iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: V Month of publication: May 2023

DOI: https://doi.org/10.22214/ijraset.2023.52498

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

IoT Based Well Water Level Monitoring Using I2C Protocol

Karan Chauhan[1], Shrutika Abhang[2], Hunar Agrawal[3]
[1, 2, 3]*Department of Instrumentation and Control Engineering Vishwakarma Institute of Technology, Pune*

Abstract: This study suggests an Internet of Things (IoT)-based well water management system that transfers data between the well and a centralized control unit using a master-slave communication strategy. The system is designed to overcome problems with conventional water management systems, including manual monitoring and control, a dearth of real-time data, and human error. A sensor network is placed in the well as part of the suggested system to gather information on the water's level. The information is then communicated effectively and reliably to a central control unit using a master-slave communication strategy. Making timely and well-informed decisions is made possible by the central control unit's processing of the data and provision of real-time feedback on the quantity and quality of the water. The system has been put to the test in a rural well, and the results show how well it manages water, cuts down on waste, and ensures sustainable use of water resources. With access to clean and safe water, the suggested IoT-based well water management system can significantly improve the livelihoods of communities by being implemented in additional rural locations.
Keywords: Internet of Things, well water management system, master-slave communication, sensor network, data exchange, water level.

I. INTRODUCTION

All living things depend on water, thus managing it sustainably and effectively is essential to guaranteeing a higher standard of living. Traditional water management methods frequently rely on labor-intensive, prone to error, and ineffective manual monitoring and control. The development of the Internet of Things (IoT) has made it possible to gather, analyze, and analyze data in real time, paving the way for more effective and efficient water management systems. This study suggests an Internet of Things-based well water management system that transfers data between the well and a central control unit using a master-slave communication strategy.

By improving water management, reducing waste, and ensuring sustainable use of water resources, the system strives to overcome the problems with conventional water management systems. A sensor network is placed in the well as part of the suggested system to gather information on the water's quality, flow rate, and level. The information is then communicated effectively and reliably to a central control unit using a master-slave communication strategy. Making timely and well-informed decisions is made possible by the central control unit's processing of the data and provision of real-time feedback on the quantity and quality of the water. The implementation of the suggested IoT-based well water management system in rural regions has a lot of potential. By facilitating community access to clean and safe water, it can help to improve local livelihoods.

II. LITERATURE REVIEW

The publications listed below show that there is a growing body of research on IoT-based well water management systems that communicate data via a master-slave communication model. Several recurring themes and trends in the discipline are revealed by a survey of the literature on these publications.

1) The suggested methods are intended to solve a number of issues with conventional water management systems, including the absence of real-time data on water quality and quantity and the inefficiency of data transfer between sensors and the central control unit. Real-time monitoring and effective data interchange are made possible by the deployment of IoT devices and the master-slave communication method, which offers an efficient solution to these problems.
2) Second, the accuracy and efficiency of the system may be improved by including additional technologies like machine learning algorithms and cloud-based storage and analysis tools. In addition, cloud-based storage and analysis tools can offer a centralized platform for data storage and analysis. Machine learning algorithms can be used to forecast water use trends and optimize water management.

3) Thirdly, the suggested solutions may be modified to meet the particular needs of other places. For instance, the system may be used with weather stations to improve the precision of water management in rural regions, or with mobile applications to let users track their water use and get notifications when the water level is low in urban areas.
4) The suggested solutions offer a lot of room for growth and improvement in the future, too. The extension of the system to other regions can help to reduce water waste and ensure sustainable use of water resources while also improving the accuracy and efficacy of the system via the integration of additional IoT devices and technologies.
5) The research on IoT-based well water management systems that employ a master-slave communication model for data sharing, in conclusion, identifies a number of similar themes and trends in the industry. The suggested solutions are designed to overcome the problems with conventional water management methods, and the incorporation of other technologies can improve the system's precision and efficacy. The systems offer substantial advantages and may be customized to meet the unique needs of various fields that are potential for future development and expansion.

III. SYSTEM DESCRIPTION

A. *Block Diagram and Circuit Diagram*

The hardware block diagram of the transmitter is shown in Fig. 1. The master functions as the primary control component and sends a control signal to every slave. Depending on the quantity of wells, there may be numerous slaves connected to each individual well. The management of several wells utilizing a master-slave architecture is made simple and effective with the help of this block diagram, enabling improved control and oversight of the water supply.

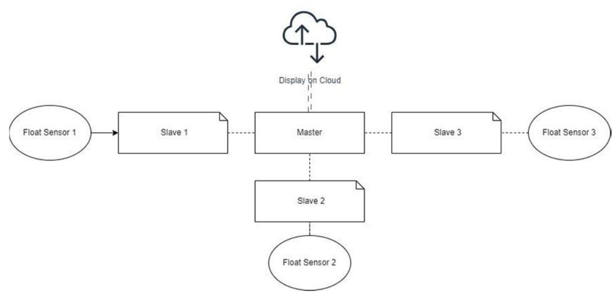


Fig 1: Block Diagram of the System

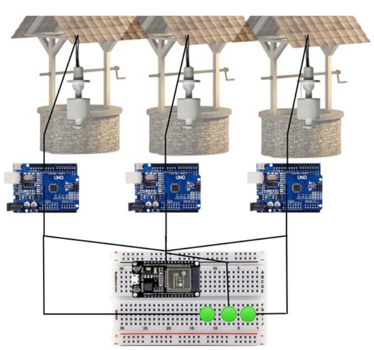


Fig 2: Circuit Diagram of the System

B. *Methodology*

A sensor network, a central control unit, and a master-slave communication strategy are all used in the proposed IoT-based well water management system to accomplish data exchange. Following is a description of the system's methodology:

1) *Sensor Network Deployment:* To gather information on the water level, a sensor network is installed in the wells. A microcontroller is linked to a sensor network made up of sensors like water level sensors.
2) *Approach to Master-Slave Communication:* A central control unit serves as the master device, and the microcontroller serves as the slave device. When data retrieval orders are sent from the master device to the slave device, the slave device replies by returning the desired data. This master-slave communication strategy makes data sharing effective and dependable. In this project, ESP8266 is being used as Master and Arduino UNO is being used as Slave.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

3) *Data Transmission and Processing:* The microcontroller receives data from the sensors, processes it, and then delivers it, using the master-slave communication method, to the central control unit. The data is delivered to the central control unit, which analyzes it and provides real-time feedback on the water level.
4) *Making Decisions:* The central control unit's real-time feedback enables prompt and well-informed decision-making. For instance, the central control unit may instruct the motor to begin pumping water into the well if the level of water in the well is low.

An IoT-based well water management system that employs a master-slave communication model for data sharing may be put into place using the methods described above as a framework. By giving people access to clean, safe water, the system has the ability to improve livelihoods while addressing issues with conventional water management systems.

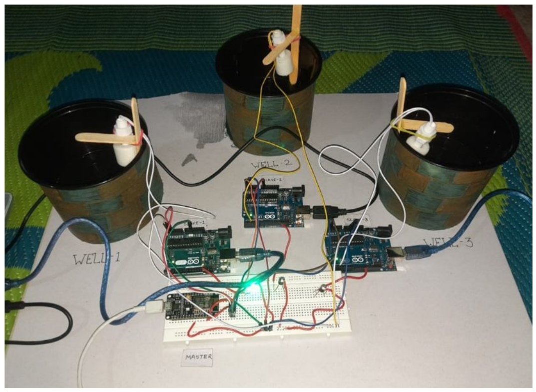


Fig 3: LED 1 glows

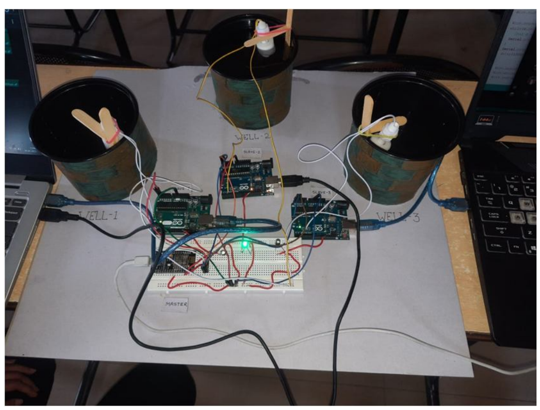


Fig 4: LED 2 glows

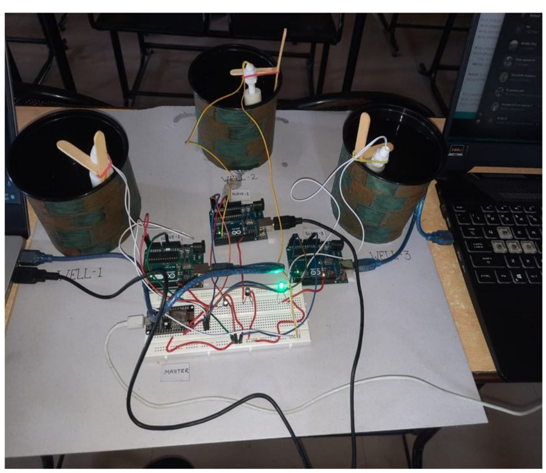


Fig 5: LED 3 glows

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

IV. RESULTS

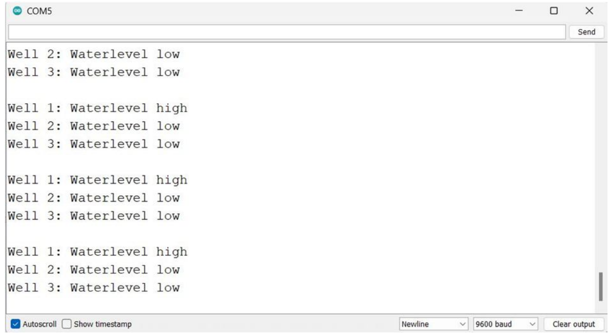


Fig 6: Well 1 water level high display

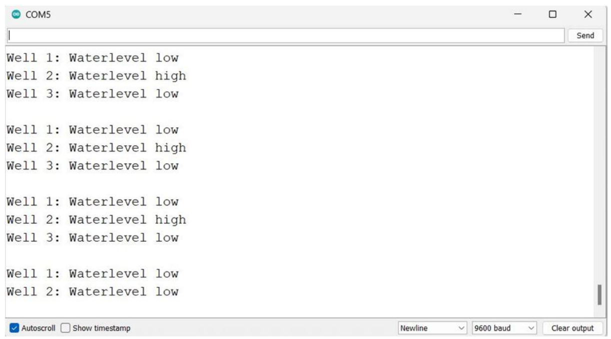


Fig 7: Well 2 water level high display

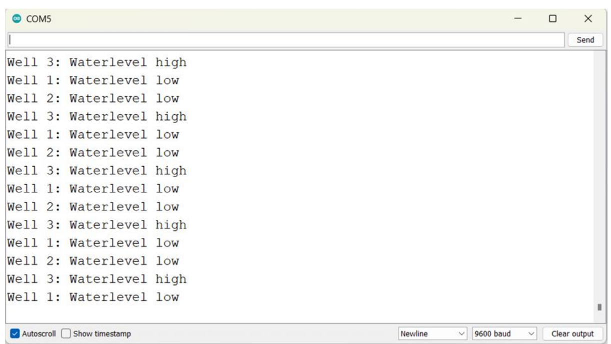


Fig 8: Well 3 water level high display

V. FUTURE SCOPE

The proposed system can further be modified by the points mentioned below:

1) *Attachment of Water Pumps:* After monitoring the water levels of the wells analysis can be done and then the water from the well with more water can be pumped to the well with lesser water level.
2) *Integration with other IoT devices:* To improve the precision of water management, the suggested system may be linked with other IoT devices like water quality sensor, humidity sensor etc. It can also be associated with weather stations. Weather stations can offer real-time information on temperature, humidity, and rainfall that can be used to optimize water consumption and cut down on waste.
3) *Algorithms for machine learning:* Algorithms for machine learning can be included into the system to forecast patterns of water use and improve water management. The algorithms can examine past data to spot trends and offer information that may be utilized to make wise judgements.
4) *Mobile Application:* To offer real-time feedback on the quantity and quality of water, a mobile application may be created. Users of the programme may also be able to keep an eye on their water consumption and get warnings when the water level is low.

5) *Cloud-Based Analysis And Storage:* The system is compatible with cloud-based solutions for data analysis and storage, which can offer a centralized platform for data storage. Users may access data stored in the cloud from any location, and cloud-based analytical tools can offer enhanced analytics capabilities.
6) *Extension To Further Regions:* The suggested system may be extended to additional regions, such as metropolitan areas where water management is a pressing concern. The system may be modified to fit the region's unique needs and can help ensure sustainable use of water resources by lowering water waste.

VI. CONCLUSION

In conclusion, an efficient method for controlling well water resources may be found in the suggested IoT-based well water management system, which employs a master-slave communication strategy for data sharing. Real-time monitoring of the quality and amount of water is made possible by the system's efficient and dependable data interchange between the sensors and the central control unit.

The system can help prevent water waste, guarantee the sustainable use of water resources, and enhance community livelihoods. The accuracy and efficiency of the system may be improved by the incorporation of other IoT devices, machine learning algorithms, cloud-based storage, and analytic tools.

The suggested system may be modified to meet the particular needs of various places and has a great deal of room for future growth and improvement. The system may be made more effective and efficient by integrating a mobile application that allows users to track water consumption and get warnings when the water level is low.

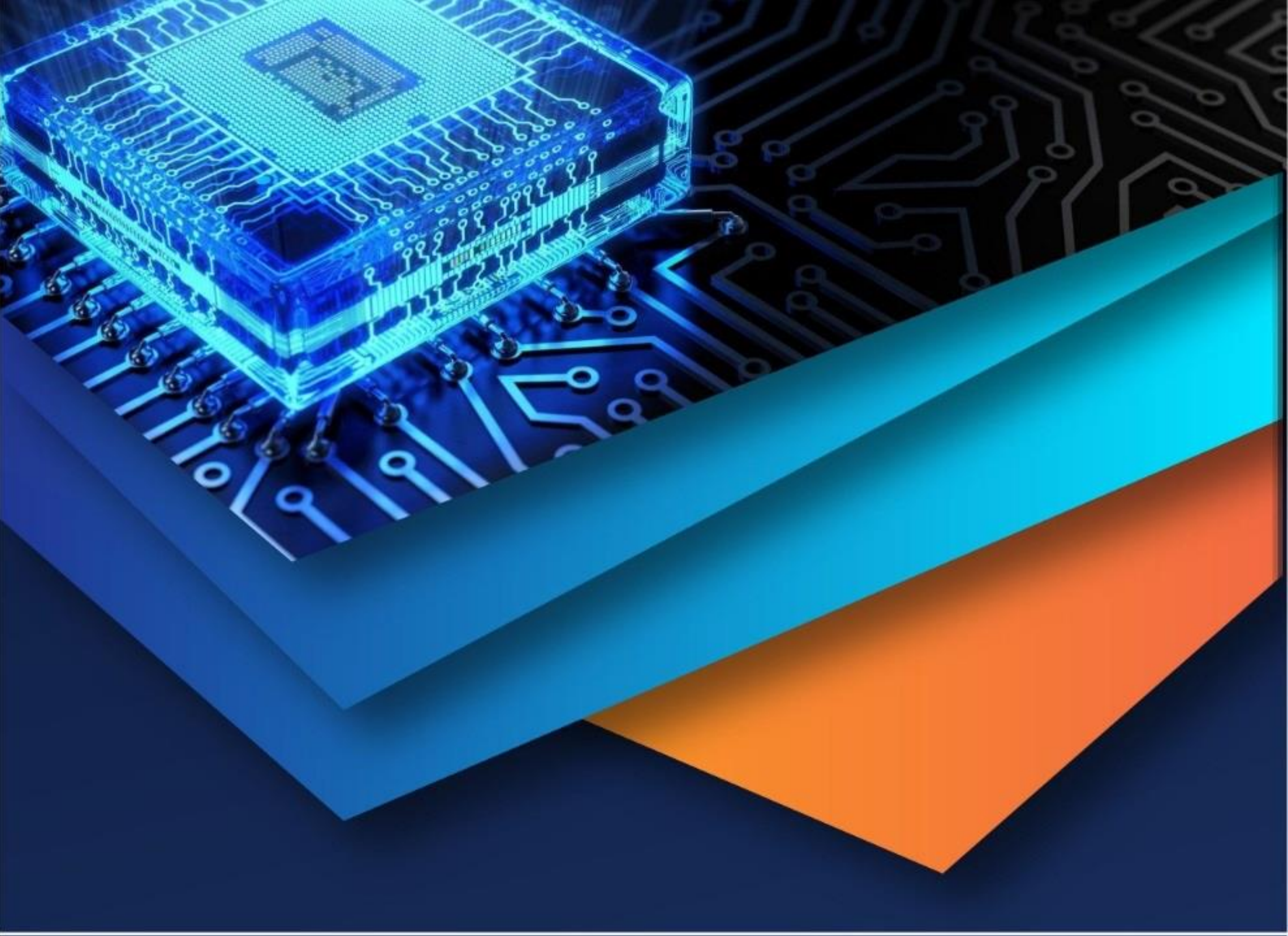
In general, the suggested Internet of Things (IoT)-based well water management system may overcome the issues with conventional water management systems and help to achieve the sustainable use of water resources.

VII. ACKNOWLEDGMENT

It gives us immense pleasure to express our deep sense of gratitude with sincere thanks and appreciation to our project guide Prof. Manisha Mhetre Madam for suggesting and supporting us to carry the project work. We were able to complete this project successfully with the help of valuable guidance and constant encouragement from her.

REFERENCES

[1] Ahmed, R. (2019). Internet of Things Based Smart Water Management System. International Journal of Advanced Science and Technology, 28(19), 364-371.
[2] Balaji, P., & Kannan, R. (2018). IoT based Smart Water Management System. International Journal of Pure and Applied Mathematics, 119(17), 885-892.
[3] Chauhan, A., Jain, A., & Sharma, S. (2017). IoT Based Water Quality Monitoring and Controlling System using Arduino. International Journal of Innovative Research in Science, Engineering and Technology, 6(4), 6514-6520.
[4] Das, B. K., & Mishra, S. K. (2019). IoT Based Smart Water Management System: A Review. International Journal of Engineering and Advanced Technology, 8(2), 94-99.
[5] Shinde, P., & Shirke, S. (2019). IoT Based Water Management System using Machine Learning. International Journal of Innovative Technology and Exploring Engineering, 8(9), 1552-1558.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY