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Smart Water Controller

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A B S T R A C T

Water is very precious for the living beings and scarcity of the same is gradually increasing. Most of the cities in the county and that of the world are facing this problem. This is one of the motivations for the current work and to deploy techniques in order to save water and help the environment which in turn ensures water for the future. Hence, it is of utmost importance to preserve and save water. Managing house water supply in a society consisting of water tanks, motors, and pumps automatically is an important task for efficient consumption of water. In this project, we propose a smart solution for water consumption from the tank by using sensor data. The data from each house is stored on the cloud for analyzing the water consumption of each house in a society and main water supply. A hybrid application, Smart Water Grid, is responsible for monitoring the water level in the tank continuously, to control the motor automatically, and it consists of an inspection mode to detect the leakage in the tank and its dimension. The controller automatically turn ON the motor when the tank gets drain and it automatically turn OFF the motor when the tank gets full. Therefore there is no wastage of water and it prevents us from the scarcity of water. By using this we can control the multiple tanks. The float switch in the overhead tank senses the water level of the each tank and sends the signal to the microcontroller. The microcontroller is used to decide which solenoid valve wants to open and sends the signal to that solenoid valve to open till the tank gets full.

Keywords: Wastage of Water, Controller, Water management

1. Introduction

Water is one of the most important substances on earth. All plants and animals must have water to survive. If there was no water there would be no life on earth. Apart from drinking it to survive, people have many other uses for water. Overhead water tanks are used for Domestic water storage and commercial water storage purposes. They are generally placed over the rooftop of any house, building or apartment. These tanks circulates the water through its distributary channels or pipes to the taps. Generally most of the houses depends upon the overhead tanks as the main source of water. One of the commonly seen situation in every house is that the overflow from the tank made people to switch off the pump. Otherwise they should keep monitoring the tank when the pump is ON and switch off the pump as soon as the tank is full.

What happens when the client or user is not aware of water overflow or he is not at the home while water is overflowing, As a result water resource is being wasted only because of improper management standards that we follow. Efficient usage techniques should be employed to gain better control on resource consumption water wastage is a serious issue that must be considered. Every drop of water counts when it comes to human survival on this planet as we only have a little amount of water available for us. as per the records only 3 percent of the water is available for the inhabitation the remaining 97 percent of the water is situated in the oceans.

We can't use sea water by any means because it is salty. Now a day's sea water is being used in energy generation system. So the 3 percent of the water is present in the underground and rivers. Bore wells and pumps are used to extract water from the underground and stored in the tanks or sumps. Such an important and lifesaving resource is being wasted by us. Water wastage is the serious problem for both the rural and urban areas, this can be achieved by

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using current technologies which are made available by the research community for general use. We can develop an automatic system which can monitor behalf of us. Currently there are many products which can solve this problem but the implementation and maintenance are much difficult.
This model does works by communicating wirelessly so the client will no longer worry about the connection wires. Automatic water level monitoring system uses network of things i.e. this model uses its own local area network to maintain communication between the nodes Microcontrollers calculate and make decisions based on the program given by the developer. Electronics is the discipline dealing with the development and application of devices and systems involving the flow of electrons in a vacuum, in gaseous media, and in semiconductors. Electronics deals with electrical circuits that involve active electrical components such as vacuum tubes, transistors, diodes, integrated circuits, optoelectronics, and sensors, associated passive electrical components, and interconnection technologies. Commonly, electronic devices contain circuitry consisting primarily or exclusively of active semiconductors supplemented with passive elements; such a circuit is described as an electronic circuit. Electronics is considered to be a branch of physics and electrical engineering.

1.1. Problem Statement

Most of the times People generally switch on the motor when their taps go dry and switch off the motor when the tank starts overflowing. This results in unnecessary wastage of water and sometimes non-availability of water in emergency. Sometimes people forget to switch OFF the pump by involving in their day to day activities. This results in wastage of both water and power resources. This is the serious problem that must be considered because the global scale of power and water resource wastage will be high.

1.2. Objectives

The main intention of this project is to control the water management activity automatic by using some sensors which can detect the water level and controllers which can turn ON or OFF the pump based on the water level.

- The system which decreases human intervention in maintaining the overhead tanks which is capable of effective water usage.
- Autonomous system which guarantees overflow prevention and optimal power usage.
- To deploy a system which can solve the problem of water overflow from the tanks.

1.3. Scope of the Project

This prototype can turn OFF the pump as soon as the sensor detects the maximum water level in the tank. The pump will be turned ON as soon as the water level in the tank goes low. This is not intended for triggering the alarm or any other notifying activities to the user.

2. Literature Survey

In the paper by P. Eietz, W. Yerazunis, E. Leigh there is explanation of the advantages of water level monitoring and controlling by using the Wi-Fi or wireless based type of monitoring using the Arduino. The paper of M. Javanmard, K.A. Abbas and F.Arvin deals with brief explanation of using Arduino to automate the homes. The existing system of the Bluetooth method of automation limitations was analyzed to prove that Android and Arduino make up for a better method of automation. In the paper by Hicks, F. Tyler, 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. 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. Microcontroller Based Automated Water Level Sensing and Controlling a Design and Implementation Bessie Proceedings of the World Congress on Engineering and Computer Science is the paper which proposes a method of automation where the cloud using the SHA-1 and Caive Bayes algorithm. In the paper by S.M. Khaled Reza, Shah Ahsanuzzaman Md. Tariq, and S.M. Mohin Reza is presented 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-GFB 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. The existing system presents a low cost and flexible water level monitoring system using an embedded microprocessor and microcontroller, with BP connectivity for accessing and controlling devices and appliances remotely using Smartphone application. The proposed system by M. Javanmard, K.A. Abbas, and F. Arvin 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. The need to access and control BDT devices is described in the paper by DsamaMahfooz, MujtabaMemon, and AsimBftikhar. For security purposes such as avoiding cyber-crime

authentication mechanisms are proposed like A i) Tagging mechanism for access control, ii) Tag Assignment, iii) Selective Publication; finally describing the steps of the algorithm followed. Low cost and flexible Water level monitoring system is discussed in the paper by JagadeshBoopathi. An embedded micro web server in Arduino is used with BP connectivity to access and control devices.

The 555-timer- based water-level-controller paper delineates about the existing Water level monitoring system using BR Sensors Also proposal of using the Android Smartphone to control devices using the Wi-Fi as a communication protocol thus creating a friendly interface force communication between the Raspberry Pi server and the Android device. Illustration of the method to automate the Water level monitoring using the secure Wi-Fi technology that acts as a server is shown in the paper of S.Jatmiko, A B.Mutiara, Bndriati. Various systems that can be monitored are temperature and humidity, motion detection.

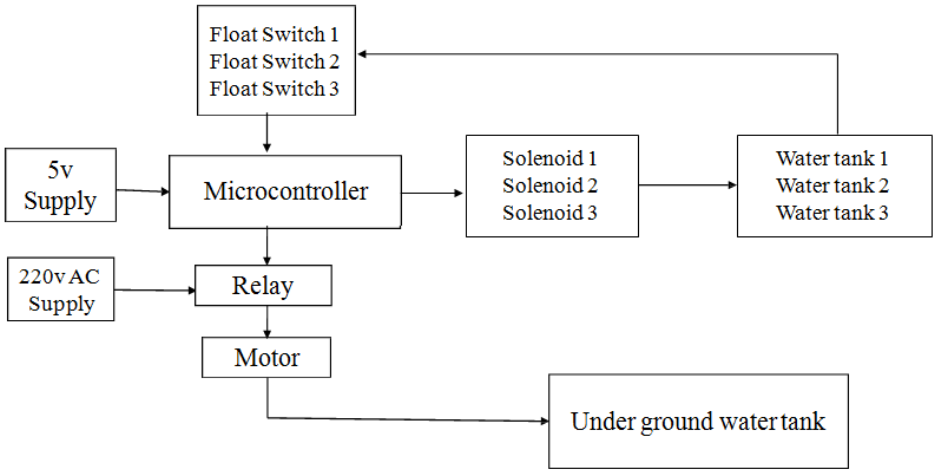

Fig.1 – Block Diagram

3. Proposed System

Automatic water monitoring system solves the problem of water overflow by installing the Float Switch with the Arduino UNO at the top of the water tank. This senses the water level and gives the value in the form of centimetres. Arduino is programmed to send the water level to the pump, where another Arduino is installed with 5V relay. The communication between the Arduino and components can be achieved by using RF modules. The module we are using is NRF24L01 which can transmit the signal up to 1000 m in line of sight. And Greater than 500 m with any obstructions in between. The distance may vary depending upon the Obstructing medium.

Let say the height of the tank is 140 cm so that we can consider that the maximum point or threshold that the water can reach maximum is 120 cm. When ultrasonic outputs the distance as less than 30 cm then the water is about to reach its threshold. When the water reaches 120 cm the ultrasonic outputs 20 cm. Arduino is progr4ammed to continuously transmit the data to the arduino which is installed at the pump. Let's say that the Arduino and the Setup installed at the pump will be the receiver section. The sensors and microcontroller at the tank will be the transmitter section.

The arduino at the receiver section is programmed to trigger the relay when the data transmitted by the transmitter will be 20 cm. The 5V relay is already running and operational when is triggered by giving 1 then the relay will break the connection or power supply to pump. Another case is when the data transmitted is above 100 cm then the Arduino at the receiver will again trigger the 5V relay but this time it triggers by giving logic 0 so that the pump will be switched ON. The data 100 cm indicates that the water in the tank is low. The Complete setup is shown in figure 1.

3.1. Hardware Components Used

- Horizontal Mount Float Switch
- Two-Way Solenoid Valve
- Two Channel Relay Module
- Arduino UNO
- Motor Pump

4. Results and Discussion

As discussed above, as per the block diagram, hardware has been implemented and the software code has been developed using arduino ide. In figure 2, software implementation of arduino with float switch has been shown and in figure 3, software implementation of arduino with solenoid valve has been shown. In Figure 4, hardware implementation and results were shown, i.e., when the water level reaches the maximum limit it is indicated by the float switch and the valve is closed. Similarly when the water level is very low, it is also sensed by another float switch and the valve is opened to fill in the tank.

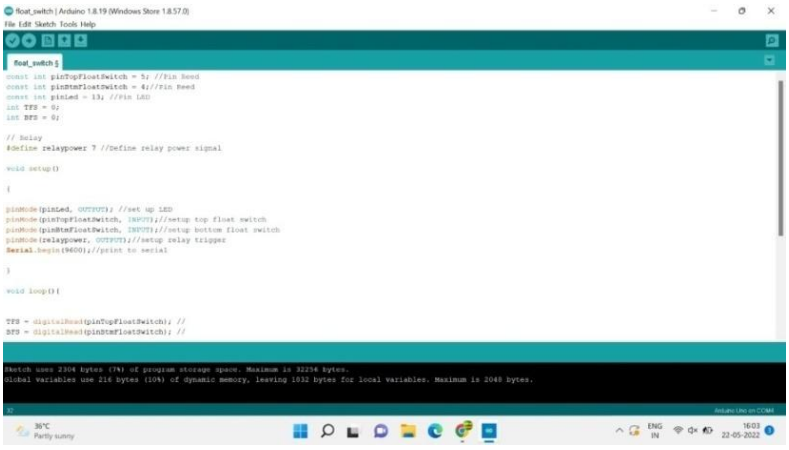

Fig.2 – Software implementation – interfacing arduino and float switch

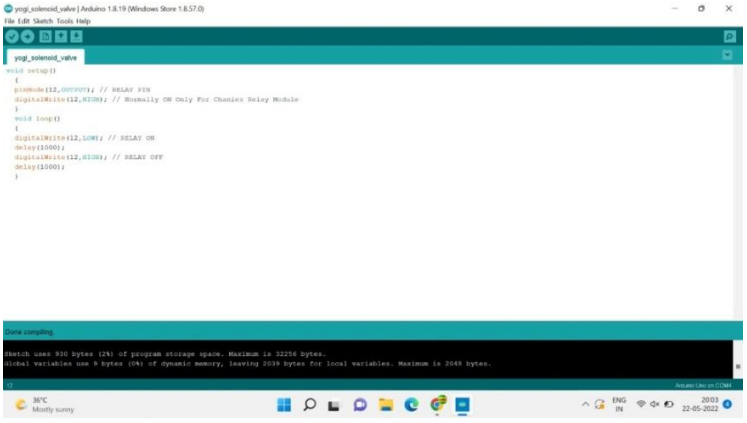

Fig.3 – Software implementation – interfacing arduino and solenoid valve

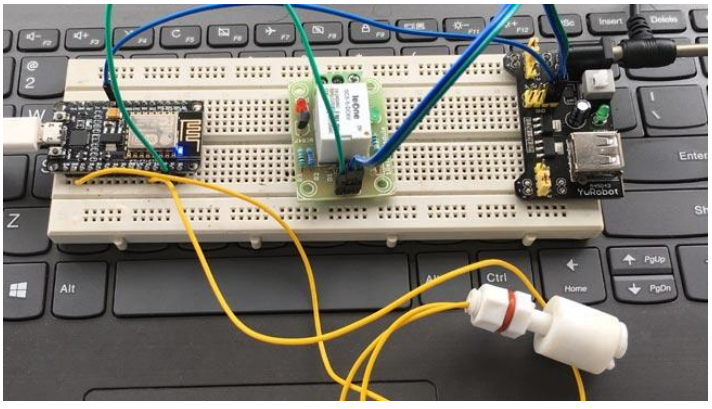

Fig.4 – Hardware implementation

5. Conclusion

Effective Water and power management in houses. And we don't have to look after the motor anymore. There are certain limitations to this model. Some of them are addressed below: The maximum and minimum threshold limits of the tank are variable for tank to tank. The power supply for the model needs AC supply at the tank client should deploy one if it is not avail at present. The obstructions decrease the communication distance so that the better frequency ranges should be deployed. The future work of this project include adding The GSM board to send the real time notifications to the client. Automatic detection of tank depth while installation. Optimizing the power usage and noise decreasing in wireless communication. This module can be adapted to connect to the internet by giving a gprs connection with 5G network. This system can be altered with high processing Microcontrollers like raspberry pi to take this model to a whole new level of IoT. By adding IoT the data analytics on water usage can be made possible so that the clear picture of water wastage with respect to different analysis can be achieved.

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