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IoT based Water Monitoring and Alerting System

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ABSTRACT

The goal of this project is to implement a product to help the charging system for Indian urban household water consumption. The project involves a water flow sensor to provide an unconcerned solution for calculating and tracking water usage with ATMEGA-328 micro-controller, which generates and transmits SMS at the end of each month. Alternatively, we can monitor the water usage in BLYNK mobile app.

Key words: Microcontroller,ATMEGA-328, BLYNK, Consumption, Water flow sensor.

1.INTRODUCTION

Through building consists of a single Analog water meter in the current water billing system and, regardless of the amount of water used, the overall bill is always divided into the entire property. Our system can be set up cost-efficiently in each room. And many of the instruments used in the process include both the Analog (mechanical) and the digital meters, but the two meters do not make it easy to read the values and transmit them to the user on time, enabling the user to monitor the use every day and therefore aid in future water usage planning and therefore in water conservation efforts.

At the moment, the user will wait until the end of the month to know how much his water is being used, so that the user can hardly access the regular data. After that, it's time to get the water bill. The bill is not appropriate. With timely notification of username and SMS to your mobile phone, the usage of water can be regularly tracked via the free cloud platform and the total amount of water.

The goal cost of around 2000 INR seems to be expensive compared to the currently used mechanical water meters, but because this is a one-time expense, it is likely to save consumers money because only what they are using will be accounted for. Rust can be formed in Mechanical water meters due to corrosion because they are made of metal. The meters are visible to the outside world. In the case of our proposal with more circuitry and less mechanical components, the machine can be made less vulnerable to environmental change as it has a wide variety with working conditions. It is sent via SMS when it is consumed at the end of the month. Software is also designed to act as a user interface for such features.

2.LITERATURE SURVEY

According to the work of Ria Sood, Manjit Kaur and Hemant Lenka, they have contributed to the design and construction of an automated water flow meter.

Paper aimed at developing a low-cost flow meter model for calculating the flow rate through the irrigation pipeline.Kulkarni and Tim Farnham focused on identifying the significant problems associated with water treatment plants, such as leakage management, demand management, asset management and so on.

Early work on the optical water meter has been performed using a hall-effect sensor and a microcontroller. The computer was used for data collection and the offline method. Other researchers are developing the use of Zigbee Technology and GPRS-GSM technology for wireless communication.

The other development of the water flow meter is the use of a velocity meter coupled with ultrasonic sensors, which make it operate on two separate concepts and based on the Doppler effect. All have high costs, particularly in the maintaining of the system.The other development of the water flow meter is the use of a velocity meter combined with an ultrasonic sensor, which lets it work on two different principles based on the Doppler effect. They all have high costs, especially concerning the maintenance of the network.

This model has developed and implemented a network of wireless sensors for power, water and other devices. We have introduced a meter reading program based on IOT technology due to the difficulty of conventional metering such as error reading, inaccuracy, external factors affecting measuring. This program carries out tasks including calculation interpretation, bill delivery and notification.

3.PROBLEM STATEMENT

In the current water billing system, each building consists of one analogue water meter and the total bill amount is equally applied to each home in that building, irrespective of the amount of water the household uses, our system is cost-effective enough to be built in any household.

Besides, many of the water systems used in the process are analogue (mechanical) and digital meters, which do not allow the facility to read the values and transmit them to the customer in good time, allowing the user to monitor their everyday usage and thus help with potential water usage planning and therefore help with water conservation steps.

4.SUGGESTED SYSTEM

The method for monitoring the use of water is to calculate the inflow and outflow of water. Water supplied by the Water Distribution Authority is collected in ground-floor reservoirs or overhead reservoirs and then distributed to the rest of the customers.

In this project, we will mount a flow measurement sensors at the output and then monitor the amount of water being sent from the water reservoirs. Then one sensor at each house inlet. The cumulative usage of individual house is compared with the water sent from the reservoir to know the difference in water usage.

If there is any difference in the usage then, a message is sent to the concerning authorities.

5.PROGRAM DESIGN

The program requires the use of a wide variety of creative technologies. First, the use of high-density polyethene pipes requiring fewer joints makes the device more durable and avoids leakage of water.Second, the use of the Automated Meter Reading system has contributed to the possibility of a successful measurement of water at any time and with 100% precision.

This IoT-based automated water billing system consists of a digital water flow sensor that is used to calculate the volume of water collected more accurately than standard analogue meters.

Depending on the amount of water used, the bill will be drawn up towards the end of the month and a notification will be sent to the registered customer. At the same time, the specifics of this bill are shown on the LCD panel, eliminating delays in the process.

Application is made available to customers where they can track the amount of water they use regularly and even use the electronic bill payment system.

Node MCU with an onboard ESP8266 Microcontroller is used for this project. Thismicro-controller has input/output ports. 5V, USB power source. The Water Flow Rate Meter used is centred on the Hall Effect Working Theory.

6.BLOCK DIAGRAM

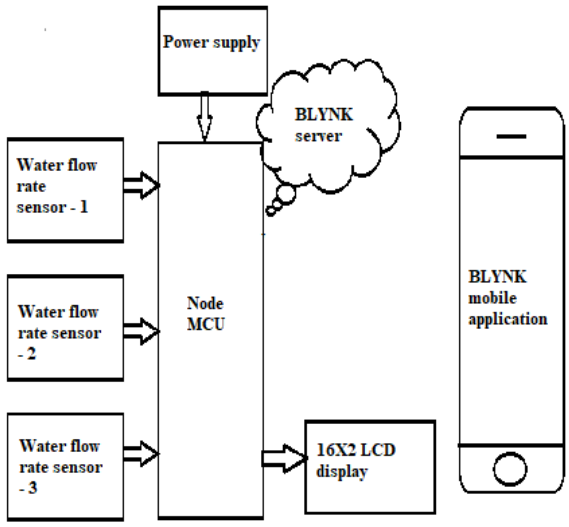

Figure 1: Proposed system architecture

7.PRINCIPLE OF WORKING

The schematic diagram of our concept is seen in the diagram above. Here we used the Node MCU based on the ESP8266 microcontroller since it consists of the built-in Wi-fi module and the water flow sensors are one on the dealer side and two on the customer side. The data is continuously submitted to the Blynk server and the customer can get the information from the Blynk android application and the 16 X 2 LCD is also used to view the amount of water consumed.

8.METHODOLOGY

In this proposed method, we are not only calculating water usage and generating bills on that basis, but we are also monitoring for water leakage or waste and informing the authorities about this.

First, we attach a single water flow sensor at the outlet of the main water tank or reservoir, then one at each house inlet. The water usage of each house can be seen in the LCD monitor And these values are constantly updated to the Blynk server with the support of the ESP8266 wifi module, which has a constant power supply. And these values can also be seen in the Blynk application.

With the support of the code we use, we compare the flow of water from the main tank outlet and the accumulation of each house inlet, if there is any variation in these values, this means that there is some leakage or wastage of water in the pipes.

As there would be a small excess of water in the pipes (water that is always present in the pipes), we are eliminating that amount of water from the difference values collected.
Water bills are released at the end of each month and the bill amount is sent to the owner via e-mail, mobile notification, and the owner can pay the bill amount online or offline. The balance of the bill is always still available in the Blynk app.

9. HARDWARE COMPONENTS

9.1 Node MCU

The Node MCU-ESP8266 is a Wi-Fi-enabled microcontroller. It's an open-source Io T platform. This small board helps microcontrollers to connect to a Wi-Fi network and to render basic TCP/IP connections using Hayes-style commands. Node MCU applies to the firmware by default. Lua is the programming language used for the firmware.

The operating system and processor used with this is XTOS and ESP8266. It has a 128 KB memory and a 4 MB disk space. Power for the controller is supplied by USB.

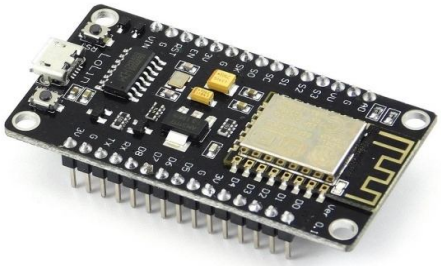

Figure 2: Node MCU-ESP8266 module

9.2 Liquid Crystal Display (LCD)

Liquid Crystal Display LCD is a mixture of two layers of matter, solid and liquid. This is an electronic display module with a 16x2 LCD screen that states it has 16 characters for 2 rows. LCD uses crystal fluid to create a visible image.

This technology is used to display an image on a notebook or some other electronic device. This operates on the concept of blocking light rather than transmitting light and consists of 16 pins of which about 8 pins are input and also includes an additional input voltage pin of 5v.This has a distinct advantage of having a low power consumption relative to an LED or a cathode ray tube.

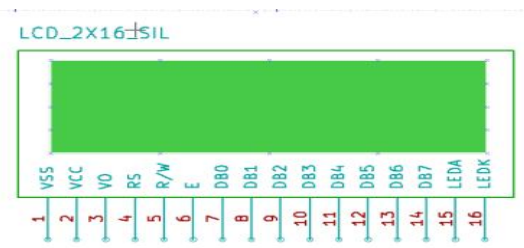

Figure 3: LCD pin description

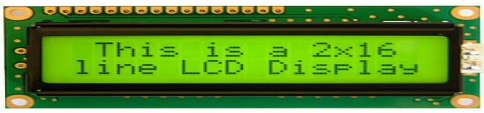

Figure 4: LCD screen

9.3 Flow Monitoring Sensor

Flow monitoring sensors are used for this purpose. These sensors are mounted on the water source or pipe to assess the flow rate of the liquid and to measure the volume of liquid flowing through the pipe. The liquid flow rate is expressed as litres per hour or cubic meter.

Figure 5:- Flow monitoring sensor

9.4 Power Supply

Figure 6: 6V battery

9.5 Jumper Wires

Figure 7: Jumper wires

10. SOFTWARE REQUIREMENTS

10.1 Arduino IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform framework (for Windows, Mac OS, Linux) written in C and C++ functions. This is used to write and upload programs to Arduino consistent boards, but also, with the help of 3rd party cores, to other product development boards.

10.2 Embedded C

Embedded C is a common term for a programming language written in C that is associated with a specific hardware architecture. Embedded C is a C-language extension with several extra header data. These header files can be modified from controller to controller.

10.3 BLYNK Application for Android

Blynk was designed for the Internet of Things. This helps us to remotely track equipment and its data.

11. RESULTS

Below is a snapshot of the Blynk app. This screenshot illustrates the use of each home, the overall use and the difference in value.

The monthly bill and the difference in consumption values are notified to the user through mobile prompts and e-mail alerts shown at the bottom of the screenshot.

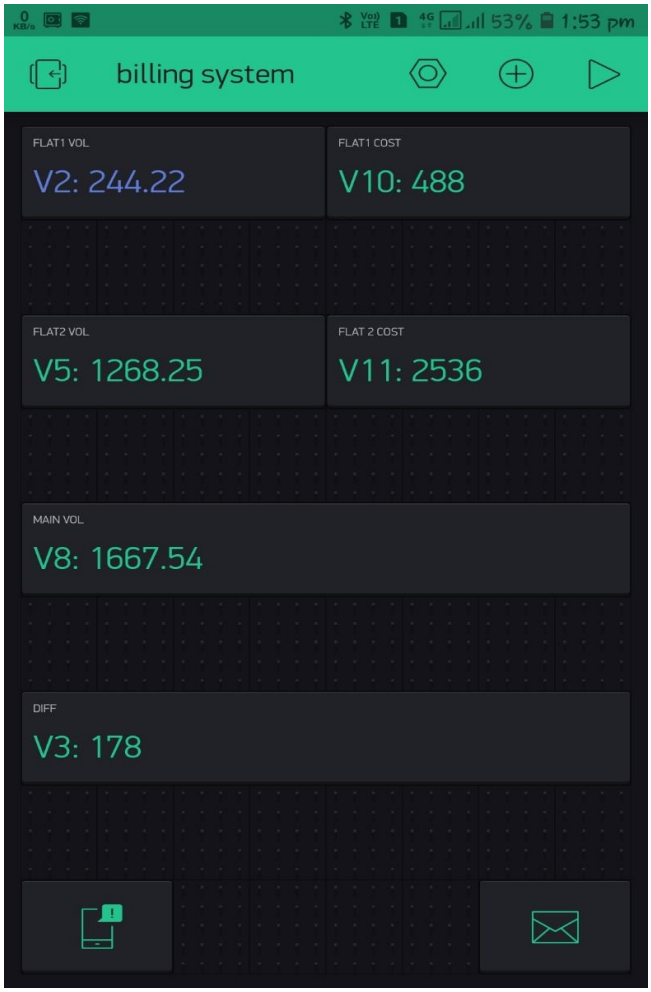

Figure 8: Screenshot of BLYNK mobile app.

12. FUTURE ENHANCEMENT

In this proposal, we are just informing the authorities about the leakage of water in the pipes. In the further improvements, we can use a valve near the tank outlet to stop the flow of water in the pipes if water leakage is detected so that we can minimize the loss of water until the authorities come to repair the damaged pipeline.

13. CONCLUSION

As mentioned in this article, an automated water billing system based on IoT plays an increasingly important role in the conservation of water. The implementation of water conservation approaches and technologies that promote the conservation and management of water is, therefore, a field of increased importance. By investing in such technologies and systems, cities will dramatically reduce consumption and ease the burden on our nation's water supply.

The project explains the design and function of the Smart Meter and how it can be used for Automatic Meter Reading. In this age of technology, human growth is the most economical implementation.

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