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IoT based efficient water distribution system for human and agricultural uses

Mayur Bhalchandra Tangadi
mayur.tangadi111@gmail.com
Universal College of Engineering, Vasai, Mumbai, Maharashtra

Chirag Sadanand Patil
pchirag1995@gmail.com
Universal College of Engineering, Vasai, Mumbai, Maharashtra

Prayag Narayan Mhatre
prayagm96@gmail.com
Universal College of Engineering, Vasai, Mumbai, Maharashtra

Kanchan Dabre
kanchan.dabre@universal.edu.in
Universal College of Engineering, Vasai, Mumbai, Maharashtra

ABSTRACT

An Integrated System Based On Internet Of Things Technology Is Proposed For Managing, Monitoring and Efficient Distribution Of Water. With the increase in Population, urban residential areas have increased because of this reasons water has become a crucial problem which affects the problem of water distribution, interrupted water supply, water conservation, water consumption. Current Water distribution and management system involves Water wastage and faces new challenges like System Lags behind related to technical aspects, Degradation of Soil Quality with respect to Irrigation. In order to curb the problems involved in the existing system, Solutions are implemented in the proposed system. IoT Based Efficient Water Distribution SystemFor Human And Agricultural Use Like The Name Says Is all About Managing Water Supply Throughout The Scale, including Small Societies, Townships, Urban Infrastructure And Also For Irrigational use.The Water supply with continuous monitoring makes a proper distribution so that, we can have a record of the available amount of water in tanks, flow rate, abnormality in the distribution line. IoT is a network of physical objects which are embedded with electronics devices, sensors, software, and network connectivity. Monitoring can be done from anywhere as a central office. As per the scarcity of the water, it will be indicated by sending short message service notification as well notification of water supply timing to societies. This proposed system also helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil moisture and DHT11 sensor. The DHT11 is low-cost humidity and temperature sensor. It senses the humidity and temperature in the environment of the farm land and sends the result to the system.The moisture sensor is used to check the soil moisture and based on this microcontroller drives the solenoid valve. This will improve the cultivation method and leads to better productivity. It Can Control The Water Usage In A Precise Way.

Keywords: *Efficient Water Distribution, Drip Irrigation, water level sensor, Internet of Things, soil moisture, solenoid valve, DHT11.*

1. INTRODUCTION

Water is an important resource for all the livings on the earth. In that, some people are not getting sufficient amount of water because of unequal distribution. This approach can be used so that everyone gets the equal amount of water. It is also used to avoid the wastage of water during the distribution period. In the previous method, the employee will go to that place and open the valve for a particular duration, then again the employee will go to the same place and close the valve, it is waste of time. The proposed system is fully automated. Here human work and time are saved table text styles are provided. The formatter will create these components, incorporating the applicable criteria that follow. The real-time monitoring of water resources information will benefit the water resources management department and the public. The main concept of real-time IOT based water resources Management system is to provide comprehensive and accurate information. The system is developed through defining some explicit water resource parameters then, Water level and flow parameter are defined for water measure & management, followed by a sensor network for water resources and information monitoring is constructed based on IOT.

2. LITERATURE SURVEY

In earlier effort, IoT based water management system was proposed by prachet verma[1] and group for the campus. But it did not include SMS notification service. Water level management was done by the ultrasonic sensor.In another related work, Navnath Bansode[2]and the group used an internet-based approach to measuring water quality and usage on a real-time basis. But it does not include the billing system. A Flow sensor for measuring of quantity supplied, eliminating the drawbacks of traditional water metering systems. The Ph and Conductivity sensors are described in it. A MEGA initiative to define reference architecture for water management based on the integration of IoT capabilities to achieve a scalable and feasible system is described by Tomas Robles[3] and Group.The Humidity sensor is used which detects the humidity of soil and based on this data the microcontroller will drive the solenoid valve which controls the flow of water. Irrigation status is updated to the server or local host using Personal Computer. It will also reduce the human factor, energy, and power [4].AmeyaBhale[5] has proposed of developing a decision support system that will take sensor values as input and would trigger the electromagnetic solenoid valves based on crop water requirement equations. Further, this decision support system can be accessed through an android phone. Rashmi Jain and group [6] presented a paper with objective to develop a smart wireless sensor network (WSN) for an agricultural system. The Remote monitoring system using RF module is investigated in this system.In order to control drip irrigation system, an approach is proposed for collecting environment data and sending a control command to turn on/off irrigation system by Shweta Bopshetty and group [7].TheExperiments and actual application results prove thatinformation technology is a main component and is critical in modern water resources management and distribution [8].A Wireless Network Based Automatic Irrigation System is proposed byA. Anusha and D. Gouthami [9] in which with the help of GSM Module, the user can control the motor from anywhere.A Wireless sensor network and Embedded based technique of DTMF (Dual Tone MultipleFrequency) signalling to control the flow of water for sectored, Sprinkler or drip irrigation technique is proposed by Vandana Dubey, Nilesh Dubey and Shailesh Singh Chouhan [10].

3. PROPOSED SYSTEM

The aim of the proposed system is to achieve efficient Distribution, Management, and Conservation of water For Human and Agricultural use. The system which is proposed enhances the existing system by overcoming the disadvantages in it. The contribution work includes an integrated network of sensors connected to an Arduino Uno which in turn is connected to ESP 8266 Controller. The data and information collected by the sensors will be sent to Arduino which will send the data to the website through ESP 8266.The block diagram of the designed system is given in Fig 1.

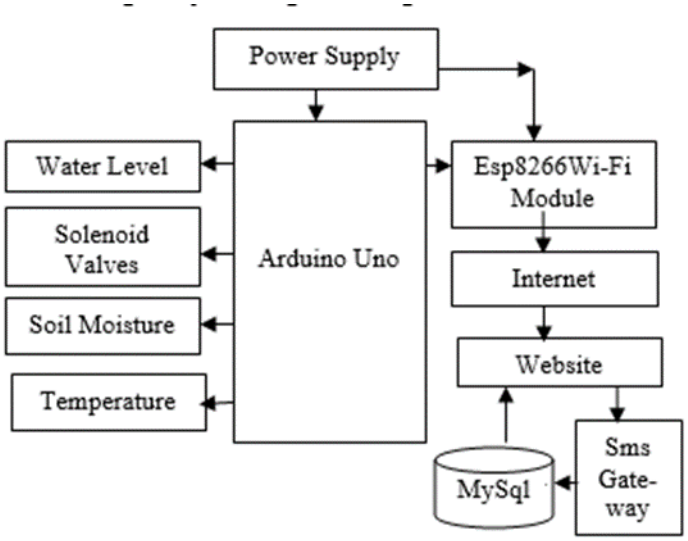

Fig 1. Block Diagram

The Arduino Uno board is a microcontroller based on the ATmega328P .It consists of 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It takes the values/parameters/data from the sensors that are connected to it and pass the Information to the ESP 8266 Controller which is also connected to it. The ESP 8266 is a chip with full TCP/IP stack. It has the MCU (microcontroller unit) capability. It is a self-contained SOC (System on a chip) with integrated TCP/IP protocol stack. It is a Wi-Fi module that will perform the task of Transferring data/parameter/commands/values from Arduino Uno to website and from website to Arduino Uno. It has 64 kb of instruction RAM and 96 kb of data RAM. It is the HC-SR04 ultrasonic ranging water level sensor. Each module of HC-SR04 includes an ultrasonic transmitter, a receiver and a control circuit. This sensor will be mounted on Water Tank and it will check the level of water in the tank and send the signal. Upon that values it will be decided whether to release the water or not. The soil moisture is used to detect the volumetric Water content in the soil. It measures the moisture content in the soil. It has the Accuracy of ±4%.It operates within the temperature range of –40°C to +60°C.With respect to agriculture use, the Sensor When powered on will check the moisture content in the soil and send the data to the System through Arduino Uno and ESP 8266.Based on this data It will be decided whether to Open the Valve so that water can be released. This Sensor needs power supply of 3mA @5VDC. DHT11 is a basic digital temperature and humidity sensor. It uses a capacitive humidity sensor and spits out a digital signal on the data pin. It will sense the humidity in the air and send the signal to the system. It needs power supply of 3 to 5V.2.It uses 5mA max current during conversion (while requesting the data).It has 4 pins with 0.1" spacing. The cost of this sensor is less. The workflow diagram of designed system for societies is given in Fig 2.

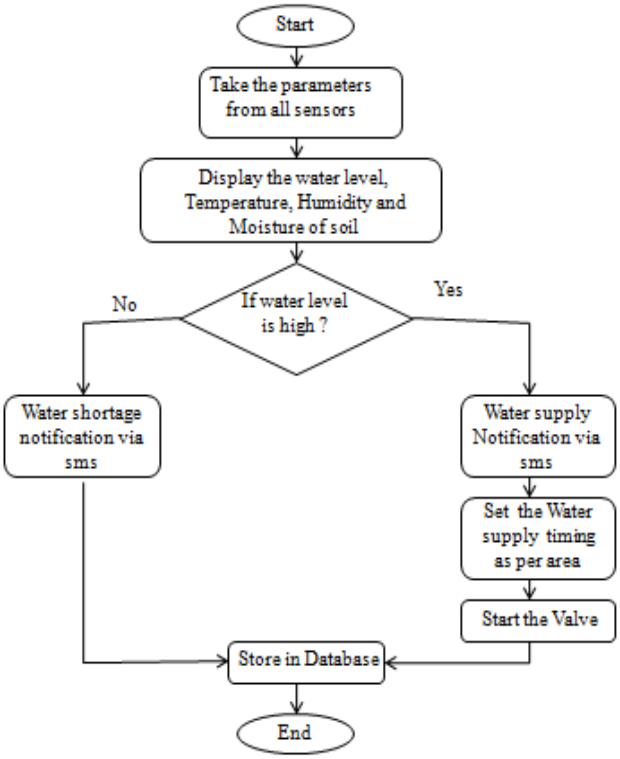

Fig 2. Work Flow Diagram for Societies

When the system will be powered on, all the devices and sensors will be activated.after the components are active, all the parameters/data from the sensors will be collected on the website and stored in the database. Information such as Level of water in the tank, temperature etc. will be displayed on the website. Based on this data further decisions will be taken. If the water level is low than the previously set level than an SMS notification will be sent about the shortage of water and the information will be stored in database. If the water level is high than the previously set level then an SMS Notification will be sent about the Water supply timing and the information will be stored in database. As the water level is high the solenoid valve will be opened and the water supply will start and it will be distributed further. The workflow diagram of designed system for agriculture is given in Fig 3.

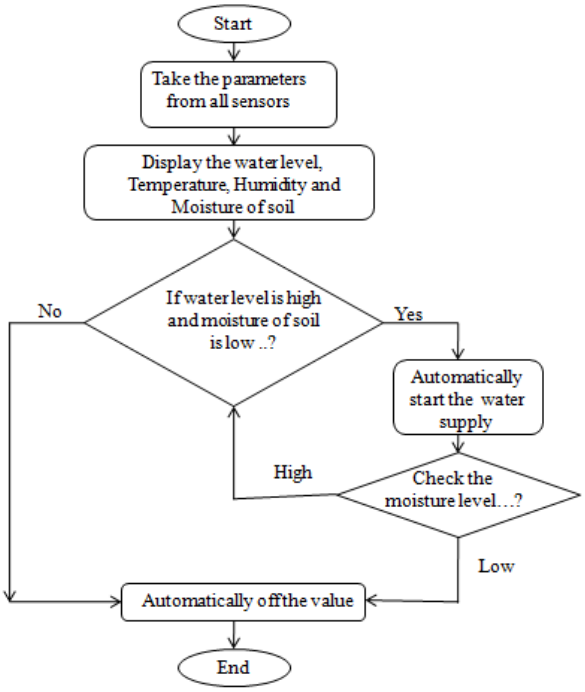

Fig 3. Work Flow Diagram For Agriculture

When the System will be powered on, all the devices and sensors will be activated. After the components are active, all the parameters/data from the sensors will be collected on the website and stored in the database information such as level of water, moisture content of the soil, temperature etc. will be displayed on the website. Based on this collected data further decisions will be taken. If the level of water is high and moisture content of the soil is high then the valve will not open and there will be no supply of water. If the water level is high and the moisture content of the soil is low then the valve will open automatically and the water

supply will start. After some time the moisture level will be checked again. if it high then the valve will be turned off and the water supply will stop.

4. RESULT AND DISCUSSION

IoT based water resource management can be useful for monitoring, tracing and manage the remote location valves and meters. In conventional systems a person is employed for such remote location valves and meter management. The aim is to focus on various applications of IoT in water resource management which reduces the human effort and overcome the drawbacks in the conventional system. The Fig. 4 shows the partial result of the system.

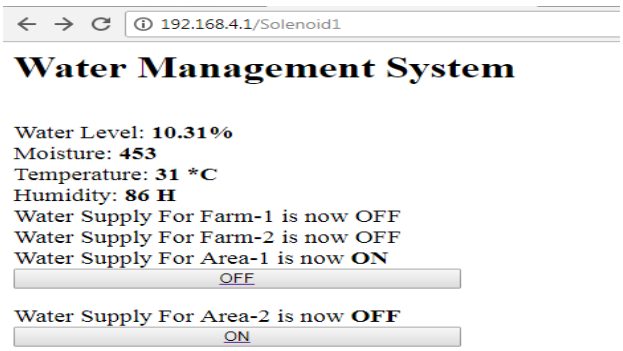

Fig 4. Partial Result of the System

In the above figure, the result of the project is displayed.It shows the water level, the moisture level, and the humidity level.The water supply for Farm-1 and Farm-2 is OFF.When the moisture level will be Low the water supply will start Automatically. The water supply for Area-1 and Area-2 will be controlled Manually on the basis of the water level.

5. CONCLUSION

The architecture for water management based on Internet of Things technology to achieve a scalable and feasible Water Distribution system For Agriculture and Human Use is described. The System consists of interconnected sensors based on the wireless network. The Soil Moisture sensor detects the soil moisture and DHT11 sensor detects the humidity based on this the Solenoid valve Will be driven. The Monitoring of Water either for Human use or for the Irrigational purpose can. be done from anywhere as a central office. This Reduces the Human Efforts of Physically going near the Water Reservoir for Monitoring. The SMS gateway is used for Sending the Notifications of Water Supply Timings or About Shortage of Water.

The Future Enhancement includes using the ESP 8266 controller, which will replace the Arduino Uno. The cost of ESP 8266 is comparatively low than the Arduino Uno.

Another future enhancement that is planned is including the Billing System. The Bill for the total water consumed will be sent through SMS Notification.

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