

Automatic Water Distribution System Using Arduino UNO

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ABSTRACT: In Urban areas water distribution is among those issues which are not taken seriously. There are a lots of issues related to water, among those a small issue is fight among the peoples of apartments for acquiring water as per their requirement. This project is proposed to solve this issue by supplying water in a proper channelized manner using embedded technology. In order to implement water distribution system in a proper channelized manner to the end users, the control room of each apartment should be provided with a microcontroller to regulate the required quantity of water in proper time interval. The solenoid valve is used to supply water, which stops automatically when the flow rate exceeds a predetermined limit. The solenoid valve is controlled using a predefined clock to control the flow of water accordingly for a fixed duration of time. The GSM module is employed for wireless communication so that message can be sent to the authority in the central control room.

Keywords: GSM module, solenoid valve, Arduino UNO, Water distribution system.

I. INTRODUCTION

Water scarcity is fast becoming urban India's number one woe, with government's own data revealing that residents in 22 out of 32 major cities have to deal with daily shortages. "In official records, many cities might be getting adequate water. But because of faulty engineering and poor maintenance, the actual availability is much less," .Water supply must meet the requirements of Public, Commercial and Industrial activities

The basic idea of our project is to channelize a proper water distribution system, which can supply water to the end users. For such type of water distribution it is necessary to have a proper distribution layout such that it can suffice the basic requirements of the end users. As the main objective of our project is to have a system which can reach the end users their basic need of water, with proper quantity and time.

II. LAYOUT OF DISTRIBUTION IN EXISTING SYSTEM

Different topologies for the distribution of water:

There are three basic layout of distribution system.

1. Radial distribution system.

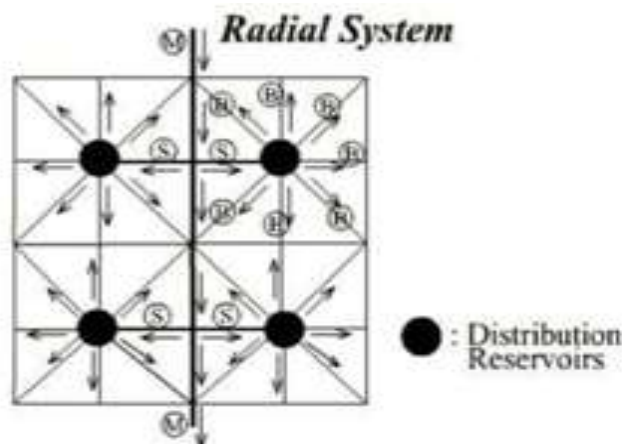


Fig. 1. Radial System

In radial distribution system Distribution reservoir is kept at the middle of each zone. No two zones are interconnected with each other. Water is distributed in only one direction to any point.

2. Grid iron distribution system

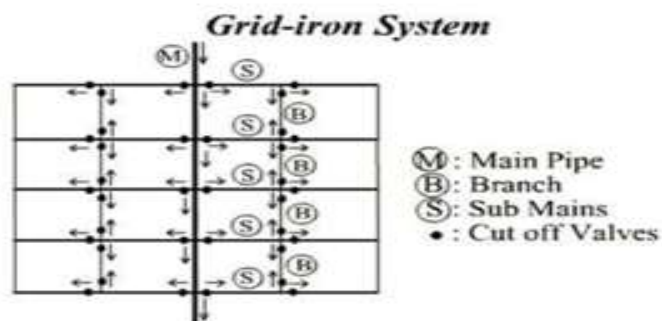


Fig. 2. Grid system

This type of distribution system has a rectangular layout and is suitable for cities with rectangular layout. The water mains and branches are laid out in rectangle.

3. Ring Distribution System.

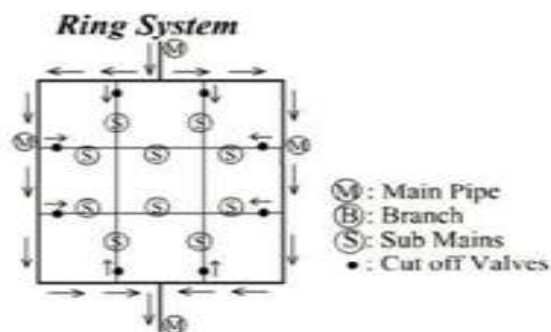


Fig. 3. Ring System

The supply main is laid all along the peripheral roads and sub mains branch out from the main. Determination of pipe size is easy.

III. PROPOSED SYSTEM DESCRIPTION

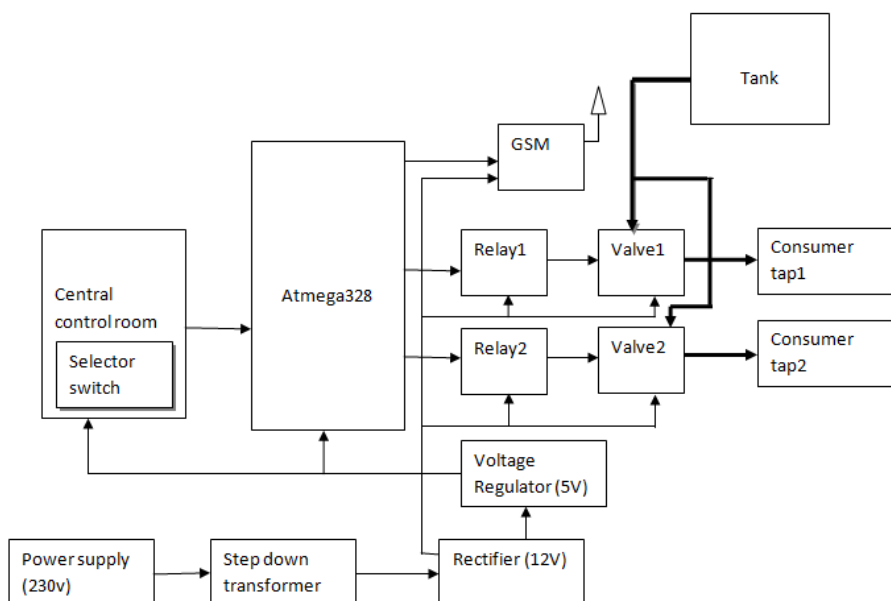


Fig.4. Block Diagram

When the switch of the central control room is activated, microcontroller triggers the relay circuit and it acts as a switch for solenoid valve. The solenoid valve gets open and water starts flowing from valve 1,2 to the customer tank1&2 for a pre determined time interval and after the calculated time interval is reached water automatically stops and a message is delivered to the authority that “both tanks are full”. If any one of the customer in the apartment requires access amount of water other than regular interval allotted to the whole apartment then it can be delivered using the selector switch which is set for that particular house/room and hence after the same procedure carried above, when the calculated time interval is reached water automatically stops and message is delivered to the authority that “customer tank 1/2 ...is full”.

IV. HARDWARE REQUIREMENT

Solenoid Valve

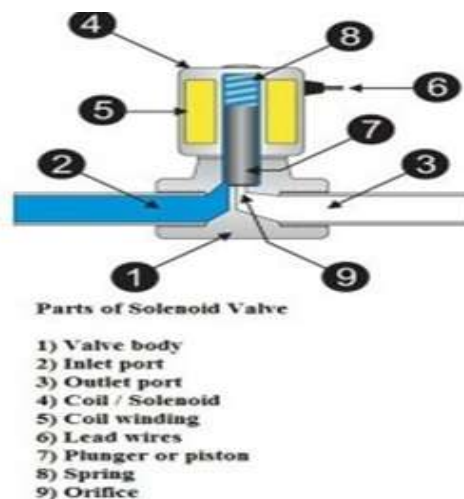


Fig.5.Solenoid valve

Solenoid valve is an electromagnetic device that converts electronic energy into linear mechanical motion. The solenoid consists of a coil of wire with an iron plunger that is allowed to move through the coil. The plunger is being held about halfway out of the coil by a spring. When the coil is energized, the resulting magnetic field pulls the plunger to the middle of the coil. The magnetic force is unidirectional — a spring is required to return the plunger to its un-energized position.

GSM Modem - RS232 - SIM900A

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB to- serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

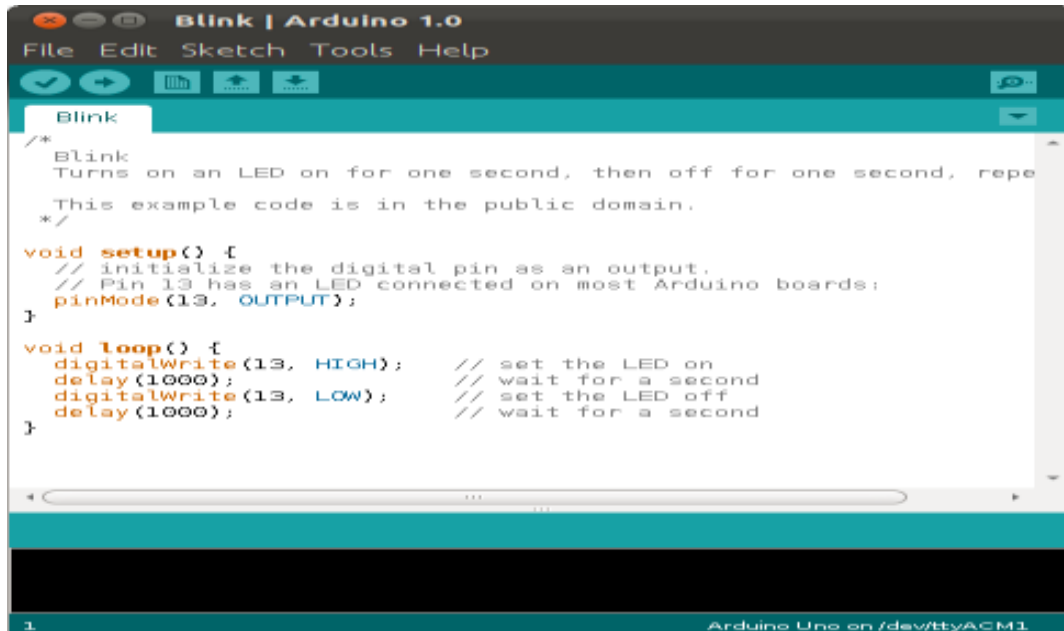
V. SOFTWARE SUPPORT FOR ARDUINO UNO

Arduino programs are written in C or C++. The Arduino IDE comes with a software library called "Wiring" from the original Wiring project, which makes many common input/output operations much easier. The users need only to define two functions to make an executable cyclic executive program:

- `setup()`: a function run once at the start of a program that can initialize settings

- loop(): a function called repeatedly until the board powers off

Most Arduino boards contain an LED and a load resistor connected between the pin 13 and ground, which is a convenient feature for many simple tests. The previous code would not be seen by a standard C++ compiler as a valid program, so when the user clicks the "Upload to I/O board" button in the IDE, a copy of the code is written to a temporary file with an extra include header at the top and a very simple main () function at the bottom, to make it a valid C++ program.



```
Arduino 1.0
File Edit Sketch Tools Help
Blink
/*
 * Blink
 * Turns on an LED on for one second, then off for one second, repeatedly.
 * This example code is in the public domain.
 */
void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
}
void loop() {
  digitalWrite(13, HIGH); // set the LED on
  delay(1000);           // wait for a second
  digitalWrite(13, LOW); // set the LED off
  delay(1000);           // wait for a second
}
1 Arduino Uno on /dev/ttyACM1
```

Fig.6.Arduino UNO software

VI. RESULT

When selector switch 1 is switched, both relay 1&2 gets activated and water starts flowing from the solenoid valve1&2 to the customer tank1&2. When both the tanks are full then message is delivered to the authority in the central control room “both tank are full”.

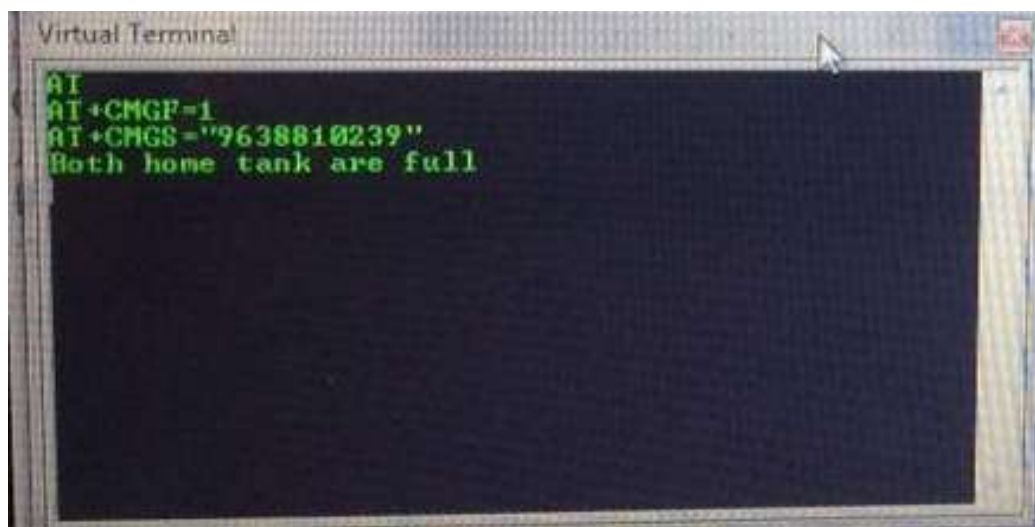


Fig.7.Screenshot of output 1 on Proteus

Now water is delivered on customer’s request for extra use then the messages will be sent to the authority when tank is full as per the allotted house no/name.

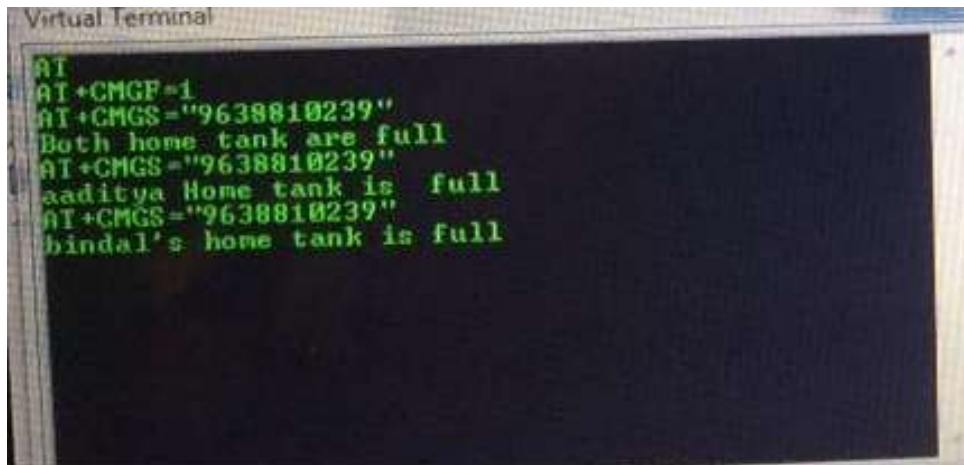


Fig.8. Screenshot of output 2&3 on Proteus

VII. CONCLUSION

“AUTOMATIC WATER DISTRIBUTION SYSTEM” ensures to avoid wastage of water and also reduces time. Due to the use of “Arduino Uno” it is possible to monitor and control the whole system from the central control room. The reduction of the operating cost as well as reduction in the water losses is achieved by the implementation of an intelligent control system.

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