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WATER LEVEL MONITORING SYSTEM USING IOT

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Abstract - *One of the major problems faced by most of the countries is the issue of water scarcity in the world and wastage during transmission has been identified as a major culprit; this is one of the motivations for this research, to deploy computing techniques in creating a barrier to wastage in order to not only provide more financial gains and help the environment as well as the water cycle which in turn ensures that we save water for our future. IOT based Water Level Monitoring system is an innovative system which will inform the users about the level of liquid and will prevent it from overflowing. To demonstrate this the system makes use of containers, where the ultrasonic sensors placed over the containers to detect the liquid level and compare it with the container's depth. The system makes use of AVR family microcontroller, Raspberry Pi, LCD screen, Wi-Fi modem for sending data and a buzzer. A 12 V transformer is used for power supply in this system. The LCD screen is used to display the status of the level of liquid in the containers. The liquid level is highlighted as colored to show the level of liquid present in the container with the help of a web page to the user. The buzzer starts ringing when the set limit of the liquid is crossed. Thus this system helps to prevent the wastage of water by informing about the liquid levels of the containers.*

***Key Words*: AVR microcontroller, LCD, Raspberry Pi, Wi-Fi and buzzer**.

1. 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.

1.1 OBJECTIVE

The main aim of this system is to monitor the water level at rural areas so that they help in detecting the wastage of water and measures can be taken to avoid unnecessary overflowing of water in the areas where monitoring is a difficult task.

1.2 DELIVERABLES

The LED switches on when the particular water level is detected. Level of water is detected by IR sensor. We have defined 4 levels at 20,40,60 and 85 and whenever water reaches the respective levels the LED at that level will glow.

2. 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 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.

[10] Illustration of the method to automate the Water level monitoring using the secure WiFi technology that acts as a server is shown. Various systems that can be monitored are temperature and humidity, motion detection.

3. 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

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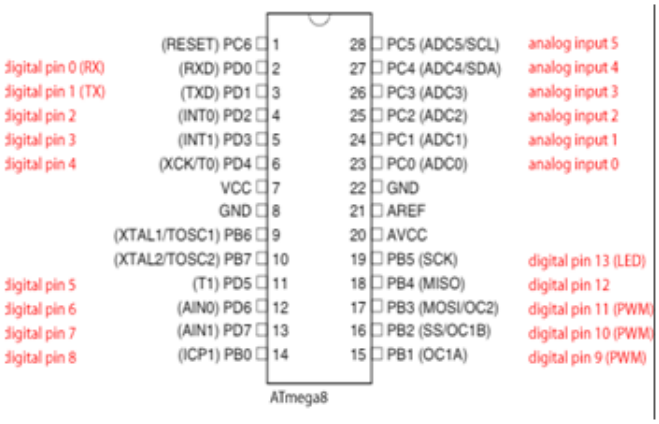
3.2 HARDWARE REQUIREMENTS

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.

Fig -1: Aurdino Pin Details



a. Power Pins

The header provides 5V on Pin 2 and 3.3V on Pin 1. The 3.3V supply is limited to 50mA. The 5V supply draws current directly from your micro USB so you can use whatever is left over after the board has taken its share. A 1A power supply could supply up to 300mA once the board has drawn 700mA**.**

b. Basic GPIO

The header provides 17 Pins that can be configured as inputs and outputs. By default they are all configured as inputs except GPIO 14 & 15. In order to use these pins, you must tell the system whether they are input or output.

c. IR sensor

This detects the movement of the object in the environment. IR Sensors work by using a specific light sensor to detect a selected light wavelength in the Infra- Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

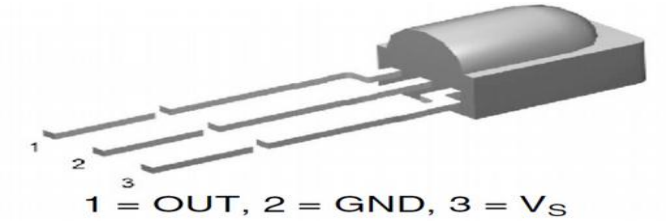


Fig -2: IR sensor

3.3 SOFTWARE REQUIREMENTS

Software requirements definition is an abstract description of the services, that the system should provide, and constraints under which the system must operate. Only the superficial behavior of the system should be specified and is not concerned with system design characteristics.

Operating system: WINDOWS IDE: XRDP
Coding language: Matlab

3.4 SOFTWARE SYSTEM ATTRIBUTES

1. **Reliability:** The overall consistency of a measure.
A measure is said to have a high reliability if it produces similar results under consistent conditions.

2. **Availability:** The degree to which a system, subsystem or equipment is in a specified operable and committable state at the start of a mission, when the mission is called for at an unknown.

3. **Security:** Degree of resistance to any harm.

4. **Portability:** Using the same software in different environments.

5. Maintainability: Measures the ease and speed with which a system can be restored to operational status after a failure occurs.

6. **Performance:** To analyze if the system meets its goals.

3.5 PERFORMANCE REQUIREMENT

In order to assess the performance of a system, the following are necessary:

- Response
- Workload
- Scalability
- Platform

4. DESIGN

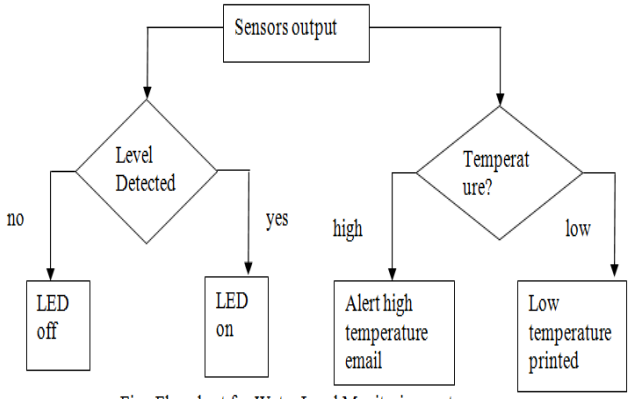


Chart 1: Flowchart of the proposed system

5. IMPLEMENTATION

5.1 TOOLS USED

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.

Python IDE: Python is an interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently whereas other languages use punctuation, and it has fewer syntactical constructions than other languages.

- **Python is Interpreted:** Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- **Python is Interactive:** You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- **Python is Object-Oriented:** Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- **Python is a Beginner's Language:** Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to browsers to games.

6. RESULTS AND SNAPSHOTS

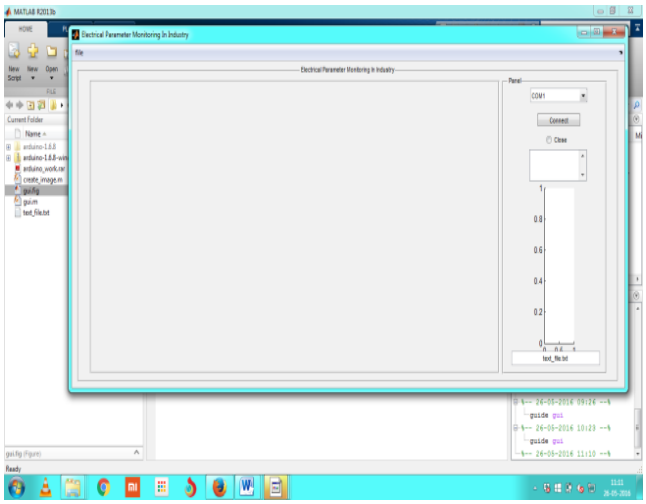


Fig -3: GUI Monitor

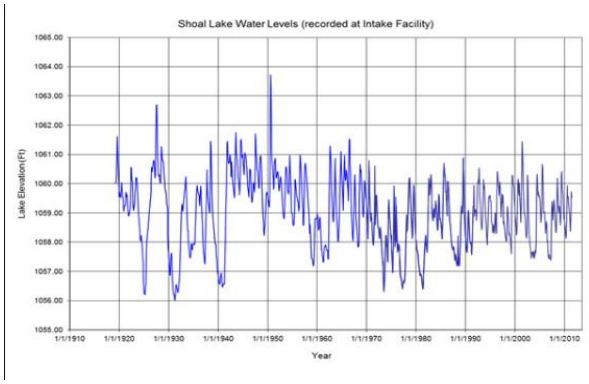


Fig -4: Result Analysis

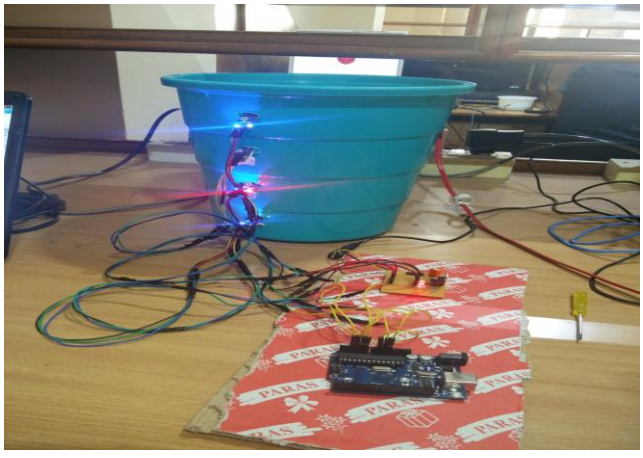


Fig -5: Setup

7. 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 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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