# Automatic Strategy to Control Entire Villager's Water Valves with User Level Authentication

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*Abstract-* Water is the basic needs of the humans. So it should be supplied controllably and at the appropriate time to locality. The water supply system is a part of the rural and urban infrastructure, commercial and personal usage which must assure the continuity of the water distribution, water quality control and the monitoring. The traditional drinking water supply system is facing many problems related to filtration, pumping of water, distribution of water and testing of water. The major problems in water supply system are leakage or wastage of water. Majority of publics uses suction motors to suck water from main supply connection, which results decrease in water pressure. To overcome the above problems, an automated system has been proposed which enhances the water distribution, reduces wastage of water. In the modern years, in every field new technologies have been implemented which is found to be efficient, simple to operate and also user friendly. So keeping all these factors in mind this work develops and proposes an embedded/microcontroller based remote controlled water supply system, namely, "automatic strategy to control entire villager's water valves with user level authentication". This work can be used in municipalities, agricultural field, and can also afforded in the industries according to their need.

*Index Terms*- Water Distribution, Pumping Station, Valve, Controlled water, Microcontroller.

## I. INTRODUCTION

Water is very important to all the humans and to the plants, trees, animals and industries, etc. [6, 11]. In existing system, in rural and urban area, water is supplied to the home with the help of man power. The person in charge will go to the valve point and then opens it for Particular Street for certain fixed time. Once the time is over the person will go again to that place and close the valve. This is a waste of time, man power and also water wastage if the operator does not closes valve within stipulated time. Also, the people may take excess water for their personal use with the help of motor or some other equipment. Due to this many needy people will not receive required amount of water for their usage. Conventional water supply system comprises two different sections: First one is the pumping station- which performs the sucking of water from water source and the other is the distribution section- through which water is distributed to all the municipal wards. Currently these two sections are working independently. The use of water diversity increases because of restriction imposed by the water availability, hydrological conditions, storage capability of tank, control and process parameters. The system includes pumping stations, storage tanks, piping distribution network and central dispatching unit. With the continuous economic growth, the water demand of enterprises is also increasing. The monitoring of water resource for these enterprises can prevent the occurrence of water stealing and water leaking effectively. Therefore, the monitoring system of urban and rural water supply has aroused extensive attention in recent years. The theft can be prevented only when any public inform the officials about the theft. But the possibility of public to inform the concerned higher officers are very rare. So the theft prevention or one who does the theft is difficult to identify in the early methods. Water scarcity is one of the major problems facing major cities of the world and wastage during transmission has been identified as a major due to waste of water at the time of pumping into overhead thanks [7]. To overcome the above problems, i.e. to supply the water equally to each house and to stop the water theft practice, an automated system using embedded controller has been proposed which enhances water distribution and reduces the wastage of water. A survey is also presented to focus on an identified ways to increase the performance and monitoring for the water distribution system.

### A. LITERATURE REVIEW

The work proposed in [1], on design and development of automatic water level control system of software and hardware architecture combined together for the interfacing purposes. The system employs advance sensing technology to detect the water level using Arduino and relay to control the motor. The research work in [2] presented a system of automatic water level controller with SMS notification. The program was developed in Arduino program environment and loaded to the Microcontroller. This system avoids the manpower required for daily filling of the tank and checking for overflow. The research work in [3], emphasized on the need of water level controller in agriculture irrigation system. Every crop requires different amount of water and this can be achieved by using automatic water level controller- which also help in reducing wastage of water. Hall Effect Sensor (G1/2) is used to measure flow rate in irrigation pipelines whose speed of rotation changes with the different rate of flow of water. The authors in [4], proposed a microcontroller based drip irrigation system capable to provide irrigation to larger areas of plants with less water consumption and lower pressure. Using this, one can save manpower and water with improved production and profit.

Microcontroller chip Technology [5] **-** This is an on-chip computer- programmed to perform any control, sequencing, monitoring and display the function. Its great advantage is no other external compounds are needed for its application because all necessary peripherals are already built into it. Thus, we can save the time, space and cost which is needed to construct low cost device.

A GSM based Zigbee controlled solenoid valve for drip irrigation system was proposed in [6], which monitors and controls all the activities of drip irrigation efficiency and results in saving of manpower, water and the power consumption. The research work in [7], development and implemented an embedded system namely, an automatic water pump controller. This system uses microcontroller to automate the process of water pumping in an overhead tank, detects the water level in a tank and also switch on/off the pump accordingly and display the status. A literature review on embedded system based automatic water distribution monitoring system is presented in [8]. Distribution of water in every house within different areas needs the control and monitor for avoiding the water wastage and the water theft practices. Various technologies have been used to distribute/supply the water to all houses of residential areas. Arduino [9] is an open source prototyping platform based on easy-to-use hardware and software. One can train the board what to do by sending a set of instructions to the microcontroller on the board. The system in [10] operates automatically according to required irrigation sub areas to realize graded and constant pressure irrigation which enhances irrigation uniformity with saving the water and energy besides protecting the water pumps and pipeline system. The work in [11, 12] proposed a microcontroller based automatic plant irrigation system which helps in saving money and water. The system is controlled by microcontroller which is giving the interrupt signal to the sprinkler/motor. Temperature sensor and humidity sensor are connected to internal ports of micro controller via comparator.

Now, in the modern years in every field, new technologies have been implemented which is found to be efficient, simple to operate and also user friendly. So, keeping all these factors in mind, this work proposes an embedded based water supply control system namely, "an automatic strategy to control entire villager's water valves with user level authentication". This work is a microcontroller based, can be used in municipalities, agricultural field, and can also afforded in the industries according to their need.

## II. OBJECTIVES OF THE PROPOSED WORK

There are some objectives need to be achieved in order to accomplish this proposed work. These objectives will act as a guide and will restrict the system to be implemented for certain applications:

- Study the current technology used for supply water to the streets of locality.
- Design and develop automatic control system to control water flow based on Water requirement for the streets.
- Design and develop control circuit for the uniform water distribution.
- To achieve overall automation in the public water supply system which is an efficient.

## III. PROPOSED METHODOLOGY

The system proposed shown in figure 3.1 is developed by using microcontroller based program. To build proposed model two AC motors have been used and a tank for collecting water in which three water level sensors are attached on the wall to sense water level. The ac source which is used in this system is to supply continuous power to the microcontroller unit for its operation. With the rapid development of global mobile system infrastructure, information and communication technology in the past few decades has made the communication more efficient and reliable for transmitting and receiving information. So here we used RF modem for efficient communication purpose.
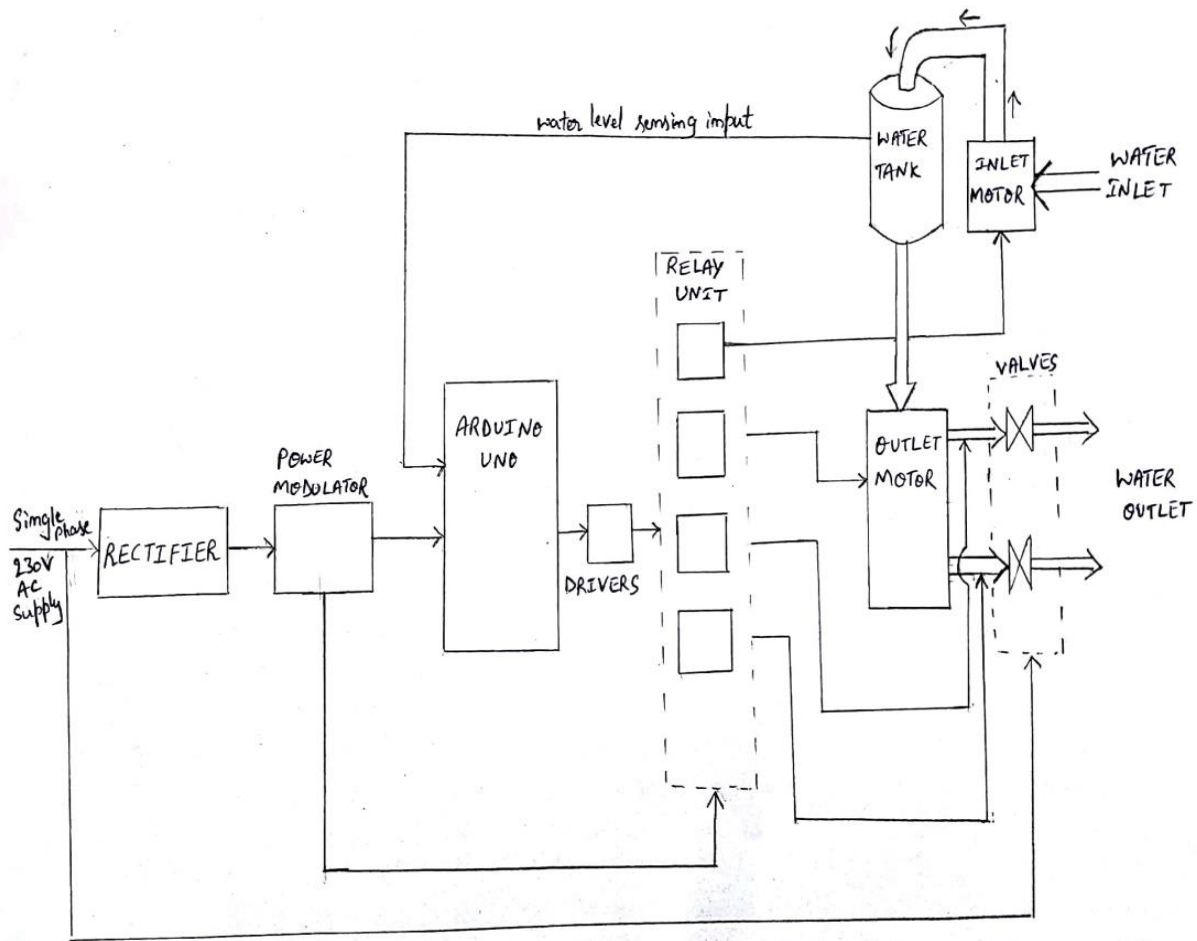
**Fig. 3.1** Block Diagram of proposed system

*A. Block Diagram*

The block diagram of the proposed work is as shown in fig. 3.1 consists of rectifier, power modulator, arduino, driver circuit, relay unit, inlet motor, water tank, valve, etc.

*B. Functional Block Diagram*

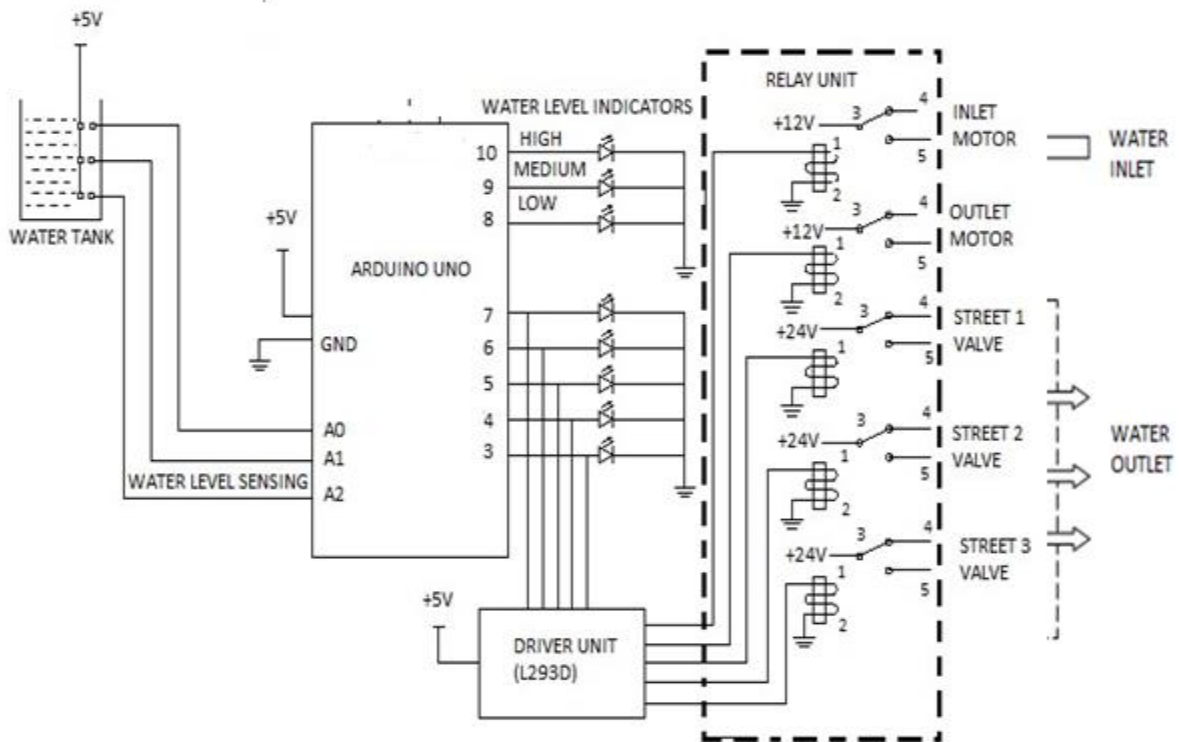Figure 3.2 gives the functional block diagram of the proposed system.

**Fig. 3.2:** Functional Block Diagram

### C. Working Principle

The available single phase AC supply is rectified and supplied to power modulator. Power modulator contain individual regulator IC'S to obtain different voltage levels to drive Motor, RF Transmitter, Aurduino, etc. Once the program is set and supply is given, the microcontroller starts processing and that gives signal to the driver circuit. Here the relay is energised by DC supply and this relay is normally open. When the micro controller pin became high according to the programming in addition to water level condition it will give the positively high (+5V) to L293D. L293D will provide the energizing supply to relay unit according to pulse received by Arduino pins.

The main work in this proposed work is carried by two AC Motors.

### Inlet motor

The job of inlet motor is that it draws water from the available source like lakes, rivers, or from a well to the tank. Inside the tank, 3 water level sensor are attached so that when the water in the tank gets filled up completely, the sensor senses and it gives signal to the microcontroller so as to stop the inlet motor. Likewise, when the level of water is low in tank the motor is made to start automatically.

### Outlet motor

It continuously draws water from the tank and feed water to the different streets through solenoid gate valves. There will be three valves to control the water supply to public using solenoid valves.

Let us assume that we need to supply water for a particular street for 10 (timing can be changed according to the requirements) minutes that is predefined in the program. So for that duration the first valve gets open and it is open for particular pre-defined time and water is supplied. After a pre-set time, it is programmed in such a way that it must close automatically and thereafter simultaneously second gate valve is opened and it supplies for a pre-set time to the other different street that defined earlier on a program. Similarly, water is supplied to Next Street. Now if there is power failure during the water supply, say for about half an hour, this scheme is designed in such a way that when the power is restored, whatever the time is remaining to complete the pre-set time, gate valve will open to that duration and get closed after completing the remaining time and then only the second gate valve opens if necessary. This is one of the major advantages of this system. In addition to this, every change over occur in supplying water to different area the system, this message will passed to water supply board authority/operator by using RF Transmitter module.

### D. Flow Chart

Figure 3.4 gives the flow chart for the proposed automatic water supply control System.
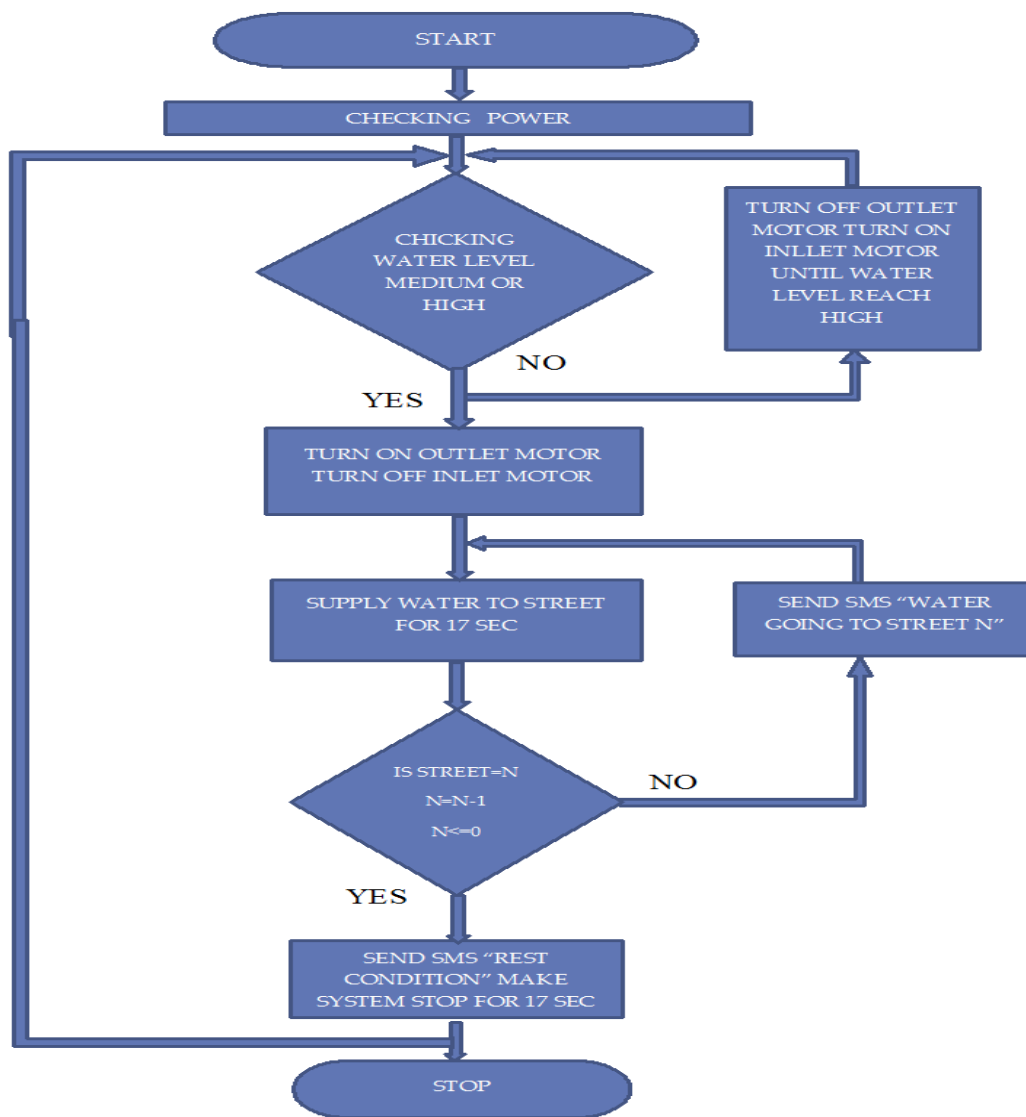
**Fig. 3.4: Flow chart for the proposed automatic water supply control System**

## IV.    RESULTS AND DISCUSSION

The proposed automatic public water supply control system has been tested and it is working satisfactorily. All the components of the system found to be working appropriately. Water supplied to all streets with predefined time in a proper controlled and efficient manner and is achieved successfully. The two AC motors are operating automatically when water reaches to medium level and water going to all street through solenoid valve. If there is any power failure at the time of operation, on chip timer will be continued until power restore and RF transmitter sends message automatically regarding which area is getting water. This work if implemented in municipalities it will minimize the man power, equal distribution of water without wastage and it also helps to minimise the over usage of water.

### A. Advantages of Proposed Water Supply Scheme

- In this system water is not stagnate in pipe at any instant and hence fresh water is available always

- Lesser pipe sizes are required.
- Relatively cheaper.
- Determination of discharge and pressure is easier due to less number of valves.
- Water is kept in good circulation due to the absence of dead end.
- In the case of break down in some section, water is available from some other direction.

### B. Applications

- Utilized for domestic and irrigation purpose.
- For household automation system.
- This work can also be used in municipalities, agricultural field, and can also afforded in the industries according to their need.

## V.    CONCLUSIONS AND SCOPE FOR FUTURE WORK

### A. Conclusions

This work entitled, "Automatic strategy to control entire villager's water valves with user level authentication", is successfully developed, tested and is found to be working satisfactory. It has a very good feature when compared with the existing controller. This system distributes water equally and continuously with reduced cost of the water supply system. Since the system is based on microcontroller and GSM, the functioning is fast, easy and accurate.

### B. Scope for future Work

- In this project, the GSM is used to send messages and alert the operator. For future improvement it can be used to control the entire operation of the water supply system.
- By adopting pressure sensor it can detect any leakage in pipe and intimate to the operator.
- Using some suitable sensors, this work can be applicable for irrigation purpose such as: moisture sensors, temperature sensors, etc.

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