

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 2, February 2020

Tank Water Monitoring System Using IoT

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ABSTRACT: Water source is necessary and an important factor in agricultural and farm production and is a key of our quality of life as well. Monitoring water level of a water source, such as water tank or borewell etc., plays a key role in agricultural. For example if a water level drops below the threshold level for pumping in a borewell, the pump motor may get damaged due to dry running. In such case monitoring water level and controlling the water pump accordingly becomes necessary task. There are many other situations where water level monitoring is an important task. It may be used to preserve water or to study the water usage of a water source. This paper proposes a prototype system design, implementation and description of required tools and technologies to develop Internet of Things (IoT) based water level monitoring system which can be implemented in future smart villages in India

KEYWORDS: Internet of Things, IoT, Water Level Monitoring, Smart Village, IoT Application, Smart Agricultural

I. INTRODUCTION

Imagine the usefulness of being able to switch on the air conditioner system ten minutes before you get home on a hot afternoon. How about security system to detect smoke, burglary attempts alerted to you. These imaginations build the idea of Water Level Monitoring that has no end. The sophisticated Water Level Monitoring systems of course record the usage of water.

Technology nowadays has become an integrated part of people's lives. It has, and continues to influence many aspects of daily life and has allowed better social interaction, ease of transportation, the ability to indulge in entertainment and media and has helped in the development in medicine. The creation of many devices such as mobile phones and computers have caused many people to rely on technology to communicate with their friends, store information such as pictures, movies, documents, and music.

The internet has become a common interface that many devices use in order to simplify the daily life of many people giving the ability to search for information, store their own information in the cloud while also giving them better ways of managing information. From the time of its introduction, the number of people that use mobile phones and the internet to communicate with other people has increased dramatically to become one of the major means of communication. People with the help of smartphones can now connect to the internet without the need for a computer, while still offering the same functionality but through different means. With the introduction of advanced software and hardware devices, smartphones are now powerful devices and have become an important part of people's daily lives. A major aspect is how the Smartphone is able to connect and communicate with other devices.

A field that is recently gaining popularity is Water Level Monitoring which can also use smartphones as information or functionality hubs.

Villages in India will soon be transforming to smart villages as Government of India brings Smart Village initiative to the

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country. The smart village initiative will promote digital inclusion which will enable the enhanced access to services through Information Technology (IT) enabled platforms. Thus the Internet of Things (IoT) has a major role to play in Smart Village in India. In IoT enabled Smart Village every physical object, a thing, will be connected to the Internet and enable users to keep track of its status and to control it remotely. This will help users to access to services provided by such objects as and when required. IoT can be used in smart village to develop Smart Agriculture, Smart Dairy, Smart Schools, Smart Healthcare and Smart Grid solutions. IoT in agriculture can be used for better management of resources used in crop production. Water is one of the important substances used in crop production. It must be saved to avoid water shortage in future. One such way to save water is to monitor and study its usage and accordingly its utilization should be managed. Monitoring water level of a water source, such as water tank or borewell etc., plays a key role in water management. Keeping track of water level in a water source can be used to preserve water and to study the water usage. Thus monitoring water level is an important task in agricultural.

II. LITERATURE REVIEW

2.1 HISTORY OF WATER LEVEL MONITORING SYSTEM

Water Level Monitoring can be found in many areas since before. Various types of Water Level Monitoring system based on the control are:

- 1. Individual systems:** This is a very popular type of systems. Here the whole model is implemented on a targeted single source system.
- 2. Large control systems:** Here the water level is implemented on a very large scale basis and huge amounts of sensors are used.
- 3. Central Control systems:** Computerized systems programmed to handle all the functions of multiple utilities like air conditioning system or home entertainment systems, refrigerators all at the same instant regardless of your presence. Control system can be accessed through telephone or internet from any corner of the world.

Based on the method of automation various types are as follows:

- 1. Bluetooth based Water Level Monitoring:** Here Bluetooth plays a major role in alerting the anomalies.
- 2. Remote Water Level Monitoring:** In this, the system is controlled remotely.
- 3. Automatic Water Level Monitoring:** The system is programmed to automatically perform some defined actions.

2.2 RESEARCH WORK

[1] This paper explains the advantages of water level monitoring and proposing on using the WiFi or wireless based type of monitoring using the Aurdino.

[2] This paper deals with brief explanation of using aurdino to automate the homes. The existing system of the Bluetooth method of automation limitations was analyzed to prove that android and Aurdino make up for a better method of automation. The hardware and software specifications are also explained.

[3] A prototype for Water Level Monitoring is developed for detecting water level through the internet. A central device

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like microprocessor connects to the internet and receives orders to control sensors. A server manages the users and devices. Android Application acts as a front-end to interact.

[4] The cloud is a platform that connects things around us so that one can access any device anywhere in a user-friendly manner. Applications that use devices such as sensors need immense space to store volumes of big data with huge computation power for real-time processing. This paper proposes a method of automation where the cloud uses the SHA-1 and Naive Bayes algorithm.

[5] This paper presents the design and implementation concepts for a wireless real-time Water level monitoring system based on Arduino Uno microcontroller as central controllers. The proposed system has two operational modes. i) manually-automated mode in which the user can monitor and control the home appliances from anywhere in the world using the cellular phone through Wi-Fi communication technology. ii) self-automated mode that makes the controllers be capable of monitoring and controlling different appliances in the home automatically in response to the signals comes from the related sensors. A hardware implementation with Matlab-GUI platform for the proposed system is carried out to show the reliability of the system thus making it a simple, cost-effective and flexible resulting as a good candidate for the smart city future.

[6] The existing system presents a low cost and flexible water level monitoring system using an embedded microprocessor and microcontroller, with IP connectivity for accessing and controlling devices and appliances remotely using Smartphone application. The proposed system does not require a dedicated server PC with respect to similar systems and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality.

[7] The need to access and control IOT devices is described. For security purposes such as avoiding cyber-crime authentication mechanisms are proposed like:

- i) Tagging mechanism for access control,
- ii) Tag Assignment,
- iii) Selective Publication; finally describing the steps of the algorithm followed.

[8] Low cost and flexible Water level monitoring system are discussed. An embedded micro web server in Arduino is used with IP connectivity to access and control devices.

[9] This paper delineates about the existing Water level monitoring system using IR Sensors Also proposal of using the Android Smartphone to control devices using the WiFi as a communication protocol thus creating a friendly interface force communication between the Raspberry Pi server and the Android device.

III. SOFTWARE REQUIREMENT SPECIFICATION

3.1 OVERVIEW

The automation system that is developed works as follows. When water is detected the LED's are switched on and vice versa. For this, the movement is detected by the IR sensor. The various levels will be shown. The automation system that is developed works as follows. When water is detected the LED's are switched on and vice versa. For this, the movement is detected by the IR sensor. The various levels will be shown.

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3.2 HARDWARE REQUIREMENTS

Hardware requirement analysis is to define and analyze a complete set of functional, operational, performance, interface, quality factors, design, criticality and test requirements. Water Level uses the Aurdino board along with the IR sensors.

System: Dual Core Processor Board: Aurdino board. Sensors: IR sensors HDMI to VGA converter, power supply, relay.

IV. DESIGN REQUIREMENT

4.1 System Architecture

The overall system presented in this study is subdivided into of three layers of the system architecture. The physical layer, service layer and presentation layer.

Physical Layer: Physical layer consists of sensor nodes and communicate ion technologies. At this layer the data is collected and sent to the service layer.

Service Layer: The service layer plays an important role in the system architecture. The application/business logic is implemented here. It also stores collected data for future use. This layer also provides various tools for data analytics.

Presentation Layer: The most upper layer is the presentation layer which visualizes the information to the user and allows user to interact with the system.

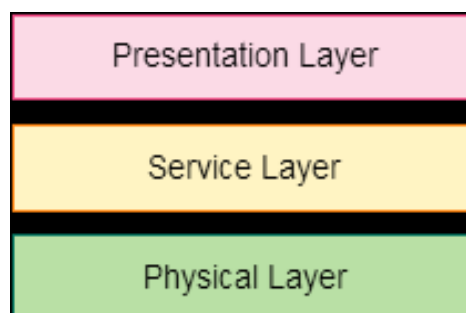


Figure 1: The three layers of the proposed system

The working principle of the proposed system architecture for monitoring water level is shown in figure 2.

In this proposed application architecture of the system, the physical layer consists of the physical environment such as water source and WSN node to sense the water level in a water source with required network connectivity. The sensor data is uploaded to carriers [9] at service layer of the architecture which is the second layer. The carriers is a cloud application platform for IoT. Carriers has many advantages. It receive data stream from WSN in real-time and is used to store and analyze data stream. Many other operations can be performed on data streams such as generating event triggers, alerting users through SMS or social network. At the presentation layer of the system, user of the application is the main focus. This layer allows user to interact with the system. At the presentation layer of the application architecture freeboard [10] is used to visualize the data. Freeboard is a dashboard that works as a visualization tool. It provides several widgets for this purpose. Freeboard receives data stream from carriers in JSON format and then visualize it according to selected widgets.

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The widgets at freeboard are updated in real time as soon as carriots is updated with data stream. The communication between carriots and freeboard is done using REST API.

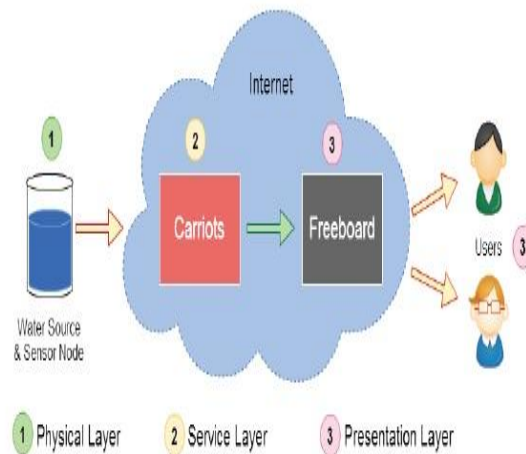


Figure 2: Interaction between the three layers of proposed Water Level System

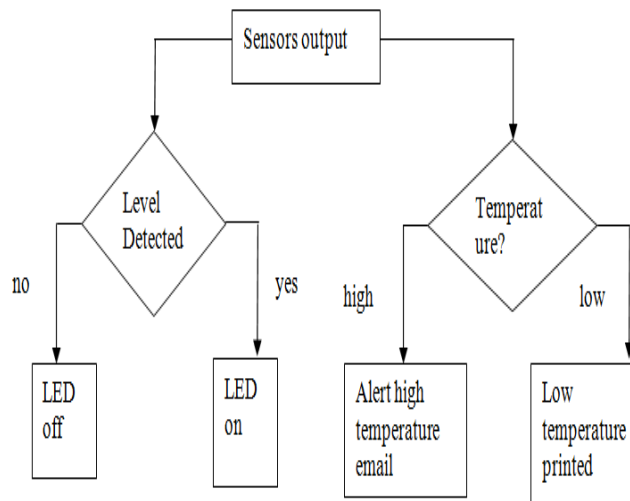


Chart 1: Flowchart of the proposed system

V. IMPLEMENTATION

XRDP: Xrdp is the main server accepting connections from RDP clients. Xrdp contains the RDP, security, MCS, ISO and TCP layers, a simple window manager and a few controls. It's a multi-threaded single process server. It is in this process was the central management of the sessions are maintained. Central management includes shadowing a session and administrating pop-ups to users. Xrdp is controlled by the configuration file xrdp.ini.

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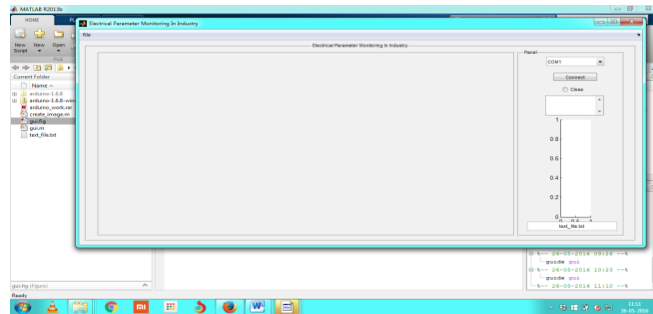


Fig -3: GUI Monitor

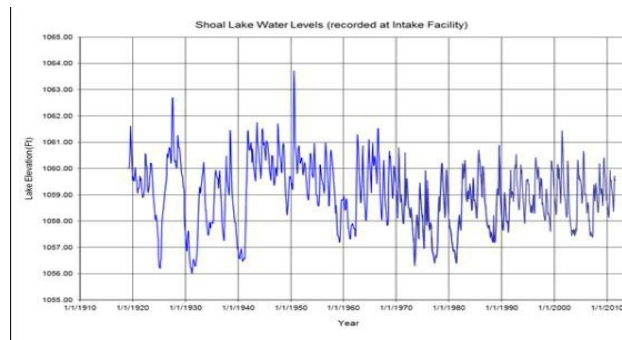


Fig -4: Result Analysis

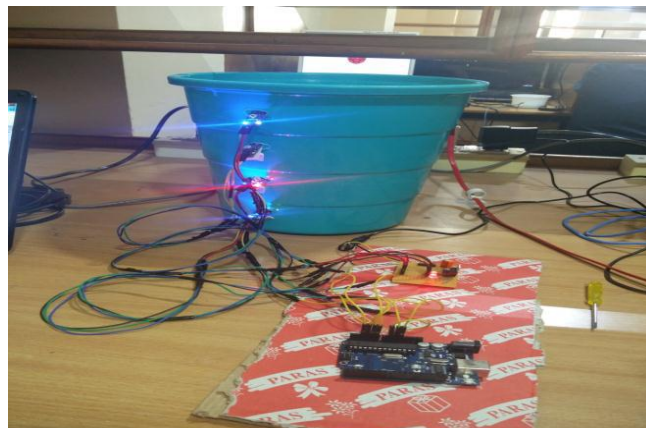


Fig -5: Setup

VI. CONCLUSION

The Internet has changed the dimensions of life involving virtual interaction. IOT has the potential to add new dimensions enabling smarter objects communications. The project proposes a simple water level monitoring system with different

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levels indicated. It also signifies when the water level is below and above then the requirement. System design and architecture is as discussed, thus being a cost-effective and simple strategy to monitor the water level system. Future Work can involve the analysis of water level in a particular area so that the wastage of water is prevented. We can also include the GSM-based system where the message will be sent to the particular authorized person when the water level is below the required level.

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