babu L 2019 Influence of benzoyl chloride treatment on the tribological characteristics of Cyperus pangorei fibers based nonasbestos brake friction composites Mater. Res. Express 7 015303.

Manoharan S, Sai Krishnan G, Babu L G, Vijay R and Singaravelu D L 2019 Synergistic effect of red mud-iron sulfide particles on faderecovery characteristics of non-asbestos organic brake friction composites Mater. Res. Express 6 105311.

Manoharan S, Shihab A I, Alemdar A S A, Ganesh Babu L, Vijay R and Lenin Singaravelu D 2019 Influence of recycled basalt-aramid fibres integration on the mechanical and thermal properties of brake friction composites Material Research Express 6 115310.

Qaysar S.Mahdi, "Prediction of Mobile Radio Wave Propagation in Complex Topography", *Eurasian Journal of Science & Engineering*, Volume 4, Issue 1 (Special Issue); September, 2018, PP 49-55.

Qaysar S. Mahd, "Survivability Analysis of GSM Network Systems", *Eurasian Journal of Science & Engineering*, Volume 3, Issue 3; June, 2018, PP 113-123.

Qaysar S. Mahdi, "Comparison Study of Multi-Beams Radar under Different Radar Cross Section and Different Transmitting Frequency", *Eurasian Journal of Science & Engineering*, Volume 3, Issue 3; June, 2018, PP 1-11.

Qaysar Salih Mahdi, Idris Hadi Saleh, Ghani Hashim, Ganesh Babu Loganathan, "Evaluation of Robot Professor Technology in Teaching and Business", *Information Technology in Industry*, Volume 09, Issue 01, PP 1182-1194.

Ellappan Mohan, Arunachalam Rajesh, Gurram Sunitha, Reddy Madhavi Konduru, Janagaraj Avanija, Loganathan Ganesh Babu, "A deep neural network learning-based speckle noise removal technique for enhancing the quality of synthetic-aperture radar images", *Concurrency And Computation-Practice & Experience*, <https://doi.org/10.1002/cpe.6239>.

Ganesh Babu Loganathan, Idris Hadi Salih, A. Karthikayen, N. Satheesh Kumar, Udayakumar Durairaj. (2021). EERP: Intelligent Cluster based Energy Enhanced Routing Protocol Design over Wireless Sensor Network Environment. *International Journal of Modern Agriculture*, 10(2), 1725 - 1736. Retrieved from <http://www.modern-journals.com/index.php/ijma/article/view/908>

C. Kannan, Nalin Kant Mohanty, R. Selvarasu,"A new topology for cascaded H-bridge multilevel inverter with PI and Fuzzy control", *Energy Procedia*, Volume 117, 2017, Pages 917-926, ISSN 1876-6102, <https://doi.org/10.1016/j.egypro.2017.05.211>.

C. Kannan, and C.K. Kishore, "A Comparison of Three Phase 27 Level Inverter Scheme under No Load and Multiple Load Conditions", *Bulletin of Electrical Engineering and Informatics* Vol. 3, No.4, pp. 245-250, December 2014

Nandagopal, Dr.V., Maheswari, Dr.V. and Kannan, C. (2016) Newly Constructed Real Time ECG Monitoring System Using LabView. *Circuits and Systems*, 7, 4227-4235.

BABU LOGANATHAN, GANESH; E.MOHAN, Dr.. High Quality Intelligent Database Driven Microcontroller Based Heartbeat Monitoring System. *International Journal of Engineering & Technology*, [S.I.], v. 7, n. 4.6, p. 472-476, sep. 2018. ISSN 2227-524X.

Loganathan, Ganesh Babu, Vanet Based Secured Accident Prevention System (September 10, 2019). *International Journal of Mechanical Engineering and Technology*, 10(6), 2019, pp. 285-291,

Mr.Manikandan Ganesan, Mrs.Ishwarya K. R, Mr. Demoz Lisanetwork, Mr.Ayenachew Hailu Mengiste. (2021). Investigation on autonomous pesticide spraying robotic vehicle in agriculture field. *International Journal of Modern Agriculture*, 10(1), 382-386.

Manikandan Ganesan, k. R. Ishwarya. (2021). Design, Fabrication and Analysis Of Quadrotor. *International Journal of Modern Agriculture*, 10(2), 1711 - 1724.

S Priyadharsini, TS Sivakumaran, C Kannan, "Performance analysis of photovoltaic-based SL-quasi Z source inverter" *International Journal of Energy Technology and Policy*, Volume 1, Issue 3, Pages 254-264.

Maheswari, V., Nandagopal, V. and Kannan, C. (2016), "Performance Metric of Z Source CHB Multilevel Inverter FED IM for Selective Harmonic Elimination and THD Reduction", *Circuits and Systems*, 7, 3794-3806. doi: 10.4236/cs.2016.711317.

Dr.A.Senthil Kumar, Dr.G.Suresh, Dr.S.Lekashri, Mr.L.Ganesh Babu, Dr. R.Manikandan, "Smart Agriculture System With E – Carbage Using Iot", *International Journal of Modern Agriculture*, Volume 10, No.1, 2021 pp 928-931.

Mustafa Othman, M., YasenBakr, G., Aziz Taha, S. (2021). 'Study Of Electron Transport Coefficients And Critical Field Strength In N2O And N2O-SF6 Mixtures Using Boltzmann Equation Analysis', *Int. J. of Aquatic Science*, 12(2), pp. 1406-1419.

M. Othman, D. (2021). 'Electron Transport Coefficients ForCHF3', *Int. J. of Aquatic Science*, 12(2), pp. 1394-1405.

Othman, M.M., Taha, S.A. and Ibrahim, S.O. (2021). Electron Swarm Parameters and Dielectric Properties of the Superconducting Binary Mixtures of He-H2. *Alinteri Journal of Agriculture Sciences*, 36(1): 420-432. doi: 10.47059/alinteri/V36I1/AJAS21063.

Muthukumar, S., Ganesan, M., Dhanasekar, J. and Loganathan, G.B. (2021). Path Planning Optimization for Agricultural Spraying Robots Using Hybrid Dragonfly – Cuckoo Search Algorithm. *Alinteri Journal of Agriculture Sciences*, 36(1): 412-419. doi: 10.47059/alinteri/V36I1/AJAS21062.

Dr.Mohammad, M. Othman. (2021). Properties of electron swarm parameters in Tetrahydrofuran. *International Journal of Modern Agriculture*, 10(2), 2412 - 2425. Retrieved from <http://www.modern-journals.com/index.php/ijma/article/view/1036>

Mohammad Mustafa Othman, Sherzad Aziz Taha, and Jwan Jalal Mohammad, "Electron transport parameters in Hydrogen–argon mixtures", *AIP Conference Proceedings* (2017), Volume 1888, pp 020040.

Dr.Mohammad M. Othman, Dr.Idris H. Salih, Dr.Sherzad A.Taha, Electron Transport Properties In Tetramethylsilane Vapour, *Solid State Technology*(2020), Volume 63, Issue 6, PP No. 10188-10200.

M. Othman, M., taha, sherzad and Rasool Hussein, S. (2020) "Boltzmann equation studies on electron swarm parameters for oxygen plasma by using electron collision cross – sections", *Zanco Journal of Pure and Applied Sciences*, 32(5), pp. 36-53. doi: 10.21271/ZJPAS.32.5.4.

Othman, M., Taha, S. and Salih, I. (2019) "Analysis of Electron Transport Coefficients in SiH₄ Gas Using Boltzmann Equation in the Presence of Applied Electric Field", *Zanco Journal of Pure and Applied Sciences*, 31(1), pp. 77-88. doi: 10.21271/zjpas.31.1.10.

Muthuramalingam, T., Saravanakumar, D., Babu, L.G. et al. Experimental Investigation of White Layer Thickness on EDM Processed Silicon Steel Using ANFIS Approach. *Silicon* 12, 1905–1911 (2020). <https://doi.org/10.1007/s12633-019-00287-2>

G, Sai Krishnan and Loganathan, Ganesh Babu and K, Selva Ganapathy and N, Srivathsan and M, Vasanth and G, Venkatateja, Development of Superhydrophobic Nanocomposite Coatings on FRP Sheet Surface for Anti-Icing and Wear-Resistance Applications (August 5, 2019). *Proceedings of International Conference on Recent Trends in Computing, Communication & Networking Technologies (ICRTCCNT) 2019*, SSRN: <https://ssrn.com/abstract=3432305> or <http://dx.doi.org/10.2139/ssrn.3432305>

S.P. Sundar Singh Sivam, Ganesh Babu Loganathan, K. Saravanan, S. RajendraKumar, "Outcome of the Coating Thickness on the Tool Act and Process Parameters When Dry Turning Ti–6Al–4V Alloy: GRA Taguchi & ANOVA", *International Journal of Innovative Technology and Exploring Engineering (IJITEE)* ISSN: 2278-3075, Volume-8, Issue-4, February 2019 PP. 419-423.

Sivam Sundarlingam Paramasivam, S., Loganathan, G., Kumaran, D., Saravanan, K. et al., "Function of Taguchi Grey Relation Analysis for Influencing the Process Parameter for Getting Better Product Quality and Minimize the Industrial Pollution by Coolants in Turning of Ti-6Al-4V Alloy," *SAE Technical Paper* 2019-28-0065, 2019, <https://doi.org/10.4271/2019-28-0065>.

Sivam S.P.S.S., Loganathan G.B., Saravanan K., Dinesh Guhan S., Banerjee A. (2021) Effects of Drilling Process Parameters Using ANOVA and Graphical Methods. In: Kumaresan G., Shanmugam N.S., Dhinakaran V. (eds) *Advances in Materials Research. Springer Proceedings in Materials*, vol 5. Springer, Singapore. https://doi.org/10.1007/978-981-15-8319-3_35

Muthuramalingam T., Ganesh Babu L., Sridharan K., Geethapriyan T., Srinivasan K.P. (2020) Multi-response Optimization of WEDM Process Parameters of Inconel 718 Alloy Using TGRA Method. In: Sattler KU., Nguyen D., Vu N., Tien Long B., Puta H. (eds) *Advances in Engineering Research and Application. ICERA 2019. Lecture Notes in Networks and Systems*, vol 104. Springer, Cham. https://doi.org/10.1007/978-3-030-37497-6_56

BABU, L. G. (2020). INFLUENCE ON THE TRIBOLOGICAL PERFORMANCE OF THE PURE SYNTHETIC HYDRATED CALCIUM SILICATE WITH CELLULOSE FIBER. *In Journal of the Balkan Tribological Association* (Vol. 26, Issue 4, pp. 747–754).

Sai Krishnan G., Shanmugasundar, Pradhan R., Loganathan G.B. (2020) Investigation on Mechanical Properties of Chemically Treated Banana and Areca Fiber Reinforced Polypropylene Composites. In: Praveen Kumar A., Dirgantara T., Krishna P.V. (eds) *Advances in Lightweight Materials and Structures. Springer Proceedings in Materials*, vol 8. Springer, Singapore. https://doi.org/10.1007/978-981-15-7827-4_27

Dr. Othman, M.M., Ishwarya, K.R., Ganesan, M. and Babu Loganathan, G. (2021). A Study on Data Analysis and Electronic Application for the Growth of Smart Farming. *Alinteri Journal of Agriculture Sciences*, 36(1): 209-218. doi: 10.47059/alinteri/V36I1/AJAS21031.

S. Priyadharsini, T. S. Balaji Damodhar, C. Kannan, L. Ganesh Babu, "Improved performance of photovoltaic based embedded dual power source SL-QUASI Z source inverter for IM drive", *EPRA International Journal of Research and Development (IJRD)*, ISSN: 2455-7838(Online), Volume: 6, Issue: 6, June 2021, PP 266- 273. Article DOI: <https://doi.org/10.36713/epra7328>.

Abdulghani Taha, Mohammed and Babu Loganathan, Ganesh (2020) *Adaptive Wiener Filter And Non Linera Diffusion Based Deblurring And Denoising Images*. Journal of critical reviews, 7 (3). pp. 908-915. ISSN 23945125

T. Muthuramalingam, S. Vasanth, L. G. Babu, D. Saravanakumar and P. Karthikeyan, "Flushing Pressure Automation for Efficient Machining in EDM Process," *2019 7th International Conference on Control, Mechatronics and Automation (ICCMA)*, 2019, pp. 232-236.
doi: 10.1109/ICCMA46720.2019.8988592.

Sivam, S.P.S.S., Loganathan, G.B., Kumaran, D., Saravanan, K., Rajendra Kumar, S., 2019. Performance Evaluation of Yield Function and Comparison of Yielding Characteristics of SS 304 in Annealed and Unannealed Conditions. *MSF* 969, 637–643.
<https://doi.org/10.4028/www.scientific.net/msf.969.637>.

Babu Loganathan, Ganesh (2020) Activated Carbon Production From Biowaste Materials - Properties and Applications: A Review. *Indian Journal of Environmental Protection*, 40 (5). pp. 507-511.