Section: Research Paper

MEASUREMENT AND CONTROL OF WATER FLOW USING IOT

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ABSTRACT:

The main aim of this work is across the various cities and towns, the supply of water has been a major problem as the demand of the water depends on various consumption factors and water distributors have to maintain the water supply in real-time to fill the gap between demand and supply. But the challenge is to calculate the consumption trend. Various methods like keeping track of water consumption by not wasting water and detecting the over consumption of water have been practiced a lot to reduce the water consumption around the cities. Fortunately, Smart Water Meters have been providing the perfect solution for water distributors and consumers to meet the volatile demand for water. The major crisis of water scarcity is improper discharge of the available water. In order to compensate this problem, we design a Smart System that can be placed within a residential area with the help of IOT that measures and used to detect the volume of water consumed and if water level reaches above the specified limit, system sends alert messages to the users and president of the Apartment.

Keywords: Water flow sensor, water flow control, Sensor control, Solenoid valve, Bluetooth.

I. INTRODUCTION

In many parts of the world, analog water meters have been installed by water companies to measure the consumer's water consumption. These water meters are read monthly by an authorized employee and the consumer's bill is computed based on the approval rates according to the amount of water consumed. Sometimes the customer premises are not easily accessible and consumption estimates have to be used in the computation of the water bill. This approach is error-prone as accuracy cannot be guaranteed. The method of manual data collection is also expensive, labor-intensive, and hence inefficient. Smart water meter allows extracting meter reading electronically with less human interaction. Cost savings and improved operational efficiency are achievable. Mainly cost savings that could be created from improved efficiency of meter reading personnel. Once meter reading data is available it can be captured and processed like any other signal. Internet, Mobile communication technology, and other data communication technology make it possible to bring this signal to mobile phone or hand held device. This data will convert information to get a better understanding of the system. The system typically consists of a meter installed at the water supply point, sensors that measure water flow and pressure, and communication technology such as Wi-Fi, cellular or radio frequency to transmit data to a central server. The data is then processed and analyzed to provide information on water usage patterns, leaks, and potential water wastage and it provides the particular information to our mobile phone using MIT app.

II. LITERATURE SURVEY

Smart water metering involves the use of advanced technology in water meters to monitor and manage water usage in homes and businesses. There are currently several methods used for smart water metering, including:

Automated Meter Reading (AMR): This method uses a small device attached to the water meter to collect data on water usage. The device then wirelessly transmits the data to a central database, allowing for remote monitoring of water consumption. Advanced Metering Infrastructure (AMI): This method uses a network of smart water meters connected to a central database through a communication network. The meters collect and transmit data on water usage, allowing for real-time monitoring and analysis of water consumption.

Non-intrusive Appliance Load Monitoring (NIALM): This method uses sensors to monitor the electrical signature of water-using appliances, such as washing machines and dish washers, to determine their water usage. This data can then be used to provide consumers with insights into their water consumption habits.

Ultrasonic Water Meters: This method uses ultrasonic sensors to measure water flow and volume, providing highly accurate data on water usage. Ultrasonic water meters can be used in both residential and commercial settings.

Overall, each method has its own advantages and disadvantages, and the choice of method will depend on factors such as cost, accuracy and scalability. However, all smart water metering methods share the goal of promoting sustainable water use and improving water management.

III. METHODOLOGY

In the proposed Smart System, we used Flow sensor, Solenoid valve and Arduino NANO. Water consumption details and limit status are sent to the control station via text messages (SMS) and that data gets uploaded and is displayed in the OLED. In this, Bluetooth Module HC05 is used to upload the water consumption details on to the MIT mobile app. Connect an IoT enabled water flow meter to the water pipes to detect anomalous water flow and shut the flow if needed. Automatically shut off the flow, when the user does not respond to alerts. Water bill to be paid gets uploaded into the mobile and also alerts will be sent to the respective in charge. Smart Water Meters have been providing the perfect solution for water distributors and consumers to meet the volatile demand for water. The Internet of Things (IoT) has revolutionized the way we interact with and control various devices in our daily life. This project is of a smart water meter that measures our daily waterusage and sends the information to users and in charge through mobile application

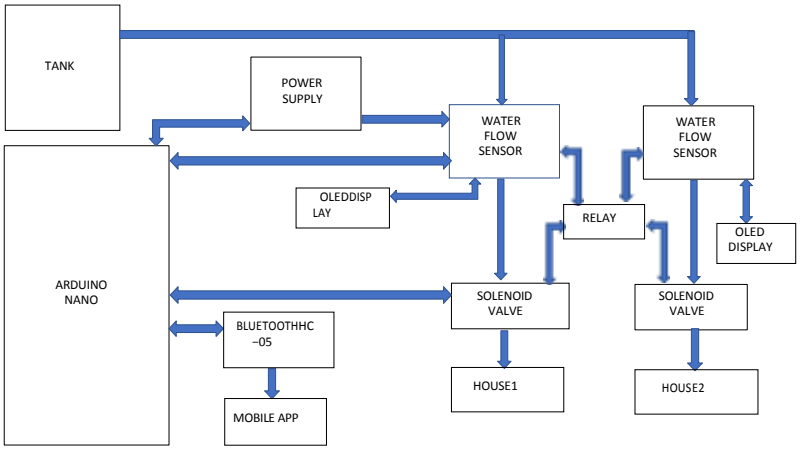

Fig1: Block Diagram

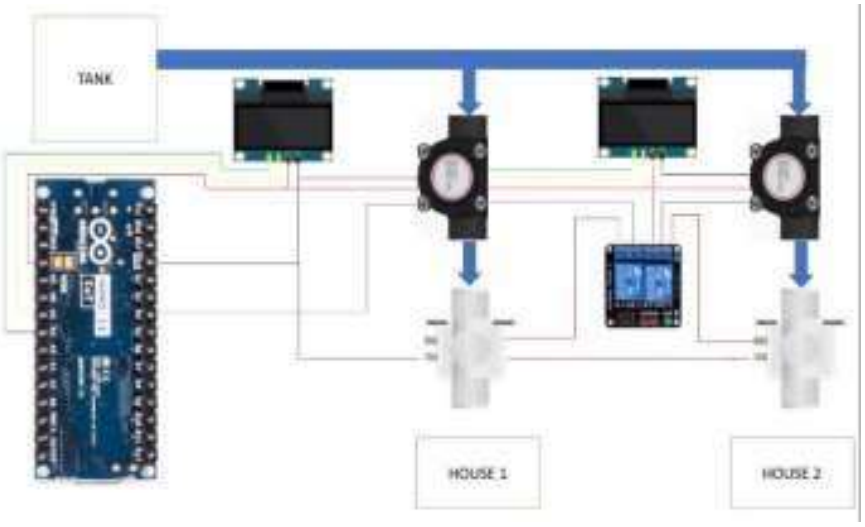

Fig2: Circuit Diagram

The IoT based Smart System that can be placed with in a residential area with the help of IOT that measure and controls the usage of water by using solenoid valve in real-time. A water flow sensor is used to detect the utility parameter and if water level reaches above the specified condition and sends message to users and in charge through Mobile App (MIT).

Arduino NANO: The Arduino Nano is a small, complete and Bread board-friendly board based on the ATmega328 (Arduino Nano3.x). It has more or less the same functionality of the Arduino Duemilanove but in a different package. The Arduino Nano is equipped with 30 male I\O headers in a DIP-30 like configuration, which can be programmed using the Arduino Software Integrated Development Environment (IDE), which is common to all Arduino boards and running both on line and offline. The board can be powered through a Type-B Mini-USB cable or from a 9V battery. The Arduino Nano has a number of facilities for communicating with a computer another Arduino or other microcontrollers.

Flow Sensor: The YFS201 water flow sensor is hall effect type sensor that is manufactured with good quality material and comes in black colour This hall effect sensor that measures water flow has a working voltage of 5 to 18V DC. This water flow meter uses the concept of hall effect and has a working flow rate of 1 to 30 Liters/Minute. The YFS201 water flow sensor is designed with 0.78" outer diameter,1/2"of thread and compatible with 1/2" nominal pipe connections. This water flow sensor comes in a small compact size of dimensions: 2.5"x1.4"x1.4".

Solenoid Valve: 24V DC Solenoid Water Air Valve Switch (Normally closed) – 1/2″ controls the flow of fluid (liquid or air) and acts as a valve between high-pressure fluid. This liquid valve would make a great addition to your robotic gardening project. There are two ½” (Nominal NPT) outlets. Normally, the valve is closed. When a 24V DC supply is applied to the two terminals, the valve opens, and water can push through. The valve works with the solenoid coil which operates electronically with DC 24-volt supply. As it is a normally closed assembly, it opens the flow of fluids as soon as it is powered ON and stops/blocks the flow when the supply voltage removed.

2-Channel Relay: Relay is an electromechanical device that uses an electric current to open or close the contacts of a switch. The 2-Channels Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps andAC load. It is designed to interface with microcontroller such as Arduino, PIC and etc. The relays terminal (COM, NO and NC) is being brought out with screw terminal. It also comes with a LED to indicate the status of relay.

IV. RESULTS & DISCUSSION

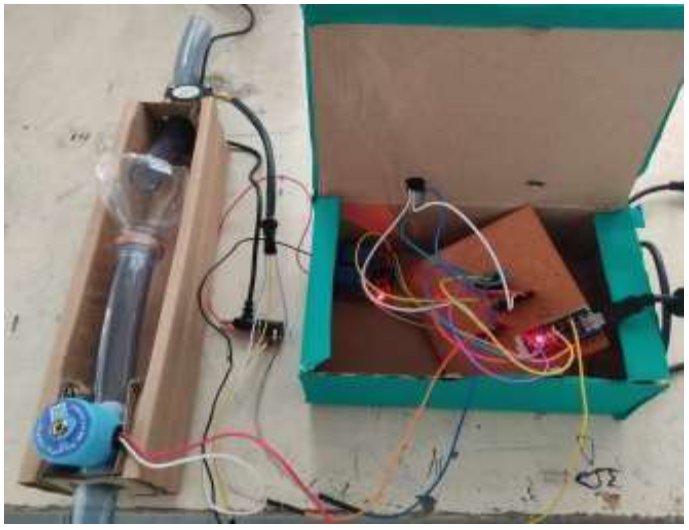

Fig.3 Overall Circuit Operation

Hence, we have completely displayed water flow rate and Total flow through water flow sensor by the OLED. Hence, we have controlled the water flow by usingthe solenoid valve for which the user consumed more than allotted water.

Fig.4 Serial Monitor Display

Fig.4 Shows that the picture contains the Flow rate and Output quality for the measuring water through serial monitor. Similarly, we have displayed water flow rate and Total flow through water flow sensor in the serial monitor

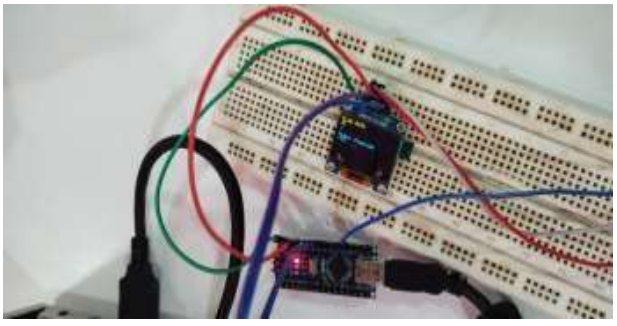

Fig.5 OLED Display

Fig.5 OLED to display the water flow rate and output quality. Hence, we have completed overall work, displayed water flow rate and total flow through water flow sensor by the OLED.

Fig.6 Mobile app

Fig.6 shows how we have transmitted the house bill to mobile by using Bluetooth module.

V. CONCLUSION

The Smart water meter is automatic and does not require much human interference, thereby reducing the errors. Water consumption details and limit status are sent to the control station via text messages (SMS) and that data gets uploaded and is displayed on the OLED display. In the Arduino NANO implementation, we use Bluetooth Module to upload the water bill details into the MIT mobile app. Flow sensor output gets uploaded on to the mobile and also alerts will be sent to the respective in charge. The limit based on condition helps in regulating water distribution. This provision is not present in the existing meter.

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