

Design and Implementation of Water Bill Control System Based GSM

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Abstract: With the rapid development that happens in the world; it was necessary to take advantage of available technologies to serve human. Water is one of the basic factors of the life for the human; it must be rationalization of consumption. Automatic meter reading helps in the rationalization and distribution of water consumption for user each according to his need. The proposed system is very accurate in the extraction and calculation of bills. It allows the water company to remote control for the water meter in consumer premises. The system uses GSM network to connect water meter with Water Company. An arduino microcontroller uses as control basis, its issued appropriate command according to the input readings. The system automatically separates the water from the user if the amount of water prepaid ended.

Keywords - Arduino, Flow sensor, Zigbee, GSM, LED.

I. INTRODUCTION

Water resources around the world are getting scarcer day after day. Climate, global warming, and irresponsible usage are major factors the make the situation even harder [1]. Tremendous population growth causes insufficient and uneven distribution of water. So measuring the water usage and providing it with proper amount will limit the wastage of water in society [2].

In the modern era of technology we came to know about various wireless control systems for our appliances or machines. Automatic meter reading is the technology of automatically collecting consumption, diagnostic, and status data from water meter or energy metering devices (gas, electric) and transferring that data to central database for billing, troubleshooting and analyzing [3].

When it comes to water consumption management, there are certain issues that be to need considered: infrastructure and architecture costs, the costs of moving from manual (or other) meter reading technology to wireless automatic meter reading, the ability that automatic meter reading provides to reduce meter reading costs, better demand management and leakage detection. The environmental issues also have to be taken in to appreciation. Water scarcity due to lack of natural spring water, advancing pollution etc. is on of the major environmental issues. The water consumption has to be controlled on global and local basis [4].

For traditional typical metering system, four steps are usually involved. In the first step, a meter records the amount of water is consumed by customer. Then, a worker records the reading of meter for each user. After that the recorded readings input to a computer system to calculate the charge for each customer. Finally a bill is generated and mailed to each customer [5].

The use of traditional water meter needs a lot of efforts by workers to collect reading for each user's meter from his home; also it is not accurate as the worker could err in one or more of the reading, and the lack of rational use of water due to the lack of restrictions for the user. This project aims to develop the traditional meter and make it automate readers to be more

accurate and fair billing account for each user, and to be the connect between the company and the user directly without need for workers; which raising the efficiency of the system and reduces the time and effort, also help the user in rationalizing water consumption.

A review of previous studies related to this project to know the correct information that we can ascribe it to build a system for the developer water meter. Design based research methodology was employed to carry out this research.

II. LITERATURE REVIEW

The literature review gives brief summary of the previous idea, implemented. The main objective of this system is to reduce the effort, time and cost and increase accuracy. They [6]-[7] are remote control technology, Zigbee technology. The newly proposed system based on GSM technology and an Arduino controller.

III. PROPOSED SYSTEM

The aim of this paper will be to help the water service providers to monitor the meter readings from the location. The customer can buy water by send SMS from his phone to control station through GSM and automatically receive the bill in his phone. Linked the server of Water Company with the server of telecommunications; to be the amount paid for the purchase of water is deducted from the existing balance in the customer's phone, If customer haven't phone; he will go directly to water company to buy water. At the control station, billing software calculates bill based on equation programmed. The control station issued order to valve to be open. The number of liters of water is determined, and then it transmitted to water meter consumed through exiting GSM network. At the user premises, the water flow through the pipe is measured using the flow sensor device, when the amount of prepaid water is end and the LCD in meter show zero; the control station received a signal through GSM from water meter to close the valve. The flow chart for the control station shown in figure 1 and the flow chart for water meter in consumer premises shown in figure 2.

IV. OPERATION OF SYSTEM

Here we have two sections; control station NEILOS Company and consumer premises (water meter). At consumer premises water meter shown in figure 3, it consists of arduino development board, and flow sensor connected with arduino Uno controller (here in simulation system a pressure switch represents a flow sensor device), LCD connected with arduino Uno controller, GSM modem also connected with arduino Uno controller (here in simulation system serial board represents GSM modem) , and small green LED connected with arduino Uno controller. Arduino board control's and arranges the work of flow sensor, GSM, LCD and LED. The water comes through pipe arrive to user premises, then LED show green light, flow sensor start count liters, sensor is read by the arduino board. LCD shows the amount of water. The simulation system design of the water meter based on the proteus software, arduino programmed by arduino Cm.

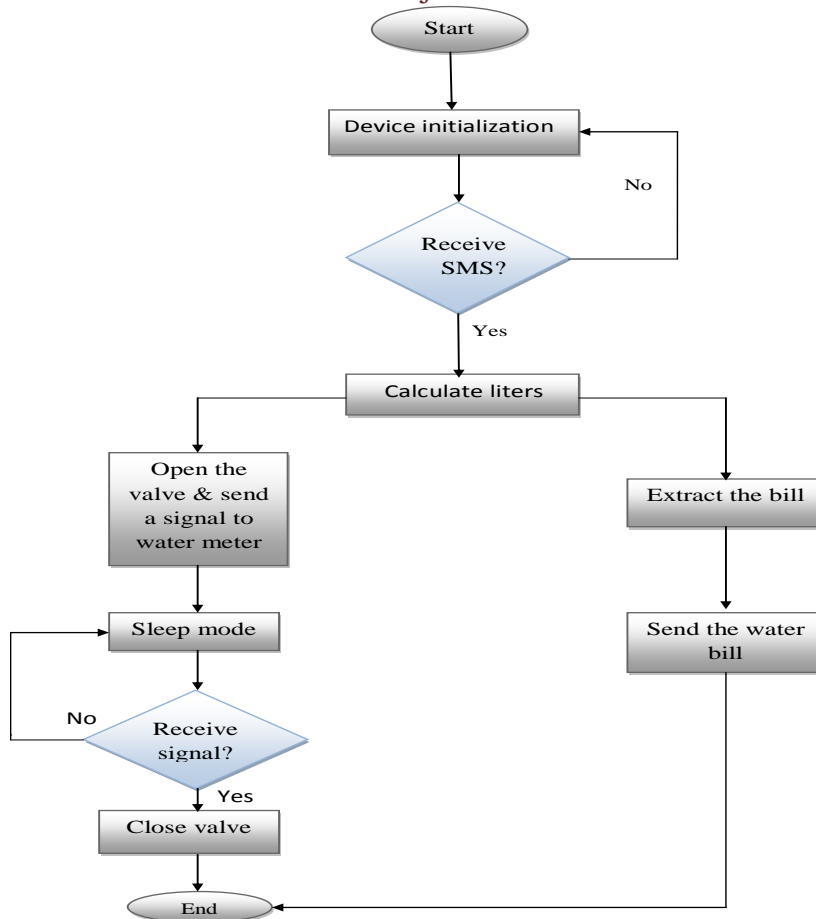


Figure 1: The follow chart for company (control station)

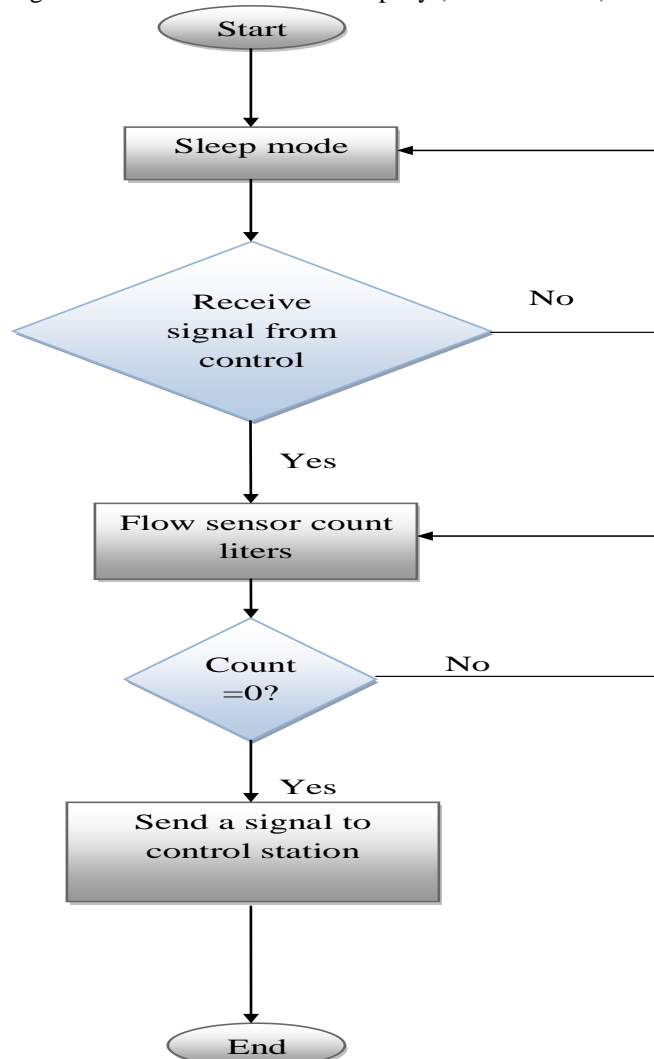


Figure 2: The follow chart for water meter

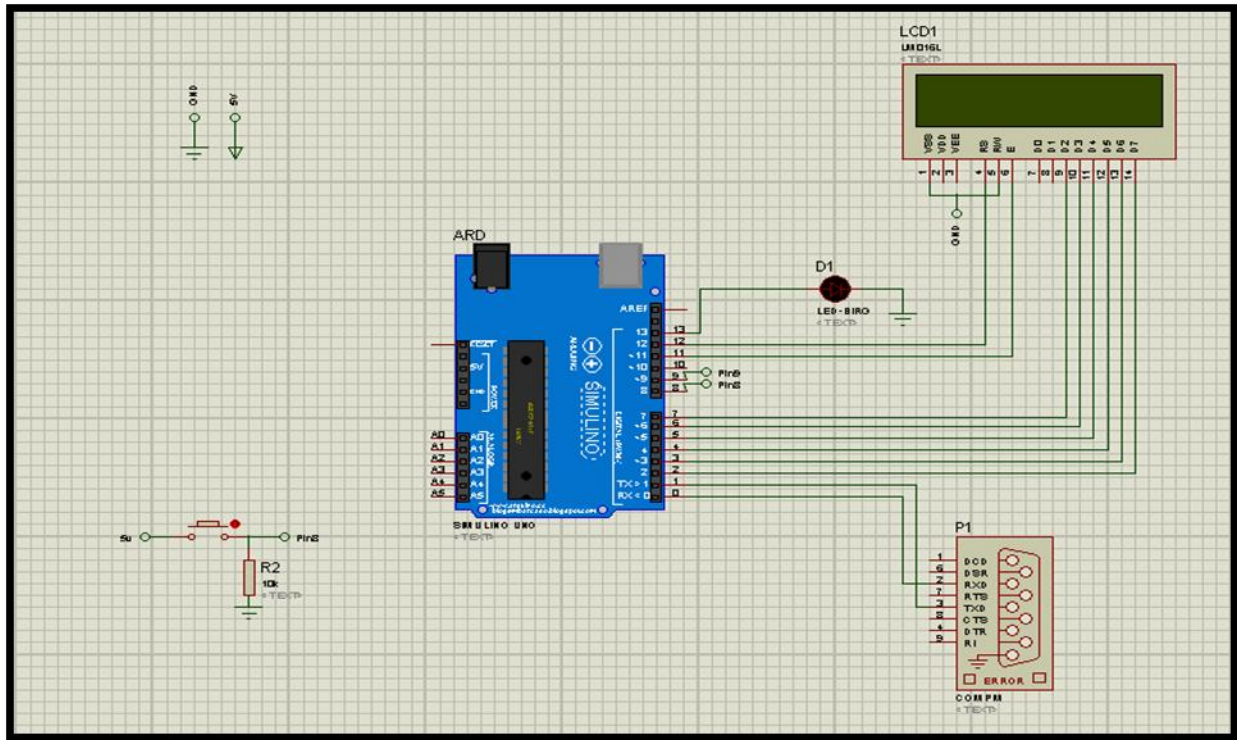


Figure 3: Water meter design

When the customer wants to buy water, he sends SMS from his phone to the number 2020 (The water company specific the No. 2020 to receive the customer orders to buy water). In the database of company stored the user name and his counter NO. For the purposes of privacy and accuracy. In the SMS the customer write his counter No and the amount SDG. SMS format (counter NO# amount SDG). When customer sends the SMS to No 2020 he will receive SMS carrying the water bill and the water meter will recharge.

Let customer Ali wants to buy water, and his counter NO. 123, the amount is 20 SDG, he send SMS from his phone to No. 2020 as shown in figure 4



Figure 4: The customer phone

Ali writes in the SMS his counter No. and the amount SDG as (123#20) and sends it as shown in figure 5

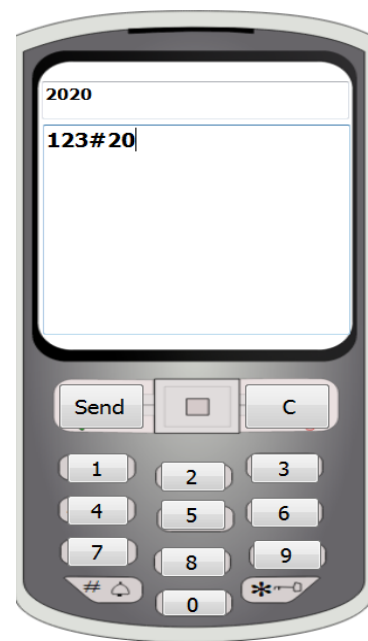


Figure 5: The customer Ali writes his counter No. and amount SDG

Then after a few seconds Ali will receive in his phone, the SMS carrying his water bill as shown in figure 6.



Figure 6: The customer Ali receive SMS

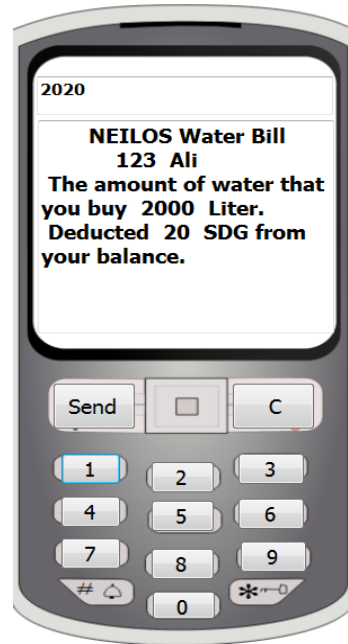


Figure 7: The water bill for the customer Ali

The water by liter is calculated by multiplying the number of coins in 100 as programmed. Ali wants to buy water by 20 SDG then the amount of liters equal $20 \times 100 = 2000$ liters. The bill show the company name (NEILOS), counter number (123), customer name (Ali), the amount of water by liters (2000) and the amount SDG (20) deducted from the existing balance in the customer's phone. The water bill shown figure 7

The customer will receive the bill and the water meter will recharge After the control station receive the customer order to buy water; then control station issued a command to valve to be open to allow the passage of water through pipes. In other side; in consumer premises the LCD of water meter show the number of liters and the LED show green light as shown in figure 8

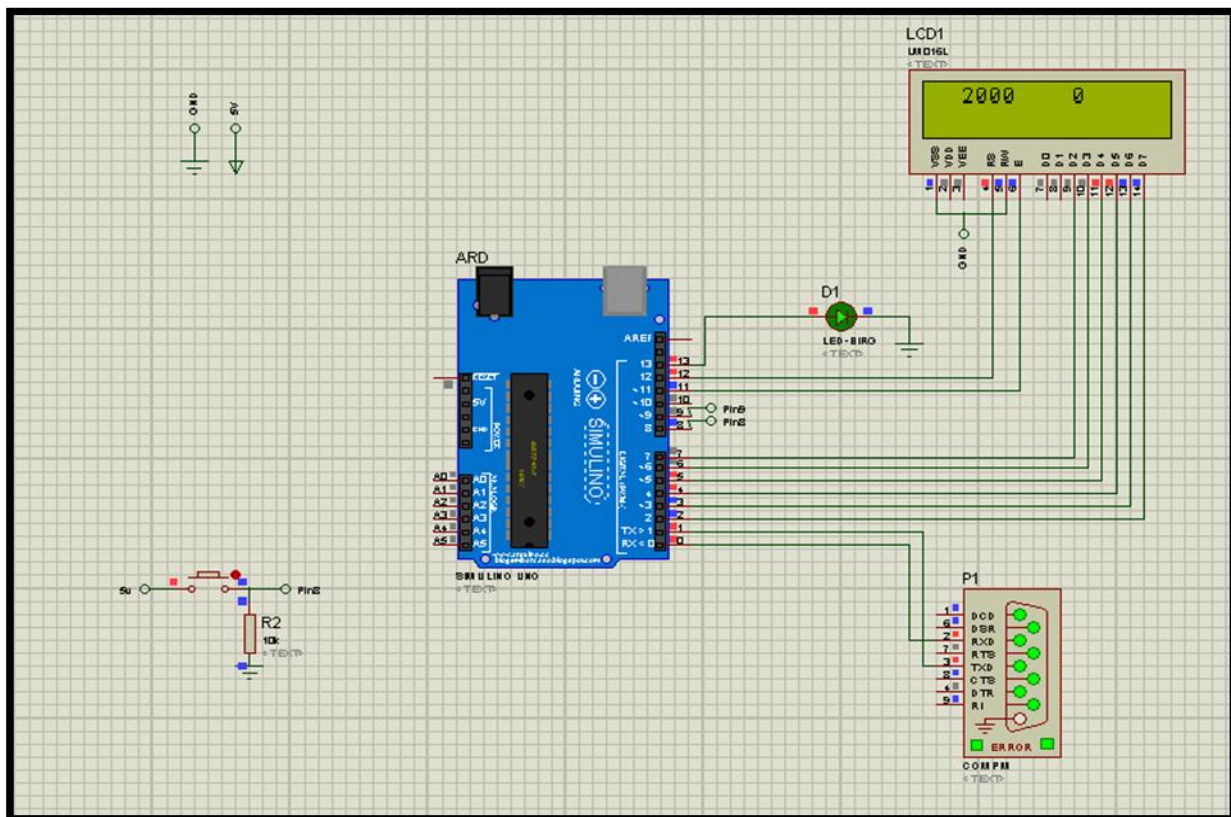


Figure 8: water meter show the number of liters

CONCLUSION

Water day after day it becomes more scarce due to climate and rising temperature, and use it unwisely, billing system using

Automatic water Meter reading help to preserved and rationalization consumption it. Automatic water Meter reading is one method reading and processing data automatically with computer and communication. The development of automatic

water meter reading system utilized wireless technology using GSM module system for data transmission was proven. In the present work wireless meter reading system is designed to measure the amount of water used and to shut down the power supply remotely whenever the consumer did not renew the purchase of water. The deployment of the proposed system uses the existing GSM network, where the water meter system can send its readings directly to a server application using a GSM modem the process of monitoring water flow rate, transmitting the usage, calculating the bill etc. is through preprogrammed Arduino controller.

Automatic water Meter reading avoids the human intervention, provides efficient meter reading, avoid the billing error and reduce the maintenance cost. It displays the corresponding information on LCD for user notification.

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