IOT Controlled Water Supply Management

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Abstract— The system shown here is IOT (Internet Of Things) based solenoid operated valve system which can effectively control the water supply. The controller is programmed which communicate with IOT protocol and connect with Ethernet or WIFI shield to operate the solenoids at particular time interval in different areas, the control room person has to operate the overall operation using android application from an android mobile. As per the requirement the main pump operates and a microcontroller turns on the particular area solenoid, the water now flows through solenoid and supplies water to particular area. After the particular timed operation the next area solenoid will trigger**.**

Index Terms— Aurdino Microcontroller, Motordriver, Liquid crystal *Display*(LED), Regulated power supply,Buzzer,WIFI sheild,sensors

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. Water management is defined as the activity of planning, developing, distributing and managing the optimum use of water resources. The water management IOT system now days are a very important parameter to prevent wastage of water. We can use this approach so that everyone gets the equal amount of water. It is also used to avoid the wastage of water during the distribution period. In manual operation the mechanical valves are operated at different time intervals at different areas. But this existing system has brought some drawbacks like improper speed regulation, improper timing. The system show here is internet of things (IOT) based solenoid operated valve system which can effectively control the water supply system. As per the requirement the main pipe operates and a controller even turns on the particular area solenoid.

2 METHODOLOGY

The system uses raindrop sensor module as a switch for he detection of water leakages in the pipe. Float sensor is used to check the water level in the tank and protect the pump from dry running. To protect the DC motor against over temperature and over voltage, temperature sensor and voltage sensors are used. All problems occurring in the system will send to the concerned person through Wi-Fi module. The solenoid valves are electromagnetically operated valves which control the flow of water. The miniature pump used here is 12v dc pump which is controlled through microcontroller and lifts the water from tank and push it to required solenoid valves.

The block diagram of the IOT controlled rain water supply management system is shown in the figure 1. The data coming over the internet is picked by the Wi-Fi module. The arduino Wi-Fi shield allows an arduino board to connect to the internet using Wi-Fi. The controlling and sensing action of sensors is done through arduino controller. The switching unit consists of relay. Relay is an electromechanical switch and it works on principle of energized an electromagnet. Solenoid valves are electromagnetically operated valves which control the flow of water. The miniature pump used here is operated at 12v dc which is controlled through microcontroller and lifts the water from tank and push it to required solenoid valves. A dc power supply system, which maintains constant voltage irrespective of fluctuations in the main supply.

For the safety of dc motor from high voltage can be possible to safeguard with the help of high voltage detection circuit. The variation in the pressure and some damages in the main pipe line may cause to wastage of water. This is designed with simple technique of wired conducting probes with transistor interface as the water level in a tank within safe limit. The transistor is in cut off state and if the water level goes below the limits the transistor goes to saturated and provides the signal arduino .The complete process takes place human less operation.

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3 HARDWARE REQUIRENMENTS

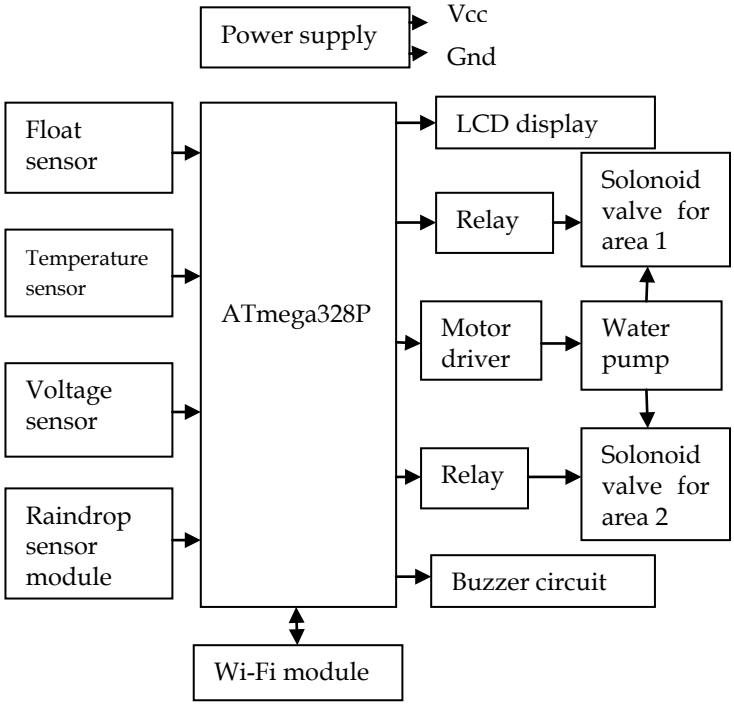

Figure 1. Block diagram of water control unit.

The main components of our project are:

- ATmega328P
- Temperature Sensor
- Float Sensor
- Voltage Sensor
- Rain Sensor Module
- Wi-Fi Module
- Motor Driver
- Buzzer Circuit

i) ATmega328P

The Atmega328 is a single chip microcontroller created by Atmel in the megaAVR family. The microcontroller has a serial programmable USART. It is a byte-oriented 2-wire serial interface. The device operates between 1.8 to 5.5 volts. Perhaps the most common implementation of this chip is on the popular arduino development platform, namely the Arduino Uno and Arduino nano models.

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ii) Temperature Sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ˚ Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4˚C at room temperature and ±3⁄4˚C over a full −55 to +150˚C temperature range. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supply.

iii) Float Sensor

A float switch is a device used to detect the level of liquid within a tank. The switch may be used to control a pump, as an indicator, an alarm, or to control other devices. One type of float switch uses a mercury switch inside a hinged float. Another common type is afloat that raises a rod to actuates a micro switch. A very common application is in pumps and condensate pumps where the switch detects the rising level of liquid in the sump or tank and energizes an electrical pump which then pumps liquid out until the level of the liquid has been substantially reduced, at which point the pump is switched off again. Float switches are often adjustable and can include substantial hysteresis. That is, the switch's "turn on" point may be much higher than the "shut off" point. This minimizes the on-off cycling of the associated pump.

iv) Voltage Sensor

The Smart Q Voltage Sensors are used to measure the potential difference between the ends of an electrical component. This range of Voltage Sensors can be used to measure both DC and low-voltage AC circuits. The Smart Q Voltage Sensors are equipped with a micro controller that greatly improves the sensor accuracy, precision and consistency of the readings. They are supplied calibrated and the stored calibration (in Volts) is automatically loaded when the Voltage Sensor is connected.

v) Rain Sensor Module

For the detection of water leakage we are using rain drop sensor, The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and also for measuring rainfall intensity. The analog output is used in detection of drops in the amount of rainfall. Connected to 5V power supply, the LED will turn on when induction board has no rain drop, and DO output is high. When dropping a little amount water, DO output is low, the switch indicator will turn on. Brush off the water droplets, and when restored to the initial state, outputs high level.

vi) Wi-Fi module

ESP8266 WIFI module is WIFI serial transceiver module, based on ESP8266. Small size and low cost makes it suitable for sensor nodes. It works on 3.3V and consumes current up to 250mA.

Current consumption is quite big so it's usually not powered on battery. If you are using 5V Arduino, then read ESP8266 WIFI and 5V Arduino connection. Before we start using ESP8266 WiFi module we need to update ESP8266 firmware. We use V0.9.2.2 version of firmware.

vii) Motor driver

The L298 Driver is a high voltage, high current dual full bridge driver designed to accept standard TTL logic levels and drive inductive loads such relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together the corresponding external terminal can be used for the connection of an external sensing resistor.

viii) Buzzer circuit

An electric buzzer or speaker is a piezoelectric device, which uses electrical signals to create mechanical motion. Motion in these devices creates vibrations in the air. These vibrations, when created at the correct frequencies, are distinct pitches or tones of sound. Creating these pitches is accomplished most simply by using a digital signal and varying the frequency of "high" values written, thereby varying the emitted pitch.

4 Implementation of Hardware

System flow:
The figure 2 shows the flow diagram of sensors like flow sensor, temperature sensor and voltage sensor. The sensors take the input, if it exceeds the threshold value it sends the message to concern person. The pump is then turned off and if threshold value is less than the sensor value the process is continued from the first stage

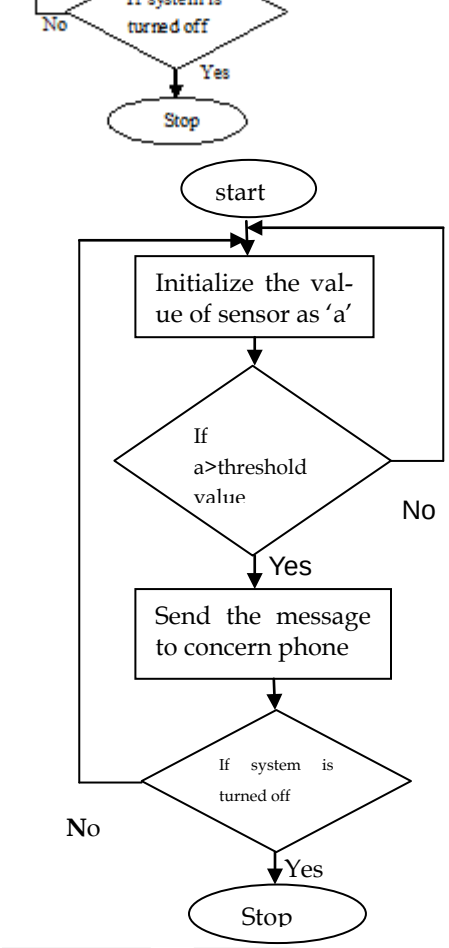

Figure 2: flow diagram of sensors.

Voltage monitoring system:

Figure 3: block diagram of voltage monitoring system.

For the safety of the DC motor with over voltage can be possible to safeguard with the help of over voltage detection circuit. The circuit is designed with zener diode based transistor switching which provides the proper bias voltage to the transistor. The bias voltage is with respect to the i/p DC voltage only as the i/p voltage increase abnormally the zener bias voltage also varies and triggers the transistor which further activate the electromagnetic relay which disconnect the i/p which prevents damage to the DC motor .

Temperature monitoring system:

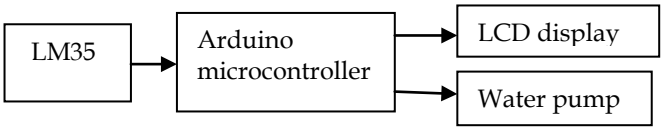

Figure 4: block diagram of temperature monitoring system.

To protect the DC motor against over temperature sensing circuit is designed with Thermistor, OP_AMP, which sense the

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working temperature of pump. The Thermistor is used as a "thermal sensitive resistor". The Thermistor resistance is very high at normal temperature. Here the OP_AMP is used as a voltage comparator. As soon as temperature increases its resistance decreases which increases the voltage.

Water leakage monitoring system:

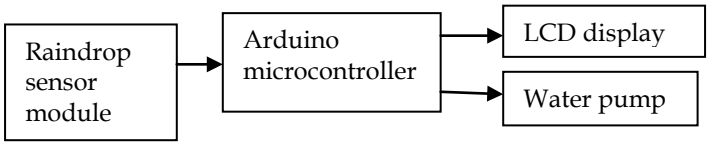

Figure 5: block diagram of water leakage monitoring system.

The complete process takes place man less operation due to this some time because of the variation in the pressure and some damages if the main pipe lines gets open or damage and if the lot of water wastage takes place, a leakages can be detected using a metallic mesh structures over the pipe lines as the leakages takes place in any of the pipeline takes place this makes a closed loop control for the mesh and it provides a signal for control room. By this method we can avoid the wastage of water also.

5. Conclusion And Future Scope

By implementing the proposed system there are various benefits for the government and public. For the government a solution for effective supply of water to the public, by using the IOT controlled water supply management system, it optimizes the usage of water by reducing wastage and reduces the human intervention for supply of water.

In this paper, an automated water supply model is proposed and successfully implemented using different circuits. The system is implemented by considering low cost, reliability, and automatic control. As the proposed model is automatically controlled and it will help the public to get proper amount of water without any wastage.

In this proposed system, water level can be monitored continuously from anywhere using android application. Motor can be controlled automatically full smart automation is achieved. The water wastage can be avoided effectively and effective supply of water for every area is possible. It is possible to control the different time intervals and also possible to modify the program using less man power.

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