IOT AUTOMATIC WATER CONSERVATION SYSTEM

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Abstract: Water the word plays a vital role in our life. It is the most important factor for the survival of every living organisms. The mankind facing the water scarcity problem in woldwide for the past decade. The water demand is the most challenging factor in India too. So there should be some technology to Conserv and manage the water resource available in nature. In this proposed work, with the concept of IoT we have designed a water monitoring and control system with real time databases. It is really useful in many areas like apartments, colleges, hostels, shopping malls etc. The concept is to intimate the user about the excess flow of water through mail and control the overflow of water using solenoid valve. Therefore the water conservation and management can be done simultaneously. With the help of Proteus Software, simulation of the monitoring and controlling system can be done.

Keywords – Arduino unocontroller, Internet of Things (IOT), Wi-Fi module, Proteus software.

1. Introduction
In day to day life water plays a major role. It is the basic requirement for all purposes such as drinking, bathing, cleaning and for agriculture fields, industries and construction so on. Water is a readily available source in nature. Nowadays the ground water level is decreased so much because of many man made activities. More bore wells were drilled for private water usage and destroying many water resources like well, lake, river without proper maintenance. Almost all the industries play its role of manufacturing, and processing with the help of water only. Some industries which build over the bed of rivers will pollute the available water resource to a great extent. It greatly affects the life of people who consumes that water and lead to different diseases. So care must taken in preserving and maintaining the water. Also the population plays a major role in the usage of water. Increase in demand leads to many illegal activities to satisfy the need of water. Hence, everyone should take responsible for saving the water and utilizing it in an effective way. A new method of conserving the water in our daily life has been proposed in this system. The system is designed using Arduino UNO controller, Water Flow sensor, Level indicator and Wi-Fi module.

2. Proposed System
The system plays a major role with Arduino Uno controller which is quite easy to use and available in market. The modules of water flow sensor, level indicator and Node MCU Wi Fi are connected with Arduino uno. The level indicator is used to show the maximum limit of water to be used. When the user exceeds the limit of water level a mail will be sent regarding their status of water usage with the help of Wi Fi module and cloud system. If the situation is continued and exceeded their maximum level as detected by water flow sensor then the connection was stopped using the solenoid valve. The proteus software is used for simulating the results.
3. Design Methodology

The water monitoring and control system design with Arduino uno is easy and compact. The modules that are chosen for designing is readily available in market. It is cost effective too. The block diagram of water monitoring and control system is shown in Figure 1.

![Figure 1: Block diagram of water monitoring and controlling system](image)

The component modules used in this system design are as follows:

3.1 Arduino UNO

Arduino is an open-source platform in which we can build prototype on our own based on applications. It can be programmed with ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board. It provides more access to the functions of microcontroller.

![Figure 2: Arduino UNO](image)

Arduino Uno is a microcontroller board which is based on 8-bit ATmega328P microcontroller. To support the microcontroller, it consists of components such as crystal oscillator, serial communication,
voltage regulator, etc. Specification of Arduino uno includes 14 digital input/output pins, USB connection and a reset button. Interfacing of Arduino uno becomes easy with other components. It can be used to communicate with a computer, another Arduino board or other microcontroller in a very effective way. It has a serial monitor for transferring data from and to the Arduino board. To simplify the interfacing the Arduino software includes a Wire library. An IDE (Integrated Development Environment) is required for the programming of Arduino Uno board.

3.2 Water flow sensor

Real time monitoring of water flow can be done through the water flow sensor. Apart from manufacturing industries these sensors plays an important role in Agriculture sector, Food processing, Water recycling, Mining industries etc. It is used to measure the flow rate and check the volume of liquid passes through the pipe. It is based on the principle of Hall effect. When the tap is closed there will be no water flow. When it is opened, the water flows through sensor producing the pulses which in turn act as interrupt signal to Arduino uno. With the help of flow frequency obtained from every signal we can measure the flow rate and volume used. The user when exceeds the maximum limit the water flow sensor sends signal to Arduino uno. Arduino uno gives warning signal to user through mail by using the Wi fi module.

![Water flow sensor](image3.jpg)

**Figure 3**: Water flow sensor

3.3 Wi Fi module

The Wi Fi module used with Arduino uno is ESP8266 wifi module. It is a low cost module that can be used for end-point IoT developments. For many embedded applications it enables the internet connectivity. The communication protocol used to connect with server/client is TCP/UDP.

![ESP8266 Wi fi Module](image4.jpg)

**Figure 4**: ESP8266 Wi fi Module
The Wi Fi module employs a set of AT commands to communicate with the Arduino uno. By making the connections with receiver and transmitter, TCP enables the communication and passes over the message to user. Once the signal is received from Arduino uno as the water flow exceeds the Wi Fi module gets the signal to send the message to user about the flow of water through mail. The system connected in the other end stores the value and simultaneously send the message to the user. The communication protocol gives the update at each level of measure. This Wi Fi module can be employed with Node mcu as it works as firmware more than a development kit. It ensures high connectivity which makes the application most suitable for practical usage.

3.4 Level indicator

Level indicators are devices used in the measurement of level of fluids at various industrial applications. Water-level indicator is used to indicate the level of water in over head tank or any water source. By using this we can avoid the overflow of water and at any time we can know the level of water in tank. Many types of level indicators are available with respect to the area of application. Normally, fluids measurement plays a huge factor in many industries because of its importance and accuracy. At present we are using this concept in houses for the measurement of water to avoid the wastage of water. Depending on user the maximum limit can be fixed. When the fixed limit has been reached by the user then the level indicator sends the signal to Arduino uno. The Solenoid valve in turn disconnect the tap from further flow of water.

![Figure 5: Water level indicator](image)

3.5 Solenoid valve

In Automation industries Solenoid valves have greater influence. The solenoid valve is mainly used for the control purpose such as open/close of water or gas pipelines. It has other features also like producing the sound for bell, as starters in vehicles etc. They differ in the characteristics based on electric current, magnetic field and the mechanism they use to have control on fluid. The operation will be similar to relay i.e when it energizes it pulls the conductive material and allows the flow of liquid. And when de energized it pushes off the tap in its previous position by blocking the flow of water.
In the proposed system, to conserve the water it is made to turn off the tap where the flow of water exceeds the maximum range.

4. Software Implementation
Proteus is a simulation tool developed by Lab Center Electronics. It ensures the designing of the circuit virtually and shows the working in simulation. It has an extensive number of components in its library which can be used to virtually design circuit for different applications. It is very important and more beneficial when the circuit is simulated before hardware implementation. If it shows any error in the module then it can be re done in the hardware part. One should ensure that all the library modules related to the application are present in the simulation software used. In this project, simulated model of water sensor should be included in the library of Proteus software for running the application.

![Figure 6: Solenoid valve](image)

![Figure 7: Proteus Simulation with Arduino Uno](image)
5. Conclusion

The IoT based water conservation system is designed by maintaining and limiting the wastage of water at commercial places. Since, water scarcity is increased and to meet the future demands the water it should be conserved in any of the methods available. This proposed system helps in saving the water in our domestic purpose. It consists of systematic control using various devices interconnected. The quantity of water consumption can be obtained by flow sensor and if the given limit is consumed by the user the solenoid valve will get closed and water will not be supplied. Also the user will be intimated about the flow of water after exceeding a certain limit. So, by this method the user will get aware about water usage and conservation will be done by every user. This system can be applicable to highly populated residential buildings, hotel rooms and shopping malls where they will have more demand on water.

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