Automatic Water Billing System

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Abstract – *In times of scares human resources, when each and every part of available things are important, life is sustained by what we can call as one of the most important available natural resource that is water. Water is available to us through number of available resources and one of the most prominent water sources which we use are lakes and ponds. The water from these sources is collected and purified and further forwarded through pipes to our home taps and in return, a monthly bill is charged from the consumers to maintain the network. This network of pipes is very large and thus a large amount of human resource is utilized. This is time consuming and can often be expensive and error prone. Thus, we are suggesting an automated way of billing in the system to reduce expenses and remove the human error factor.*

Key words: Arduino, GSM, flow sensor, 16*2 LCD.

1. INTRODUCTION

The available water resources are very limited. Changing climate, global warming, and irresponsible usage are major factor that are going to make the situation even worse with every passing day. Due to never ending demand and consumption factor being very large, the distribution of water can be very insufficient at parts. This creates a need to measure the water being used and to provide a proper capped amount of water to the society to avoid over use and wastage.

The current situation being that of wastage of water and in order to overcome this situation we can use and introduce the concept of automation. [1]This automation can be provided in terms of automatic water billing system to eliminate the traditional meter reading system and its misuses. This paper is used to give a proper system to promote water management based on cost incentives and a crisp billing system which is consumption specific. This can also substantially control wastage of water and save the water for future generation thus promoting sustainable development model which is the need of the hour.

II. SURVEYING AND ANALYSIS

After conducting surveys, in particular zones it has been found that there is water shortages and they can't even get a daily water supply even after a network of pipelines being present in the area.

In a different zone it was found that water was provided daily three times, even when this zone did not require so much water. Also, a frequent complain of water-meter getting stolen existed. At some places we could see meters were broken and giving inaccurate readings and it must be difficult to give them proper bill at the time. Major problems concerning leakages in pipeline due to which many people could not get water existed.

Analog meters had a damaged inner coil, which might be due to environmental factors.

We are suggesting a proper GSM-Arduino Based automation system which uses sensors and transmission elements to deduce a correct reading and direct consumer transmission of the bill.

III. METHODOLOGY

The process starts at the user's premises, the water flowing through the pipe will be measured using a flow sensor and the output provided by this sensor would be read by the Arduino board.

Based on the flow sensor calibration factor, the number of liters of water consumed is determined. This is a continuous process until the water flow stops through the pipe. [4]This collected data of the consumed water is transmitted to the control station through RF transmitter. At the control station using RF receiver, it receives the data and the receiver is connected to Arduino controller. Based on the liters of water consumed, amount will be calculated using Arduino controller. The bill will be stored in the controller and will be updated as and when the data arrives on the RF receiver. Using LCD display the bill is shown, which is interfaced to Arduino. Meanwhile the same is sent to the customer using GSM technology. Fig.3.1 and Fig.3.2 shows the consumer premises and control station that is transmitter and receiver of the system.
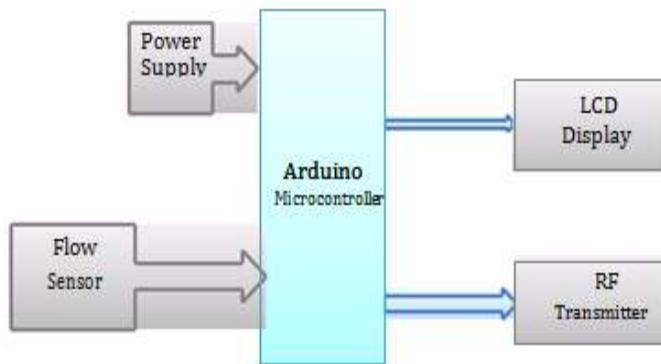
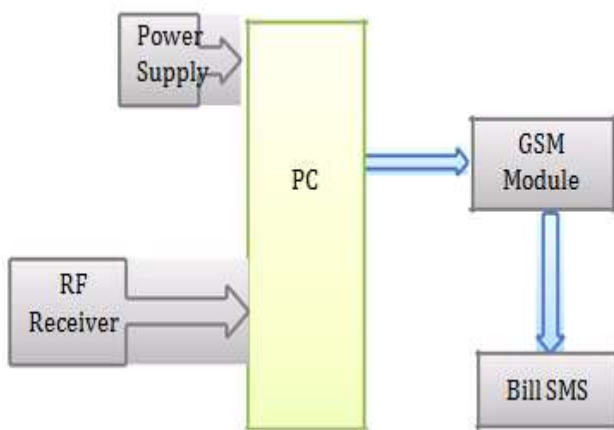Fig 3.1: Consumer premises (Transmitter)
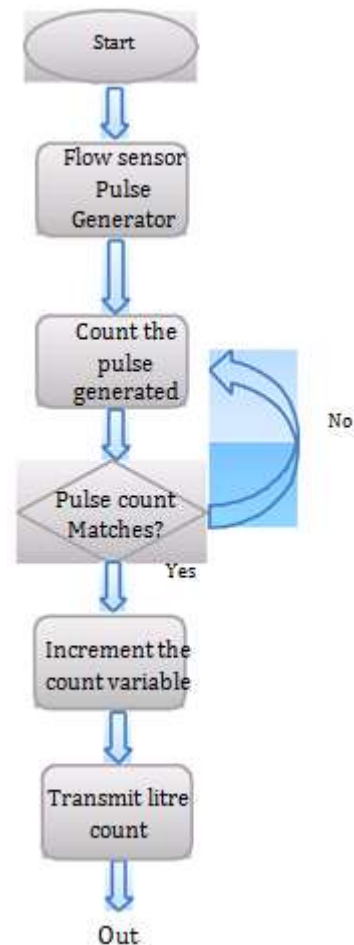

Fig 3.2: Control station (Receiver)

Fig 4.1: System analysis (transmission)

IV. SYSTEM ANALYSIS

The System analysis can be depicted in a flow chart. The initial stage starts with the first part of our automation network that is the flow sensor. The flow sensor is attached to the flow of the water. If the water flows from the pipe, the water sensor is actuated and thus starts providing the necessary information. The pulses generated are counted. This pulse count is now the instantaneous or the current count. [3]This count's value is now the referral value which will be compared to the count which is pre-stated in the coding done in the Arduino.

If the count's value matches with the already defined value, the count variable is going to be incremented. If not, a loop is created till it satisfies with the stored value provided by us. Fig.4.1 shows the system analysis.

V. SYSTEM DESIGN

This automation technique can be implemented with Flow sensor, LCD, RF Module and GSM interfacing.

Step by step implementation can be done as follows:

5.1 Flow Sensor Interfacing with Arduino

Fig 5.1: Interfacing of flow sensor with Arduino

The flow sensor comes with 3 wires connecting the supply line, ground line and a data line. Red (5V DC), Black (ground) and yellow (Hall-effect pulse output).

The +5V supply and the ground connections for the flow sensor are connected from on board regulator. The Flow sensor output is a digital signal, digital I/O pin D0 of Arduino. The interfacing circuit of flow sensor with controller is as shown in Fig 5.1.

5.2 LCD Interfacing

Arduino Uno does the interfacing part with the LCD display. Two terminals as +5V supply and ground are taken from the Arduino Uno board. The DB4, DB5, DB6, DB7 pins are used. The pins connections can be connected as shown in the Fig 5.2.
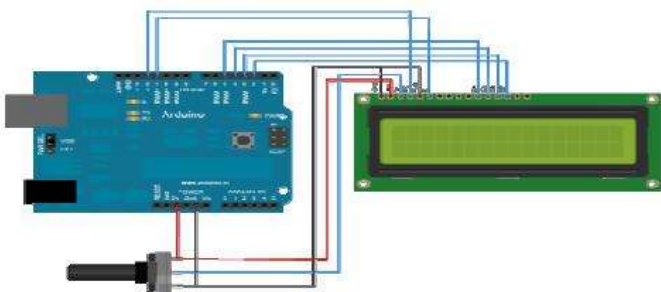

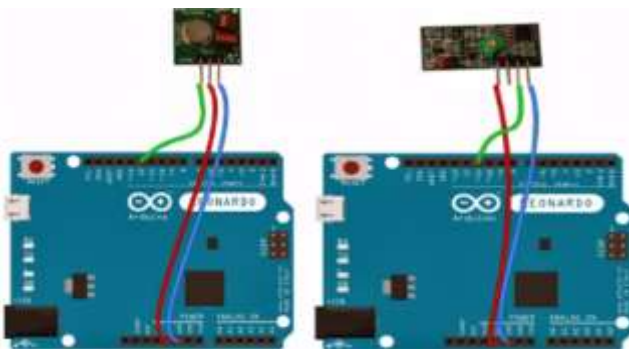Fig 5.2: LCD – Arduino Interface Circuit

5.3 RF Module Interfacing

Fig 5.3 (a)   *Fig 5.3 (b)*

Fig 5.3: RF module and Arduino interface circuit

There is a two Arduino board requirement to transmit and receive separately.[5] The data pins are programmed, the data pin for RF modules are defined and interfacing circuit of RF transmitter and R receiver with Arduino shown in Fig 5.3 (a) and Fig. 5.3 (b).
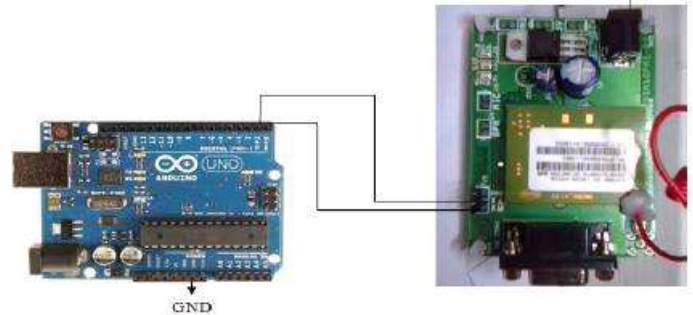
5.4 GSM Interface

Fig 5.4: Interfacing of GSM module with Arduino

The interfacing of GSM module can be seen in Fig 5.4 with the controller, where in Tx (PIN 1) and Rx (PIN 0) of Arduino board are connected to Rx and Tx of GSM respectively.[6]

VI. CONCLUSION:

Water is undoubtedly one of the most important natural resource. In order to stud the same, the collection of data need to be done wisely. Water billing system around us suffers various issues. Random water readings are taken to solve the disputes which in turn creates a loss on the revenue as well as the customers face issues trusting the result. Also, there can be factors which could be avoided like human error, faulty meters. Our proposed system targets to solve all the mentioned issues in the currently used system around us. It will save a lot of money to the user (paying the actual water consumption) and the water company (employee's salary and printing the bills) thus our proposed system will be economically for the user, water companies and the government.

VII. FUTURE SCOPE

The concept of automation has developed a lot of credibility with the innovation of technology. The advancement in terms of networking has an even more chance of growth in the future. Multiple techniques like infrared tag can be added for diagnosis along with newer microcomputers like raspberry pie can be clubbed in, to even expand this automation concept in other parts of home.

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