

A Novel Smart Water Meter Based on IoT and Smart App for City Distribution Management

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ABSTRACT– The main aim of this project is to update the consumption information of water not only to the water board and also to the consumers. To know about the individual water consumption and to reduce the further excess usage of water. This project uses water meter to detect the flow of water and the collected data will be uploaded in the server and the uploaded data can be seen by using a mobile app, and the user can turn ON and OFF the supply by using mobile app.

KEYWORD: IoT, AMR, customer relations and billing, smartphone, water distribution system, municipal utilities.

I.INTRODUCTION

The world is moving with the IoT a based digital system which helps us to do any work in any place in the world. The user can operate or control the given research by tapping one button with the help of the internet access. Here we can control the water level with the help of IoT and can measure the water level with the mobile applications. So everything in the world is converting into digital networks. So we can find out the measurement by the digital readings and can be easily controlled without any man-powers. So, there is no need of any man powers sources to measure the water reading to the cooperation. Now we can find out how the users are consumption the water sources in the individual house.

II. PROPOSED METHOD

The proposed smart meter is based on analytical approach, considering real time scenario. The proposed system uses techniques of advanced wireless communication system and sensors. In this method water flow sensor will detect the water flow, and the output of the flow sensor is connected with frequency to voltage convertor which is interfaced with ESP8266 Wi-Fi controller. The controller is uploaded with an Arduino program and is connecte4d with relay module to turn ON and OFF the water pump. Then the data base of the project can be noticed by using mobile app.

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III.METHODOLOGY

A. BLOCK DIAGRAM

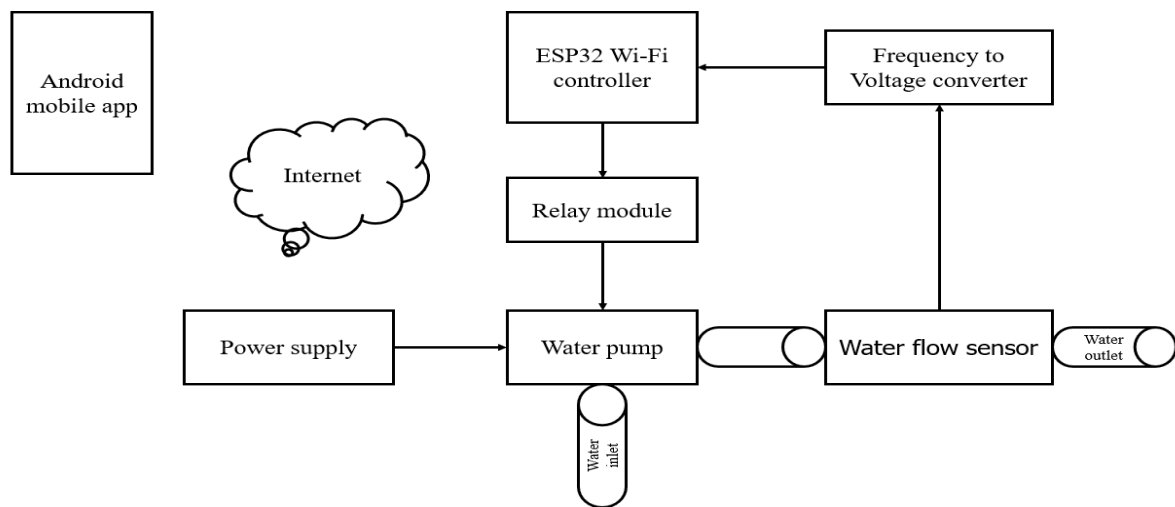


Fig 1. Block diagram

The Smart water Meter System comprises of hardware component called the Electronic Interface Module (EIM) that resides in conjunction with the basic water-meter. The EIM is designed around a low-cost CPU board with features such as interface for meter-register and water pump and Flash memory for date-time stamped Data log, Ethernet Stack and port for interface to TCP/IP network or Wi-Fi or GSM/3G/4G Routers, built-in battery and charging adaptor. The prototype Smart Water meter constructed, is a regular water-meter but with magnet-reed switch pick-off and embedded tiny magnet on a wheel which together generates. Pulses corresponding to rotation of the wheel. Recording of these pulses indicate the water consumption. For the prototype system, an external EIM designed around an Arduino ESP32 board.

B. ESP 32 WI-FI CONTROLLER

The Wi-Fi controller is used to connect the mobile devices to the respective controller to upload the program to the respective Arduino board and to connect all the peripheral devices. Thus, it also used to connect the mobile device to connect with the respective mobile application to enable and disable the water pump. All the motor drivers are connected by using this peripheral device and to notify the water level by using this application. It runs in 32-bit programming bits. The clock frequency can go from 240MHz and has over 512KB RAM. It has a built-in temperature sensor and Hall Effect sensor.

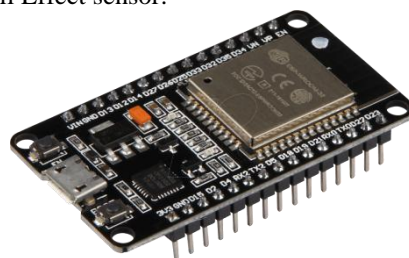


Fig 2.ESP 32 Wi-Fi Controller

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C. WATER PUMP

The water pump is submerged into the underground and pumps the required water sources to the respective houses. This water pump is operated in DC motor and has 2880 RPM. It is a single phase 51 to 100m submersible which there will be no electrical outlet from the pump. The motor is closely sealed and coupled thus there will be no pressure gap and does not damage or water levels which are distributed around the houses. The pump can be easily replaced when there is any defect in its property. Hence the pump acts as the major sources in the water distributor in the municipality or cities.



Fig 3. Water Pump

D. LIQUID CRYSTAL DISPLAY

The LCD is used to show the total quantity of water in liters and the total force in liters per hour. The digital display is encoded with the help of the Arduino board. If the Force or Liters is more than the threshold it gives notification to the android device to maintain the water level below the threshold. It is a 5V DC 16 x 2 lines ASCII Characters LCD Display with 2 row and 16 characters per row to display.

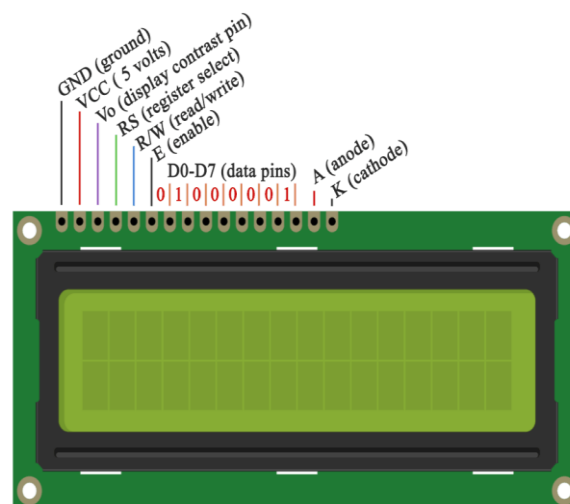


Fig 4.LCD Display

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E. WATER FLOW SENSOR

The water flow sensor is valve where water can pass through the containment unit. It has two sensors which measure the water flow. They are

- Water Rotor
- Hall Effect sensor

Here we can adjust the speed of the water where there will be no leakage of any water around the city or municipality. Their speed can be controlled by programming in the Arduino board and thus distributed thought the area.



Fig 5. Water flow Sensor

F. FREQUENCY TO VOLTAGE CONVERTER

In converts the pulse signal to the electrical output voltage. It measures the electromechanical measurements which repeat events which are occurring. It provides the necessary voltage sequences to the give the peripheral device at its own input sequence to the required voltage.



Fig 6. Frequency to Voltage Converter

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G. POWER SUPPLY

It is as 12v AC input that gives sources to all the peripheral devices including the Arduino Board. It converts high AC voltages to low voltage supply. This relies on every device without being damaged or just burned down.

H. ARDUINOIDE

It is a 14 pin IC which acts as digital input and output pins. The 6 analog pins have 16MHz ceramic resonator. It has a USB connection in which the data are shared using the computer and the IC. The Arduino IDE is coded with the basic C language with the help of the Arduino Software where its basic conversion can be changed to the required output sources. The coding is done accordingly to where the supplies has been given to the individual houses and are operated by the help of the android software which is connected using android devices. Thus the user can read the outlet of the water source and the consumption of the water and can also operate the ON and OFF terminal of the water sources with the help of the android application. Thus we can save the water without any man-made power and can be easily operated in from any other place with the help of IoT.

IV. EXPERIMENTAL SETUP AND RESULT

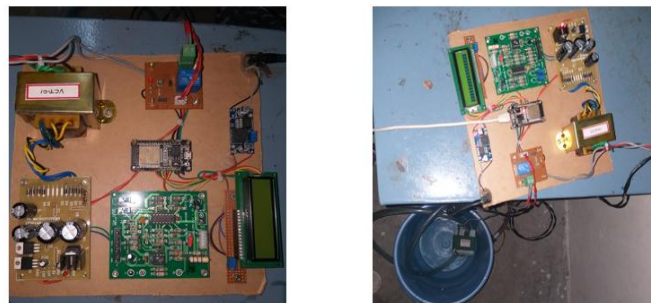


Fig 6. Experimental setup



Fig 7. Experimental result

V. CONCLUSION

A novel system for implementing an economic and reliable smart water distribution metering using IoT based hardware and smartphone App is discussed. The features of prototype system and the benefits are discussed. The novel approach overcomes disadvantages in certain smart-meter systems such as tampering in pre-paid water-meters that often go undetected due to standalone nature of pre-paid meters; tampering or unauthorized Top-Up updates to pre-paid meter smartcards using hacking software, etc. The proposed architecture also overcomes connectivity issues typically seen in DCU architectures when DCUs are installed near Meter banks in basements or areas with poor / unreliable cellular signal strengths. The work is being extended to cover a range of Distribution metering and Unaccounted for Water issues faced by utilities while giving direct and intangible gains to the consumers in the changing smart infrastructure scenario in urban areas.

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