

HARDWARE & SOFTWARE ARCHITECTURE FOR IOT BASED WATER DISTRIBUTION AND MONITORING SYSTEM

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Abstract: Now a day's, the population of urban areas increases due to the requirement for a comfortable and easy lifestyle. Day by day the population in urban areas increases therefore the need for water increases. For this proper distribution, sufficient water supply, water protection, water utilization, and other things are needed with a well plan. To overcome all these problems of water supply proper monitoring and the controlling system must be implemented. These paper addresses the development of hierarchical hardware architecture consisting of smart devices related to IoT which is water flow sensor, water pump motor, Arduino UNO board, etc. This smart system concentrated on the monitoring and controlling of water distribution. In this system, the software architecture is proposed and implemented to identify control units and end devices using unique id so as to control the flow of water, pressure of water with the help of a motor and flow sensor. As a result, the water monitoring and controlling water distribution using IoT based model was successfully passed all conditions of water distribution. The performance in terms of response time is evaluated and found to be less than 1 second which is real time system time out.

Index Terms – IoT, sensor, master slave.

I. INTRODUCTION

Now a day's, due to an increase in population the cities faces water distribution issues. For day to day needs, there is a problem of insufficient water supply. Therefore monitoring and controlling water is become a major problem. In cities, some areas have enough water supply but some areas do not have enough water supply [2]. This is due to some problems like insufficient water supply, distribution problems ,and damaged pipelines due to over pressure. Water cannot reach to users which are located on high-ground areas or very far away from the main water station or water tank[4]. All of these issues of water distribution are because of a lack of real-time monitoring and controlling system [3]. Now a day's, cities are developing very rapidly and started accepting smart technologies and a new lifestyles. After studied so many technologies for improving economic conditions, water is becomes the main priority. For this purpose, there is the necessity of controlling and manage water distribution as well as collecting and analyzing the data for smart management and store data for a future purpose [1].

II. LITERATURE SURVEY

The use of Internet of things is increasing day by day because of its many advantages. The Internet of things (IoT) is used for real time monitoring of water. So, from the paper smart water monitoring system using IoT we understand the use of Internet of things for real time monitoring of water for our paper and we decided to do a paper in the Internet of things (IoT) domain[1]. The water quality in the distribution system affects the people health, when the water is contaminated. These contaminants cause dangerous problems for human health. So, it needs to monitor continuously[2]. For this purpose, the internet of things is the best solution. Therefore, from the paper IoT technology for the smart water system, we understood these concepts. To measure different physical parameters like the level of water, the flow of water, and pressure of the water different sensors are required. We understood the use of sensors from the paper the real time monitoring of water quality in the IoT environment. It is very necessary to control the water level in the tank and provide the without any wastage. For this purpose, we studied the use of a water level controller like the ultrasonic sensor from the paper implementation of simulated water level controllr[9].

III. OBJECTIVE AND MOTIVATION

The main objective of our paper is to provide sufficient water supply to consumers. Also, to control and avoid wastage of water. The main purpose of this system is to monitor and control the flow & pressure of water to avoid pipeline damage. Also to provide sufficient water supply as per the no of members present in the family[4].

IV. METHODOLOGY

In this system, we present the system design of the IoT based water monitoring and controlling water distribution[6].

System design: The proposed system is for monitoring the flow and level of water. Automatic water pump is used for controlling the water pressure in the pipe. The control unit used to store the data of both the units.

Hardware setup: In this system, hardware setup consist of a flow sensor, ultrasonic sensor, Arduino UNO board, motor pump, control unit.

Flow sensor: It measures the flow of water as well as the pressure of water in the pipe.

Ultrasonic sensor: This sensor measures the level of water in the tank[5].

Water pump motor: This motor automatically controls the water quantity in the pipe.

Wi-Fi module: This module used for data transfer and analyze the data.

Arduino UNO board: This is the heart of the system used to control all the functions in the system.

Control unit: The control unit used to store all the real time data for future purposes.

V. HARDWARE ARCHITECTURE

This prototype is implemented by using Ultrasonic sensor, Arduino UNO, ESP8266 module & thing speak server. Hardware architecture consists of hierarchical structure in which Ardino UNO are control unit and sensors, actuators are end devices. The communication in the system is using IoT. An ultrasonic sensor mounted on the top of the tank. By using the ultrasonic sensor, we measure the water level in the tank. By measuring the distance between the top of the tank and the surface of the water, we continuously monitor the status of the ultrasonic sensor and checking the Ultrasonic sensor reading. If water is available in the tank, then start the water pump motor[10]. The fow sensor is used to check the flow rate of water flowing through the pipe. If the flow rate is more than the threshold value, then water pump motor automatically stops. All these procedures controls by Arduino UNO microcontroller. By using the ESP8266 Wi-Fi module all these data updated in the thing speak server. It is an open source platform. We can continuously monitor, analyze, and store the data received on thing speak server[7][8].

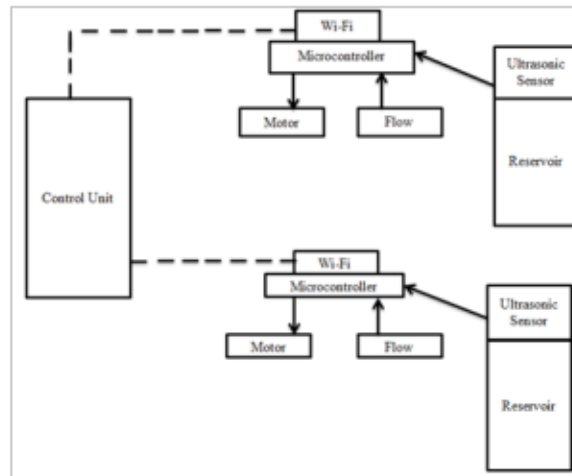


Fig : Block Diagram of proposed system

VI. SOFTWARE ARCHITECTURE

Control units and end devices in the system are identified using unique id and system follows master slave protocol

1. Start the program.
2. Initialize all the components.
3. Configure status LED as an output using the PINMODE register.
4. Check Ultrasonic sensor readings.
5. If water is available in the reservoir, then start the pump.
6. Check the flow rate of water.
7. If the flow rate of water is above the threshold level, then stop the pump.
8. Update all the readings to the control unit.
9. Store these readings to the database.
10. Stop the program.

VII. RESULT AND DISCUSSION

By making all, connections successfully, first of all we are login in thing speak application. After login, we type the value of required water in Arduino software. The water level in a tank which is sensed by Ultrasonic sensor. If water is available in the tank, then the flow sensor is ON which gives the result in ml/sec according to the flow sensor. The water pump motor is ON/OFF as per the status of the flow sensor. All these results are uploaded on thing speak application by using Wi-Fi (ESP8266) module which is connected to the Arduino Uno board (main controller). The performance in terms of response time is evaluated for prototype of proposed hardware architecture and is less compare to 1 second which is real time system time out.

VIII. CONCLUSION

In this paper, an IoT based water distribution and monitoring system are presented. For this, some sensors are used. The collected data from all the sensors are used for analysis purpose for better solutions to water problems. The data is sent to the control unit via a Wi-Fi module ESP8266. So this application will be the best challenge in real time monitoring & control system and use to solve the entire water related problem.

In this, we are monitoring the flow rate of water by using the flow sensor. By using this, we can monitor and supply sufficient water distribution in urban as well as rural areas. Also, we can detect the level of water in the reservoir.

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