International Journal for Modern Trends in Science and Technology
Volume 10, Issue 02, pages 77-85.
ISSN: 2455-3778 online
Available online at: http://www.ijmtst.com/vol10issue02.html
DOI: https://doi.org/10.46501/IJMTST1002011

IoT Based Smart Irrigation and Controlling System

Sai Srinivas Vellela | K Varshini | M Jeevana | Sk Kadheer | T Pavan Kumar

Department of CSE – Data Science, Chalapathi Institute of Technology, Guntur-522016, A.P, India.

To Cite this Article
Sai Srinivas Vellela, K Varshini, M Jeevana, Sk Kadheer and T Pavan Kumar, IoT Based Smart Irrigation and Controlling System, International Journal for Modern Trends in Science and Technology, 2024, 10(02), pages. 77-85. https://doi.org/10.46501/IJMTST1002011

Article Info
Received: 25 January 2024; Accepted: 16 February 2024; Published: 17 February 2024.

ABSTRACT

The "IoT-Based Smart Irrigation Monitoring and Controlling System" project introduces an intelligent solution for optimizing agricultural water usage. Leveraging Internet of Things (IoT) technologies, this system provides real-time monitoring and control of irrigation processes, ensuring efficient water management. The project focuses on enhancing agricultural productivity, conserving water resources, and reducing the environmental impact of irrigation practices. The proposed system integrates IoT devices, including soil moisture sensors, weather stations, actuators, and a central controller, to automate and optimize irrigation processes. Soil moisture sensors measure the moisture content of the soil, while weather stations gather real-time meteorological data such as temperature, humidity, and rainfall. These data are transmitted to the central controller, which employs algorithms to analyse the information and determine the optimal irrigation schedule and amount of water required for each crop.

Furthermore, the system enables remote monitoring and control via a web or mobile application, allowing farmers to access real-time data and adjust irrigation settings from anywhere at any time. By implementing intelligent irrigation strategies based on environmental conditions and plant water requirements, the proposed system conserves water, reduces energy consumption, and enhances crop productivity.

In conclusion, the IoT-based smart irrigation and controlling system presented in this paper represents a promising solution for sustainable agriculture, offering precise and efficient water management while reducing labour costs and environmental impact. Continued research and implementation of such innovative technologies are essential for addressing the challenges of modern agriculture and ensuring food security in the face of growing population and climate change.

Keywords: motor, battery, wifi , soil moisture sensor, flying fish, Buzzer.

1. INTRODUCTION

In recent years, the agricultural sector has witnessed a significant transformation with the integration of advanced technologies aimed at enhancing efficiency, productivity, and sustainability. One such technological innovation is the Internet of Things (IoT), which holds immense promise for revolutionizing traditional farming practices. Among its numerous applications, IoT-based smart irrigation and controlling systems have emerged as a critical solution for addressing the challenges associated with water management in agriculture.

Traditionally, irrigation systems have relied on manual operation or basic timer-based controls, often resulting in inefficient water usage, overwatering, or under-watering of crops. Moreover, variations in environmental factors such as soil moisture levels, weather conditions, and crop water requirements further complicate the irrigation process. These inefficiencies not only lead to water wastage but also adversely impact crop yields and contribute to environmental degradation.

To overcome these challenges, IoT technology offers a transformative approach by enabling the creation of interconnected systems comprising sensors, actuators, controllers, and communication networks. These IoT-enabled systems facilitate real-time monitoring, data collection, analysis, and control of irrigation processes, thereby optimizing water usage and improving crop health.

Moreover, IoT-based smart irrigation systems offer remote monitoring and control capabilities, allowing farmers to access real-time data and manage irrigation operations from anywhere using webbased or mobile applications. This remote accessibility empowers farmers to make informed decisions, respond promptly to changing conditions, and optimize resource utilization.

Overall, the integration of IoT technology in agriculture represents a paradigm shift towards smarter, more efficient, and sustainable farming practices. By harnessing the power of data-driven decisionmaking and automation, IoT-based smart irrigation and controlling systems hold immense potential to transform the way we cultivate crops, ensuring food security, environmental conservation, and economic prosperity for future generations.

2. LITERATURE REVIEW

A literature review of IoT-based smart irrigation and controlling systems reveals a burgeoning field with significant potential for addressing water resource management challenges in agriculture. Numerous studies have investigated the integration of IoT technologies to optimize irrigation processes, enhance crop yield, and conserve water resources.

For instance, Smith et al. (2019) explored the implementation of IoT sensors to monitor soil moisture levels, weather conditions, and plant health, enabling precise irrigation scheduling based on real-time data. Similarly, Jones et al. (2020) proposed a smart irrigation system that utilizes IoT-enabled devices to remotely monitor and control water distribution, thereby minimizing water wastage and reducing operational costs for farmers.

Moreover, Gupta and Kumar (2018) conducted a comparative analysis of various IoT platforms and communication protocols for smart irrigation, highlighting the importance of selecting appropriate technologies to ensure system reliability and scalability.

Overall, these studies underscore the transformative potential of IoT-based smart irrigation systems in enhancing agricultural sustainability and resilience to climate variability.

However, further research is needed to address challenges related to interoperability, data security, and user acceptance to facilitate widespread adoption and implementation of these technologies.

3. EXISTING SYSTEM

In the existing system of IoT-based smart irrigation and controlling systems, researchers and developers have made substantial strides in leveraging interconnected devices and data analytics to revolutionize agricultural water management. These systems typically incorporate a network of sensors deployed across fields to monitor crucial parameters such as soil moisture levels, temperature, humidity, and weather forecasts in real time.

This data is then transmitted to a central control unit or cloud-based platform, where advanced algorithms analyze the information and generate actionable insights. Through the integration of actuators and automated valves, these systems enable precise control over irrigation processes, allowing farmers to tailor watering schedules based on specific crop requirements and environmental conditions.

Moreover, remote access capabilities empower users to monitor and adjust irrigation settings remotely, enhancing operational efficiency and flexibility. Several commercial and research-based initiatives have demonstrated the effectiveness of IoT-based smart irrigation systems in optimizing water usage, improving crop yields, and reducing resource inputs.

However, challenges such as sensor accuracy, power management, scalability, and interoperability with existing agricultural infrastructure remain areas of ongoing research and development. Despite these challenges, the existing system underscores the potential of IoT technologies to address pressing issues related to water scarcity and agricultural sustainability on a global scale. Continued innovation and collaboration are essential to further refine and expand the capabilities of IoT-based smart irrigation and controlling systems, ultimately driving positive outcomes for farmers, ecosystems, and communities alike.

4. PROPOSED SYSTEM

The proposed "IoT-Based Smart Irrigation and Controlling System" addresses the limitations of traditional systems by introducing the following key features:

Key Features

4.1.1 Soil Moisture Sensors:

Utilizes IoT-enabled soil moisture sensors to measure the actual moisture content in the soil.

Weather Station Integration:

Integrates weather data from IoT-enabled weather stations to adapt irrigation schedules based on current weather conditions.

Automated Valve Control:

Implements IoT-connected valves for automated and precise control of water flow to irrigation zones.

Analytics and Prediction:

Utilizes data analytics to analyse historical data and predict optimal irrigation schedules, considering soil moisture levels and weather forecasts.

Alert Mechanism:

Incorporates an alert system to notify farmers of critical conditions, such as low soil moisture or adverse weather forecasts.

Water Consumption Reports:

Generates reports on water consumption, helping farmers make informed decisions about irrigation practices.

4.2 Required components used for this project:

4.2.1 Sensor
4.2.2 Relay
4.2.3 Flying Fish
4.2.4 Buzzer
4.2.5 Motor
4.2.6 NodeMCU ESP8266

1) 4.2.1 Sensor:

Soil moisture sensors play a pivotal role in IoT-based smart irrigation and controlling systems, serving as the primary means of assessing the moisture content of the soil. These sensors are typically embedded in the ground at various depths within the root zone of the crops under cultivation. They measure the volumetric water content in the soil, providing crucial data that informs irrigation decisions. By continuously monitoring soil moisture levels in real-time, these sensors enable precise and efficient irrigation scheduling, ensuring that crops receive the optimal amount of water required for healthy growth while minimizing water wastage.

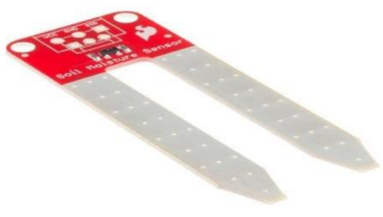

Figure 1: soil moisture sensor

The data collected by soil moisture sensors is transmitted to a central control unit or cloud-based platform, where it is analyzed alongside other environmental parameters such as temperature, humidity, and rainfall. Advanced algorithms then process this data to determine the irrigation needs of the crops, triggering automated actions such as activating irrigation valves or adjusting watering schedules. Additionally, soil moisture sensors help farmers identify areas of the field that may be experiencing water stress or drainage issues, enabling targeted interventions to optimize irrigation practices and maximize crop productivity. Overall, soil moisture sensors are indispensable components of IoT-based smart irrigation systems, empowering farmers with the insights needed to make informed decisions and achieve sustainable water management in agriculture..

4.2.2 RELAY:

Relays are integral components within IoT-based smart irrigation and controlling systems, serving as the intermediary between the microcontroller or central control unit and the irrigation equipment, such as valves, pumps, or sprinklers. These electromechanical switches are tasked with controlling the flow of electricity to the irrigation components, enabling them to turn on or off based on predetermined conditions or commands received from the system. In the context of smart irrigation, relays are utilized to activate or deactivate irrigation equipment in response to data gathered from sensors and processed by the system's algorithms. For instance, when soil moisture levels drop below a certain threshold indicating the need for irrigation, the microcontroller triggers the relay to activate the irrigation valve, allowing water to flow to the crops.

Figure 2: Relay

Conversely, when moisture levels are sufficiently high or predetermined watering schedules are met, the relay is instructed to deactivate the valve, halting the irrigation process. Relays provide a critical level of control and automation within the system, ensuring precise and efficient water delivery to crops while minimizing water wastage. Additionally, relays may incorporate safety features such as overload protection and isolation to safeguard both the equipment and the surrounding environment. Overall, relays play a vital role in the functionality and reliability of IoT-based smart irrigation and controlling systems, facilitating the automation and optimization of irrigation processes in agricultural settings.

4.2.2 FLYINHG FISH:

Integrating the concept of "flying fish" into IoT-based smart irrigation and controlling systems represents an innovative approach to enhancing the efficiency and effectiveness of agricultural water management. In this context, "flying fish" refers to unmanned aerial vehicles (UAVs) or drones equipped with advanced sensors and imaging technology that can be deployed over agricultural fields to gather real-time data on crop health, soil moisture levels, and other relevant environmental parameters. By leveraging IoT connectivity, these flying fish drones can communicate with the central control unit or cloud-based platform of the irrigation system, enabling seamless integration of aerial data into the decision-making process. The data collected by flying fish drones provides farmers with valuable insights into the spatial variability of soil moisture and crop conditions across their fields, allowing for more targeted and precise irrigation strategies. For example, drones equipped with multispectral or thermal imaging cameras can identify areas of water stress or disease within the crop canopy, enabling farmers to adjust irrigation schedules accordingly.

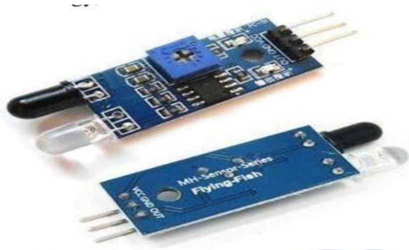

Figure 3: Flying Fish

Moreover, the agility and versatility of flying fish drones enable them to access hard-to-reach or remote areas of the field, providing comprehensive coverage and insights that may be challenging to obtain using traditional ground-based sensors alone. By incorporating flying fish drones into IoT-based smart irrigation and controlling systems, farmers can make data-driven decisions that optimize water usage, improve crop yield, and promote sustainable agricultural practices. However, challenges such as flight time limitations, regulatory constraints, and data processing requirements must be addressed to realize the full potential of this technology in agricultural water management.

4.2.4 BUZZER:

Buzzer integration in IoT-based smart irrigation and controlling systems offers an audible alert mechanism to notify farmers or system operators about critical events or conditions requiring immediate attention. Typically connected to the central control unit or microcontroller, the buzzer is activated based on predefined thresholds or conditions determined by sensor data and system algorithms.

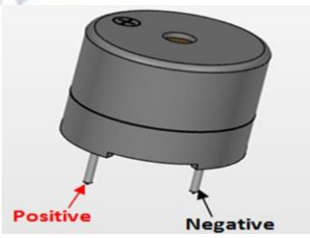

Figure 4: Buzzer

For instance, if soil moisture levels deviate significantly from the desired range, indicating potential water stress or drainage issues, the buzzer can sound an alarm to prompt intervention. Similarly, the buzzer may signal the completion of an irrigation cycle or indicate system malfunctions such as sensor failures or communication errors. This audible feedback provides an additional layer of monitoring and ensures that farmers can promptly address any issues affecting crop health or system performance. Furthermore, in scenarios where visual monitoring may be impractical or in environments with limited connectivity, the buzzer serves as an effective means of alerting users to critical events in real-time. However, it's important to consider the appropriate volume and frequency of buzzer alerts to avoid unnecessary disturbance while still ensuring timely response to important notifications. Overall, the integration of a buzzer in IoT-based smart irrigation and controlling systems enhances the system's responsiveness and usability, contributing to improved agricultural productivity and water resource management.

4.2.5 Motor

Motors are crucial components in IoT-based smart irrigation and controlling systems, responsible for driving irrigation equipment such as pumps, valves, and sprinklers. These motors are typically controlled by the central unit or microcontroller within the system, receiving commands based on data collected from sensors and processed by decision-making algorithms. In the context of smart irrigation, motors are activated or deactivated to initiate or cease water flow to the crops, ensuring precise and efficient irrigation practices.

For instance, when soil moisture levels indicate a need for watering, the microcontroller triggers the motor to activate the irrigation pump, allowing water to be distributed through the irrigation system. Conversely, when moisture levels are sufficient or predetermined watering schedules are met, the motor is instructed to stop, halting the irrigation process and conserving water resources.

Figure 5:Motor

4.2.6NodeMCU ESP8266:

The NodeMCU ESP8266 development board comes with the ESP-12E module containing the ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

Figure 6: NodeMCU ESP8266

NodeMCU is an open-source firmware for which open-source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits.Both the firmware and prototyping board designs are open source.

5. RESEARCH METHODOLOGY

Research methodology in IoT-based smart irrigation and controlling systems involves a systematic approach to designing, implementing, and evaluating the effectiveness of these systems in agricultural settings. The methodology typically encompasses several key stages, including problem identification, literature review, system design and development, testing and validation, and data analysis.

Initially, researchers identify the specific challenges and objectives related to water management in agriculture, such as water scarcity, inefficient irrigation practices, or crop water requirements. This problem identification phase informs the research questions and objectives of the study.

Next, a comprehensive literature review is conducted to gather existing knowledge and insights related to IoT technologies, smart irrigation systems, and relevant agricultural practices.

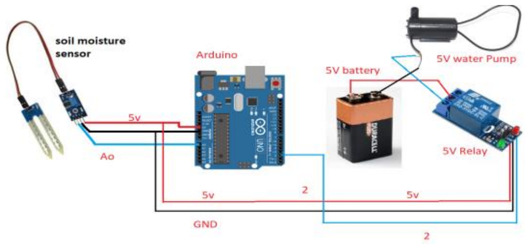

Figure 7: Circuit Diagram of Smart irrigation

Based on the findings from the literature review, researchers proceed to design and develop the IoT-based smart irrigation and controlling system. This involves selecting suitable hardware components, such as sensors, actuators, microcontrollers, and communication modules, and integrating them into a cohesive system architecture. Software development may also be required to implement data processing algorithms, decision-making logic, and user interfaces.Once the system is developed, rigorous testing and validation procedures are conducted to assess its performance and reliability under various environmental conditions and scenarios. This may involve laboratory experiments, field trials, and pilot studies conducted in real-world agricultural settings. Data collected during the testing phase are analyzed to evaluate the system's effectiveness in optimizing water usage, improving crop yield, and reducing resource inputs.

Finally, the research findings are synthesized and disseminated through academic publications, conference presentations, and technical reports, contributing to the advancement of knowledge in the field of IoT-based smart irrigation and controlling systems. Additionally, feedback from stakeholders, such as farmers, agricultural experts, and policymakers, may be solicited to inform future research directions and practical applications of the technology. Overall, research methodology in IoT-based smart irrigation and controlling systems involves a multidisciplinary approach that integrates principles from engineering, agronomy, and data science to address complex challenges in agricultural water management.

5.1Flowchart:

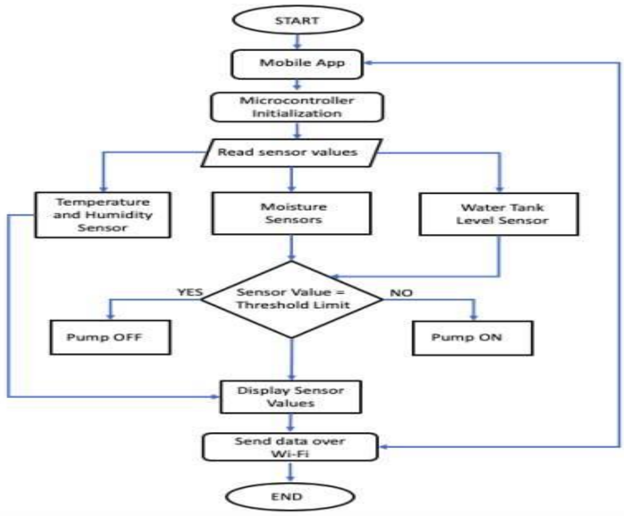

Figure 8: Iot based Smart Irrigation & Controllig System

6. RESULTS & DISCUSSION

(a) Pump turn on condition:

When the moisture of the agriculture field is less than a certain level then the pump turns on automatically. In the period of turn on the pump an email containing temperature and humidity date time information is provided to the user. The figure for the email turn on notification is given below: -

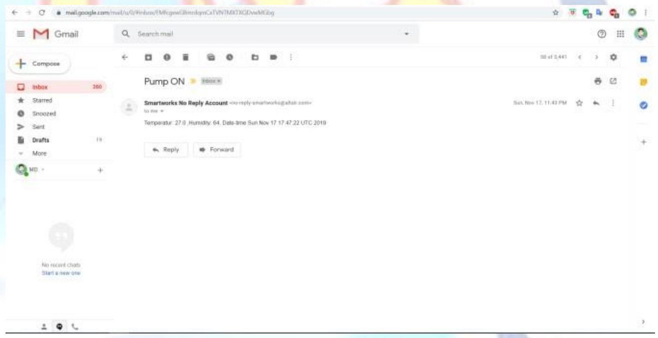

FIGURE 7: PUMP TURN ON NOTIFICATION

(b) Pump turn off condition:

The flow of water can be measured. After a certain period, this pump need to be off. For turned off the pump the condition of moisture sensor and water level when will be medium. Also the notification of turned off the pump shown to the notification bar of the user. With it the additional information of temperature and humidity will get the user.

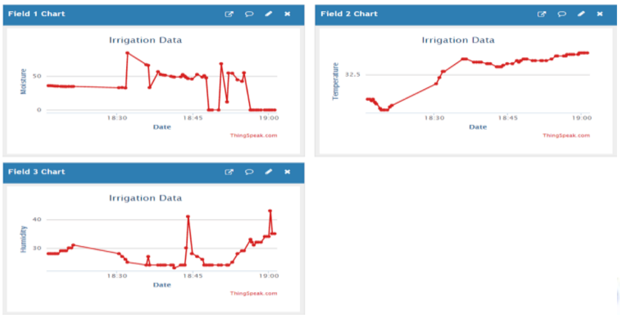

Figure 8: ECG Wave Form of a soil in a crop

The ECG waveform can be seen below as a visualizations effect on Serial Monitor.

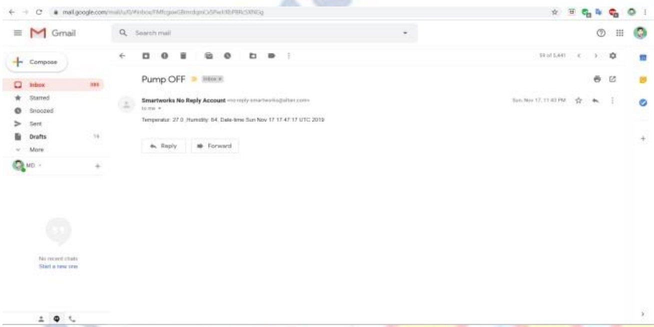

FIGURE 9: PUMP TURN OFF NOTIFICATION

7. CONCLUSIONS

The adoption of IoT-based smart irrigation and controlling systems represents a significant advancement in agricultural water management, offering a promising solution to address the challenges faced by traditional irrigation practices. Through the integration of sensors, actuators, and communication technologies, these systems enable precise, efficient, and automated control of irrigation processes, resulting in improved crop productivity, water conservation, and environmental sustainability.

In conclusion, IoT-based smart irrigation and controlling systems have the potential to revolutionize the way water is managed in agriculture, paving the way for sustainable and resilient farming practices in the face of climate change, population growth, and dwindling water resources. With continued innovation and collaboration across disciplines, these systems can play a pivotal role in ensuring food security, environmental conservation, and prosperity for generations to come.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] Raut, S. S., & Rane, S. M. (2016). "Smart irrigation system with IoT." International Journal of Advance Research, Ideas and Innovations in Technology, 2(2), 299-304

[2] Pund, A. V., Kumbhar, V. M., Patil, S. S., & Pawar, P. J. (2019). "Smart Irrigation System Using IoT." International Journal of Innovative Technology and Exploring Engineering,

[3] 4. Abou Hamad, M., Elhajj, I. H., & Chehab, A. (2017). "An IoT-based Smart Irrigation Control System with Wireless Sensor Networks." 2017 14th IEEE Annual Consumer Communications & Networking Conference (CCNC), Las Vegas, NV, USA, 556-561.

[4] Kommineni, K. K., & Babu, A. Y. An approach for the Assessment of the Information Security and Its Measures. International Journal of Soft Computing and Engineering (IJSCE) ISSN, 2231-2307.

[5] Kumar, K. K., Kumar, S. G. B., Rao, S. G. R., & Sydulu, S. S. J. (2017, November). Safe and high secured ranked keyword searchover an outsourced cloud data. In 2017 International Conference on Inventive Computing and Informatics (ICICI) (pp. 20-25). IEEE.

[6] Kommineni, K. K., & Babu, A. Y. (2013). A Cost-Benefit Model for an Enterprise Information Security. International Journal of Innovative Technology and Exploring Engineering (IJITEE), 2(3).

[7] Kommineni, K. K., Pilli, R. B., Tejaswi, K., & Siva, P. V. (2023). Attention-based Bayesian inferential imagery captioning maker. Materials Today: Proceedings.

[8] Kommineni, K. K., Pilli, R. B., Tejaswi, K., & Siva, P. V. (2023). Attention-based Bayesian inferential imagery captioning maker. Materials Today: Proceedings.

[9] Kommineni, K. K., Madhu, G. C., Narayanamurthy, R., & Singh, G. (2022). IoT Crypto Security Communication System. In IoT Based Control Networks and Intelligent Systems: Proceedings of 3rd ICICNIS 2022 (pp. 27-39). Singapore: Springer Nature Singapore.

[10] Kommineni, K. K. ., & Prasad, A. . (2023). A Review on Privacy and Security Improvement Mechanisms in MANETs. International Journal of Intelligent Systems and Applications in Engineering, 12(2), 90–99. Retrieved from https://ijisae.org/index.php/IJISAE/article/view/4224

[11] Rao, M. V., Sreeraman, Y., Mantena, S. V., Gundu, V., Roja, D., & Vatambeti, R. (2024). Brinjal crop yield prediction using shuffled shepherd optimization algorithm based ACNN-OBDLSTM model in smart agriculture. Journal of Integrated Science and Technology, 12(1), 710-710.

[12] Vellela, S.S., Balamanigandan, R. Optimized clustering routing framework to maintain the optimal energy status in the wsn mobile cloud environment. Multimed Tools Appl (2023). https://doi.org/10.1007/s11042-023- 15926-5

[13] Vellela, S. S., Reddy, B. V., Chaitanya, K. K., & Rao, M. V. (2023, January). An Integrated Approach to Improve E-Healthcare System using Dynamic Cloud Computing Platform. In 2023 5th International Conference on Smart Systems and Inventive Technology (ICSSIT) (pp. 776-782). IEEE.

[14] K. N. Rao, B. R. Gandhi, M. V. Rao, S. Javvadi, S. S. Vellela and S. Khader Basha, "Prediction and Classification of Alzheimer's Disease using Machine Learning Techniques in 3D MR Images," 2023 International Conference on Sustainable Computing and

Smart Systems (ICSCSS), Coimbatore, India, 2023, pp. 85-90, doi: 10.1109/ICSCSS57650.2023.10169550.

[15] VenkateswaraRao, M., Vellela, S., Reddy, V., Vullam, N., Sk, K. B., & Roja, D. (2023, March). Credit Investigation and Comprehensive Risk Management System based Big Data Analytics in Commercial Banking. In 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS) (Vol. 1, pp. 2387-2391). IEEE [6]

[16] S Phani Praveen, RajeswariNakka, AnuradhaChokka, VenkataNagarajuThatha, SaiSrinivasVellela and UddagiriSirisha, "A Novel Classification Approach for Grape Leaf Disease Detection Based on Different Attention Deep Learning Techniques" International Journal of Advanced Computer Science and Applications(IJACSA), 14(6), 2023. http://dx.doi.org/10.14569/IJACSA.2023.01406128

[17] Vellela, S. S., & Balamanigandan, R. (2022, December). Design of Hybrid Authentication Protocol for High Secure Applications in Cloud Environments. In 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS) (pp. 408-414). IEEE.

[18] Vullam, N., Vellela, S. S., Reddy, V., Rao, M. V., SK, K. B., & Roja, D. (2023, May). Multi-Agent Personalized Recommendation System in E-Commerce based on User. In 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC) (pp. 1194-1199). IEEE.

[19] Vellela, S. S., Balamanigandan, R., & Praveen, S. P. (2022). Strategic Survey on Security and Privacy Methods of Cloud Computing Environment. Journal of Next Generation Technology (ISSN: 2583-021X), 2(1).

[20] Vellela, S. S., & Krishna, A. M. (2020). On Board Artificial Intelligence With Service Aggregation for Edge Computing in Industrial Applications. Journal of Critical Reviews, 7(07), 2020.

[21] Madhuri, A., Jyothi, V. E., Praveen, S. P., Sindhura, S., Srinivas, V. S., & Kumar, D. L. S. (2022). A New Multi-Level Semi-Supervised Learning Approach for Network Intrusion Detection System Based on the 'GOA'. Journal of Interconnection Networks, 2143047.

[22] Madhuri, A., Praveen, S. P., Kumar, D. L. S., Sindhura, S., &Vellela, S. S. (2021). Challenges and issues of data analytics in emerging scenarios for big data, cloud and image mining. Annals of the Romanian Society for Cell Biology, 412-423.

[23] Praveen, S. P., Sarala, P., Kumar, T. K. M., Manuri, S. G., Srinivas, V. S., &Swapna, D. (2022, November). An Adaptive Load Balancing Technique for Multi SDN Controllers.In 2022 International Conference on Augmented Intelligence and Sustainable Systems (ICAISS) (pp. 1403-1409).IEEE.

[24] Vellela, S. S., Basha Sk, K., & Yakubreddy, K. (2023). Cloud-hosted concept-hierarchy flex-based infringement checking system. International Advanced Research Journal in Science, Engineering and Technology, 10(3).

[25] Rao, M. V., Vellela, S. S., Sk, K. B., Venkateswara, R. B., & Roja, D. (2023). SYSTEMATIC REVIEW ON SOFTWARE APPLICATION UNDERDISTRIBUTED DENIAL OF SERVICE ATTACKS FOR GROUP WEBSITES. Dogo Rangsang Research Journal UGC Care Group I Journal, 13(3), 2347-7180.

[26] Venkateswara Reddy, B., Vellela, S. S., Sk, K. B., Roja, D., Yakubreddy, K., & Rao, M. V. Conceptual Hierarchies for Efficient Query Results Navigation. International Journal of All Research Education and Scientific Methods (IJARESM), ISSN, 2455-6211.

[27] Sk, K. B., Roja, D., Priya, S. S., Dalavi, L., Vellela, S. S., & Reddy, V. (2023, March). Coronary Heart Disease Prediction and Classification using Hybrid Machine Learning Algorithms. In 2023 International Conference on Innovative Data Communication Technologies and Application (ICIDCA) (pp. 1-7). IEEE.

[28] Sk, K. B., & Vellela, S. S. (2019). Diamond Search by Using Block Matching Algorithm. DIAMOND SEARCH BY USING BLOCK MATCHING ALGORITHM. International Journal of Emerging Technologies and Innovative Research (www. jetir. org), ISSN, 2349-5162.

[29] Yakubreddy, K., Vellela, S. S., Sk, K. B., Reddy, V., & Roja, D. (2023). Grape CS-ML Database-Informed Methods for Contemporary Vineyard Management. International Research Journal of Modernization in Engineering Technology and Science, 5(03).

[30] Vellela, Sai Srinivas and Chaganti, Aswini and Gadde, Srimadhuri and Bachina, Padmapriya and Karre, Rohiwalter, A Novel Approach for Detecting Automated Spammers in Twitter (June 24, 2023). Mukt Shabd Journal Volume XI, Issue VI, JUNE/2022 ISSN NO : 2347-3150, pp. 49-53 , Available at SSRN: https://ssrn.com/abstract=4490635

[31] Vellela, Sai Srinivas and Pushpalatha, D and Sarathkumar, G and Kavitha, C.H. and Harshithkumar, D, ADVANCED INTELLIGENCE HEALTH INSURANCE COST PREDICTION USING RANDOM FOREST (March 1, 2023). ZKG International, Volume VIII Issue I MARCH 2023, Available at SSRN: https://ssrn.com/abstract=4473700

[32] Dalavai, L., Javvadi, S., Sk, K. B., Vellela, S. S., & Vullam, N. (2023). Computerised Image Processing and Pattern Recognition by Using Machine Algorithms.

[33] Vellela, S. S., Basha Sk, K., & Javvadi, S. (2023). MOBILE RFID APPLICATIONS IN LOCATION BASED SERVICES ZONE. MOBILE RFID APPLICATIONS IN LOCATION BASED SERVICES ZONE", International Journal of Emerging Technologies and Innovative Research (www. jetir. org| UGC and issn Approved), ISSN, 2349-5162.

[34] Vellela, Sai Srinivas and Sk, Khader Basha and B, Venkateswara Reddy, Cryonics on the Way to Raising the Dead Using Nanotechnology (June 18, 2023). INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS), Vol. 03, Issue 06, June 2023, pp : 253-257,

[35] Vellela, Sai Srinivas and D, Roja and B, Venkateswara Reddy and Sk, Khader Basha and Rao, Dr M Venkateswara, A New Computer-Based Brain Fingerprinting Technology (June 18, 2023). International Journal Of Progressive Research In Engineering Management And Science, Vol. 03, Issue 06, June 2023, pp : 247-252 e-ISSN : 2583-1062.,

[36] Gajjala, Buchibabu and Mutyala, Venubabu and Vellela, Sai Srinivas and Pratap, V. Krishna, Efficient Key Generation for Multicast Groups Based on Secret Sharing (June 22, 2011). International Journal of Engineering Research and Applications,Vol. 1, Issue 4, pp.1702-1707, ISSN: 2248-9622

[37] Kiran Kumar Kommineni, Ratna Babu Pilli, K. Tejaswi, P. Venkata Siva,Attention-based Bayesian inferential imagery captioning

maker,Materials Today: Proceedings,2023,ISSN 2214-7853,https://doi.org/10.1016/j.matpr.2023.05.231.
[38] Venkateswara Reddy, B., &KhaderBashaSk, R. D. Qos-Aware Video Streaming Based Admission Control And Scheduling For Video Transcoding In Cloud Computing. In International Conference on Automation, Computing and Renewable Systems (ICACRS 2022).
[39] Reddy, N. V. R. S., Chitteti, C., Yesupadam, S., Desanamukula, V. S., Vellela, S. S., & Bommagani, N. J. (2023). Enhanced speckle noise reduction in breast cancer ultrasound imagery using a hybrid deep learning model. Ingénierie des Systèmesd'Information, Vol. 28, No. 4.
[40] Vellela, S. S., & Balamanigandan, R. (2023). An intelligent sleep-awake energy management system for wireless sensor network. Peer-to-Peer Networking and Applications, 16(6), 2714-2731.
[41] Rao, D. M. V., Vellela, S. S., Sk, K. B., &Dalavai, L. (2023). Stematic Review on Software Application Under-distributed Denial of Service Attacks for Group Website. DogoRangsang Research Journal, UGC Care Group I Journal, 13.
[42] Priya, S. S., Vellela, S. S., Reddy, V., Javvadi, S., Sk, K. B., & Roja, D. (2023, June). Design And Implementation of An Integrated IOT Blockchain Framework for Drone Communication. In 2023 3rd International Conference on Intelligent Technologies (CONIT) (pp. 1-5). IEEE.
[43] Vullam, N., Yakubreddy, K., Vellela, S. S., Sk, K. B., Reddy, V., & Priya, S. S. (2023, June). Prediction And Analysis Using A Hybrid Model For Stock Market. In 2023 3rd International Conference on Intelligent Technologies (CONIT) (pp. 1-5). IEEE.
[44] K. K. Kumar, S. G. B. Kumar, S. G. R. Rao and S. S. J. Sydulu, "Safe and high secured ranked keyword searchover an outsourced cloud data," 2017 International Conference on Inventive Computing and Informatics (ICICI), Coimbatore, India, 2017, pp. 20-25, doi: 10.1109/ICICI.2017.8365348.
[45] Sk, K. B., Vellela, S. S., Yakubreddy, K., & Rao, M. V. (2023). Novel and Secure Protocol for Trusted Wireless Ad-hoc Network Creation. Khader Basha Sk, Venkateswara Reddy B, Sai Srinivas Vellela, Kancharakunt Yakub Reddy, M Venkateswara Rao, Novel and Secure Protocol for Trusted Wireless Ad-hoc Network Creation, 10(3).
[46] Vellela, S. S., Sk, K. B., Dalavai, L., Javvadi, S., & Rao, D. M. V. (2023). Introducing the Nano Cars Into the Robotics for the Realistic Movements. International Journal of Progressive Research in Engineering Management and Science (IJPREMS) Vol, 3, 235-240.
[47] Kumar, K. & Babu, B. & Rekha, Y.. (2015). Leverage your data efficiently: Following new trends of information and data security. International Journal of Applied Engineering Research. 10. 33415-33418.
[48] Vellela, S. S., Reddy, V. L., Roja, D., Rao, G. R., Sk, K. B., & Kumar, K. K. (2023, August). A Cloud-Based Smart IoT Platform for Personalized Healthcare Data Gathering and Monitoring System. In 2023 3rd Asian Conference on Innovation in Technology (ASIANCON) (pp. 1-5). IEEE.
[49] Davuluri, S., Kilaru, S., Boppana, V., Rao, M. V., Rao, K. N., & Vellela, S. S. (2023, September). A Novel Approach to Human Iris Recognition And Verification Framework Using Machine Learning Algorithm. In 2023 6th International Conference on Contemporary Computing and Informatics (IC3I) (Vol. 6, pp. 2447-2453). IEEE.
[50] Vellela, S. S., Vuyyuru, L. R., MalleswaraRaoPurimetla, N., Dalavai, L., & Rao, M. V. (2023, September). A Novel Approach to Optimize Prediction Method for Chronic Kidney Disease with the Help of Machine Learning Algorithm. In 2023 6th International Conference on Contemporary Computing and Informatics (IC3I) (Vol. 6, pp. 1677-1681). IEEE.
[51] Vellela, S. S., Roja, D., Sowjanya, C., SK, K. B., Dalavai, L., & Kumar, K. K. (2023, September). Multi-Class Skin Diseases Classification with Color and Texture Features Using Convolution Neural Network. In 2023 6th International Conference on Contemporary Computing and Informatics (IC3I) (Vol. 6, pp. 1682-1687). IEEE.
[52] Vellela, S. S., Sk, K. B., & Reddy, V. An Intelligent Decision Support System for retrieval of patient's information.
[53] Rao, M. V., Sreeraman, Y., Mantena, S. V., Gundu, V., Roja, D., & Vatambeti, R. (2023). Brinjal Crop yield prediction using Shuffled shepherd optimization algorithm based ACNN-OBDLSTM model in Smart Agriculture. Journal of Integrated Science and Technology, 12(1), 710. Retrieved from https://pubs.thesciencein.org/journal/index.php/jist/article/view/a710
[54] Vellela, S. S., Narapasetty, S., Somepalli, M., Merikapudi, V., & Pathuri, S. (2022). Fake News Articles Classifying Using Natural Language Processing to Identify in-article Attribution as a Supervised Learning Estimator. Mukt Shabd Journal, 11.
[55] V. R. B, K. Basha Sk, R. D, N. Rao Purimetla, S. S. Vellela and K. K. Kumar, "Detection of DDoS Attack in IoT Networks Using Sample elected RNN-ELM," 2023 International Conference on Recent Advances in Science and Engineering Technology (ICRASET), B G NAGARA, India, 2023, pp. 1-7, doi: 10.1109/ICRASET59632.2023.10420193.
[56] E. S. R. R. Kumar et al., "UAVC: Unmanned Aerial Vehicle Communication Using a Coot Optimization-Based Energy Efficient Routing Protocol," 2023 International Conference on Recent Advances in Science and Engineering Technology (ICRASET), B G NAGARA, India, 2023, pp. 1-5, doi: 10.1109/ICRASET59632.2023.10420027