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Water Management System Using IOT

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ABSTRACT -- For both the economy and for life, water is a crucial resource. Managing water scarcity is one of the biggest problems we face today. We lack the motivation to invest in the implementation of technologically sophisticated systems for organised water distribution because the value of water usage optimisation from a financial point of view is not that pronounced. A water distribution system's control stations keep an eye on a number of factors, including water pressure, flow, and quality. In these facilities, wireless sensor networks with extremely low power requirements, powered by vibration-based energy harvesters, may be a suitable alternative to the use of batteries or wired connections for these monitoring tasks. Such a system is the most effective way to conserve water based on their historical data from smart water meters. Drinking water travels directly from treatment plant to household by a pressurized mains depending on a technologies. We can also pump water to high storage tank. Special device and equipment have to regulate water pressure according to fluctuate level and consumption. The transport of drinking water from a treatment facility or well to a facility connection or consumer tap is known as a water distribution system. These systems aim to protect the quality and quantity of water as well as maintain adequate pressure in the distribution of water.

I. INTRODUCTION

Water is a priceless natural resource with a limited supply. The amount of usable water per person is decreasing as our nation's population continues to expand. Rapid industrialization and urbanization have led to an improved standard of living which has increased the demand for fresh water[1-2]. Water supply systems need to be designed in an efficient way, accounting for both construction costs and operational energy expenditures when pumping is required. Water supply systems should be built to accommodate this since water demand fluctuates depending on the needs of the moment, particularly when it comes to agricultural applications. Water supply systems are basic necessity of every city or town having dense population. If good water supply systems are not provided, general health in a city cannot be maintained. Global population increase pollution, severe droughts, overuse of groundwater, and an uneven distribution of water resources all contribute to the challenge of increasing water scarcity[3]. The uneven distribution of available freshwater is not limited to Subcontinents but the same is observed across the countries, states, districts, and villages. According to data from the water experts at Navigant Research, the average city water utility in the United States loses up to 30% due to leaks or uncharged usage. It is way higher in places like Delhi where water losses are up around 53 percent. Considering the scenario, countries like India are struggling with water scarcity and cannot continue to ignore the cost of water losses. The water distribution systems are considered to be the backbone of the society, as water is one of the prime need of humans. Almost 99 percent of the population is depending on the WDS for their water needs, from start of the day still go to sleep[3-4]. As per Indian scenario, population of India is 17.1 percent of the world's population and freshwater availability is 4 percent of the world's fresh water. This shows the controversy between the figures of population and fresh water availability. The WDS is confronted by changing drivers in the sustainable management of drinking water. Water management is not a separate issue but it is directly or indirectly inter-related with the other important issues which must be considered very seriously. Economic development, health, effective governance, agriculture and industry growth, environment etc., are inter-related with water management. The precise data collection helps in water management and finalizes government policies. For urban water utilities, both lengthy drought-related water shortages and low pressure during times of high demand can be problematic. This issue demonstrates the shortcomings of the current water distribution system and the possibilities for modern urban water management based on smart technologies to provide consumers with a safe, dependable, and sustainable water supply. The goal of water demand management is to create and put into practise techniques that will guarantee a more effective water supply and encourage water conservation practises. Water-use feedback compares water consumptions and offers generic, less-personalized level advice.

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II. PROBLEM STATEMENT

The population of metropolitan areas is clearly growing swiftly nowadays, along with the need for pleasant living, as a result of an increase in people moving from rural areas to urban areas. With increase in population, urban areas have expanded, water becomes one of the major problems in a city particularly water distribution, interfered with water supply, water protection, water utilization and furthermore the water quality. It is necessary to put in place an appropriate monitoring and controlling system to address issues related to the water supply.

III. METHODOLOGY

The proposed system provides the fixed water consumption and water distribution to avoid water shortages, leakage, and unwanted wasting of water. This system supplies 50ltr of water per day and in case of emergency and based on the necessity, they can also consume as much as they need with additional charges. The Water flow detection sensor measures the water flow supplied to each house and also prepares the tariff amount that is consumed by the consumers. This benefits both the consumers and water utility companies. Smart tariff system also includes the bill that is generated based on the usage of the water, although the consumer uses the extra water than the fixed quantity, it adds the amount of extra usage. Each consumer is provided with separate RFID tags which reads their consumption and generates bill. All these data can be viewed with the help of LCD display unit and is also updated to an Android application using Blynk app which is monitored using mobile phone. Through IOT, the bill and the amount of consumption is generated.

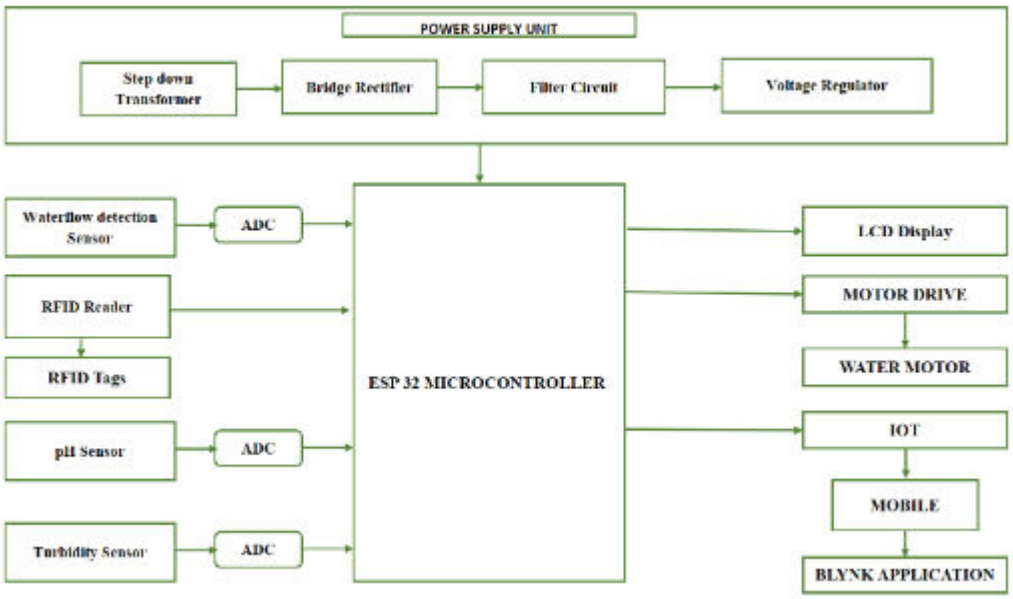

Fig.1 Block Diagram of Water Management System Using IOT

IV. FUNCTIONAL PARTITIONING

The project comprises two components: Hardware and Software. The Arduino UNO was utilized in this project, and as a result, the Arduino IDE was used. The hardware components employed in the project are listed below.

1. ESP32 MICROCONTROLLER

A line of inexpensive, low-power system on a chip microcontrollers with built-in Wi-Fi and dual-mode Bluetooth is known as the ESP32. The Tensilica Xtensa LX6 dual-core or single-core microprocessor, Tensilica Xtensa LX7 dual-core, or a single-core RISC-V microprocessor are used in the ESP32 series, which also has integrated antenna switches, RF baluns, power amplifiers, low-noise receive amplifiers, filters, and power management modules. Chinese business Espressif Systems, with headquarters in Shanghai, invented and constructed the ESP32, which is produced by TSMC

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using their 40 nm technology. It is the ESP8266 microcontroller's replacement.

2. LCD Display

Similar applications where LEDs are employed also employ liquid crystal displays (LCDs). These applications involve the segmental and dot matrix displays of numeric and alphabetic characters.

3. RFID READER AND TAG

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data.RFID tag is a microchip combined with an antenna in a compact package; The way the package is made makes it possible to attach an RFID tag to a tracking object. "RFID" stands for Radio Frequency Identification. The antenna of the tag receives signals from an RFID reader or scanner and then transmits the signal back, typically with some extra data. An RFID tag classified as passive lacks a battery; instead, the reader supplies power. A passive RFID tag's coil antenna generates a magnetic field when it comes into contact with the reader's radio waves. It provides electricity to the tag, illuminating its circuits. The tag then transmits the data recorded in its memory.RFID readers' RX and TX pins are connected to the 8051 microcontroller's TX and RX pins, respectively. Following that, the reader reads the data from the Tag and sends it via serial port to the microcontroller.

4. ADC

The data acquisition component, designated ADC0808 and ADC0809, is a monolithic CMOS device featuring an 8-bit analog-to-digital converter, an 8-channel multiplexer, and control logic that is compatible with microprocessors. The conversion method used by the 8-bit A/D converter is sequential approximation. The converter includes a successive approximation register, a 256R voltage divider with analogue switch tree, and a high impedance chopper stabilised comparator. Any of the 8 single-ended analogue signals can be directly accessed by the 8-channel multiplexerThe gadget does away with the necessity for external full-scale and zero adjustments. The latched and decoded multiplexer address inputs and latched TTL TRI-STATE outputs make it simple to interface with microprocessors.The ADC0808 and ADC0809 designs have been optimised by combining the best features of various A/D conversion methodologies. The ADC0808 and ADC0809 provide good long-term precision and repeatability, high speed, high accuracy, little temperature sensitivity, and little power consumption. This device is perfectly suited for applications ranging from process and machine control to consumer and automotive ones thanks to these qualities. See the ADC0816 data sheet for a 16-channel multiplexer with a common output (sample/hold port).

5. Power Supply Unit

A source of electricity is referred to as a power supply. A power supply unit, or PSU, is a device or system that provides electrical or other types of energy to an output load or group of loads. The phrase is most frequently used in reference to electrical energy sources, less frequently to mechanical ones, and infrequently to others.

6. Embedded C

The C Standards committee created Embedded C as a set of language extensions for the C programming language to solve issues of commonality between C extensions for various embedded devices. The C language has traditionally needed nonstandard extensions to implement exotic features like fixed-point arithmetic, many separate memory banks, and fundamental I/O operations. The C Standards Committee expanded the C language in 2008 to solve these problems by establishing a uniform standard that all implementations must follow. It has a variety of features not found in standard C, including named address spaces, fixed-point arithmetic, and fundamental I/O hardware addressing. The majority of conventional C's syntax and semantics are used by embedded C, including the main() function, variable definitions, and datatype declarations.

7. IOT

Users can gain deeper automation, analysis, and integration inside a system using IoT systems. They increase the accuracy and range of these areas. IoT makes use of both established and new technologies for sensing, networking, and robotics.IoT takes advantage of current software developments, declining hardware costs, and contemporary attitudes towards technology. Major changes in the distribution of commodities, services, and products, as well as the social, economic, and political effects of those changes, are brought about by its novel and cutting-edge components.

8. Blynk App

For use with the Internet of Things, Blynk was created. It can store data, visualise it, display sensor data, remotely control hardware, and perform many other fascinating things.

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V. CONCLUSION

In tariff planning, the problem is to design rates which are simultaneously efficient, feasible and equitable for different consumer groups. Moreover, the rates must often be optional, so that consumers can choose between different rate options. The solution proposed in this paper is to allows the utility to take into account its equity concerns in the search of efficient, feasible and fair rates.

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