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Sub Water Metering with Anti-Theft Control System

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Abstract—**In cities the water supply to residence and commercial establishments are provided at a fixed flow rate. By certain customers/users there are incidents of excess water drawing by connecting motor-pump sets to the water lines which is considered as water theft. In this project it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. In order to implement the proposed water supply system, each consumer end should be provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate using a flow sensor and to transmit the recordings to remote monitoring station using wireless transmitter and it is also provided with an electrically operated solenoid valve to supply water to the consumers. The valve turns on/off by the central processing station PC to stop the water supply whenever the flow rates exceed a predefined limit.**

Index Terms—Anti theft, Sub water metering

I. Introduction

This project mainly focuses on metering of water usage and anti –theft control system. The monitoring of water resource for this process can prevent the occurrence of stealing water and leaking water effectively. Therefore, the monitoring system of urban water supply has aroused extensive attention in recent years. Urban water supply networks form the link between drinking water supply and drinking water consumers. These large-scale networks are vital for the survival of urban life, for maintaining a healthy level of economic development, and for the continuous operation of factories and hospitals. In this research work it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. In order to implement the proposed water supply system, each consumer end should be provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate using a flow sensor and to transmit the same to a remote monitoring station using wireless transmitter. With the rapid development of global system mobile infrastructure and information communication technology in the past few decades has made the communication is reliable for transmitting and receiving information efficiently. So here we used GSM modem for efficient communication purpose. A design is based on RF and Zigbee which has some shortcomings, such as high power consumption, near distance and network's size is small. So, GSM is chosen in this project.

II. Problem Statement

With the continuous economic growth, the water demand of enterprises is also increasing. The monitoring of water resource for these enterprises can prevent the occurrence of stealing water and leaking water effectively. Therefore, the monitoring system of urban water supply has aroused extensive attention in recent years. Urban water supply networks form the link between drinking water supply and drinking water user. These large-scale networks are vital for the for maintaining a healthy level of economic development, and for the the survival of urban life, for continuous operation of factories and hospitals.

The urban water supply systems are public enterprises are usually part of a local government. The recent increased interest in privatizing public enterprises has not led to reforms of water systems. Nevertheless, in about 50 cities in the developing world, water system either has been privatized or franchised to non-governmental entity for its operation and maintenance.

III. Literature Survey

A. *Existing system:*

The water supply systems are part of the urban infrastructure which must assure the continuity of the water distribution, the water quality control and the monitoring and control of the technological process parameters, and deal with the restrictions imposed by the water availability, hydrological conditions, the storage capacity of the tanks and water towers and the increasing diversity of water use. In existing system, urban water is supplied to the home with the help of some man power. The person in charge will go to the place and then open the valve to that particular area. Once the time is over the person will go again to that place and close the valve. This type of operation needs man power. This is waste of time to go to that place and come back often. Also the people may take excess water for their personal use with the help of motor or some other equipment. Due to this many people will not receive sufficient water for their use.

B. *Proposed system:*

In this research work, it is proposed that the usage of anti-theft control system for drinking water supply. By implementing this proposed system in a real time; surely it will be able to control the drinking water theft in the domestic areas. In urban areas the water supply to residence and commercial establishments are provided at a fixed flow rate. There are incidents of excess water drawing by certain customers/users by connecting motor-pump sets to the water lines which is considered as water theft. In this work, it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. In order to implement the proposed water supply system, each consumer end should be provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate using a flow sensor and

to transmit the same to a remote monitoring station using wireless transmitter.

The system is provided with an electrically operated solenoid valve to supply water to the consumers. The valve turns on/off by the central processing station PC to supply the water for a particular time period. The system is provided with an electrically operated solenoid valve to stop the water supply whenever the flow rate exceeds a predefined limit. The microcontroller will switch ON/OFF the solenoid valve using a TRAIC switch. It is proposed to employ a GSM MODEM for wireless communication so that the information can be passed to many responsible officers cell phone for immediate action.

IV. List of Components

A. *Hardware Requirements:*

1. Arm LPC 2148
2. IOT Communicator
3. Flow Sensor
4. LCD - 16 x 2
5. Contact Unit
6. 7812/ 7805 voltage regulators for power supply.

B. *Software Requirements:*

1. Embedded c
2. Kiel-c compiler
3. Flash magic burner software

V. Components Description

1. *Arm LPC 2148A:*

The LPC2141/42/44/46/48 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. Due to their tiny size and low power consumption, LPC2141/42/44/46/48 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit. ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical system.

2. *IOT Communicator:*

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. When ESP8266 hosts the application, and when it is the only application processor in the device, it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system in such applications, and to minimize the memory requirements. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any microcontroller-based design with simple connectivity through UART interface or the CPU AHB bridge interface. ESP8266 on board processing and storage capabilities allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime.

3. *IOT Communicator:*

Accurate flow measurement is an important step for the measuring of water flowed in. Flow meter are excellent devices for the measuring water flow, it's easy to build the water flow sensor YF-S210.This sensor sits in line with the water line and contains a pinwheel sensor to measure how much water has moved through it. There is an integrated magnetic Hall-Effect sensor that outputs an electrical pulse with every revolution, this pulse proportional to the instantaneous flow rate which means that to interpret them it is necessary to implement a simple frequency counter. The output can easily be connected to a microcontroller for monitoring water usage and calculating the amount of water remaining in a tank etc.

4. *LCD:*

LCD is connected to the microcontroller through the controller interface. LCD has an internal memory which stores the lookup table for all the characters. Any ASCII value of a character that is passed to the LCD module is compared with the lookup table in the memory and that value is displayed. Liquid crystals are substances that exhibit a phase of matter that has properties between those of a conventional liquid, and those of a solid crystal. For instance, a liquid Crystal (LC) may flow like a liquid, but have the molecules in the liquid arranged and/or Oriented in a crystal-like way.

5. *Contact Unit:*

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 module features, a rain board and the control board that is separate for more convenience, power indicator LED and an adjustable sensitivity though a potentiometer. 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. Block Diagram and Methodology

ARM continuously monitor and record the energy meter. This can be achieved by using microcontroller unit. Microcontroller unit are interfaced with digital energy meter. Microcontroller unit are interfaced with the RTC by using 2 wire serial interfaces for date and time and RTC memory are also used as data storage permanently. Microcontroller unit are

also interfaced GSM modem for remote monitoring and control domestic energy meter. The data received through GSM Modem and network.

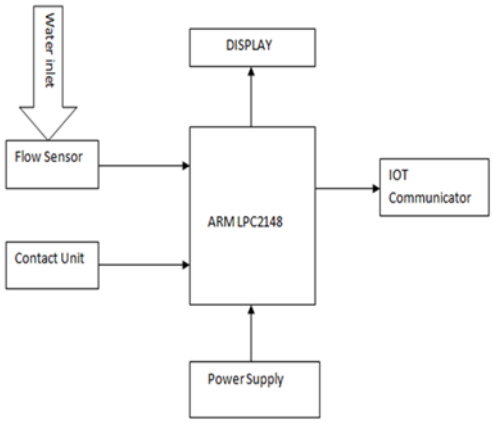

Fig. 1. Block diagram of the system

Data is being sent to the AMR on request and within a particular interval. Once the meter received the request of data from the energy provider, SMS gateway will immediately reply the meter reading with that date and time. The data received from meter is stored in database server through SMS gateway for processing and record. This data received from meter are stored in database server according to Meter ID that is providing to customer house. At the end of each month the server using the detail of database server and calculate the bill amount and send the complete detail of consummation of unit, and total bill amount. User can verify the same AMR possess have transparency on the part of customer and Service provider.

VII. Conclusion

Water is the basic needs of the humans. So it should be supplied properly and at right time. The theft can be prevented only when any public inform the officials about the theft. But the possibility of public is informing to higher officers are rare. Hence, this project mainly focuses on metering of water usage and anti –theft control system and monitoring of water resource can prevent the occurrence of stealing water and leaking water effectively.

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