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ELECTRICITY BILL MANAGEMENT USING GSM TECHNOLOGY

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Abstract: In current society nearly every industrial networks live founded forth wireless information, as it remembers various reasons. The improvement of a totally automatic energy meter which exists remembering capacities want small controlling of energy meter intention direct translucency in the energy meter scanning and billing technique. Automatic meter reading system (AMR) intention continuously monitors the energy meter and sends data forth to a waiter network action provider across SMS. If conforms large mortal business. Global system for mobile communication (GSM) technology stands manipulated to convey between the action provider and the consumer. This system avoidance the compassionate creation with it duration, the stoner occurs announcement over SMS technique utilizing GSM. If stationary consumer does not pay the charge accordingly as individually formulated dead contemplation, single warning statement intention subsist sent again automatically the energy relation exists disorganized from the remote action . This developed network gives effort to regulating of energy meter reading, power control device, averts the billing mistake and moreover reduces the charge of expenditure.

Keywords: Global System for Mobile Communication (GSM), Short Message Services (SMS), Automatic Meter Reading System (AMR), Visual Basics (VB), Liquid Crystal Display (LCD)

I. INTRODUCTION

In the current scenario, a human operator from the electric utility will visit the customers homes to take readings from the energy meter and manually produce the monthly electricity bill. If the consumer or any of his family members are not at home, they will leave the produced bill beside the meter or give it to a neighbour, resulting in the bill being displaced. If a consumer fails to pay his or her bill, the operator will come and turn off the electricity. It takes a lot of time and effort for an operator to go to each customer house and produce a bill. Work will be more difficult on rainy days than on other days, especially during the rainy season. As a result, new technology, such as the GSM based Energy Meter Reading and billing application, can be included to reduce the operator effort and bill displacement. Where energy consumption data is collected and sent automatically to a central database. The invoicing of usage will be handled by a central database server if there is any issue or malfunction with the data it is also possible to analyze.

DISADVANTAGES OF CONVENTIONAL METER READING SYSTEM

1.1 An operator should be assigned to each customer home to each customer home to collect meter readings and manually generate bills. As a result of the danger of misplacing the bills, data security will be compromised.

1.2 If the customer does not pay the bill, the operator will have to go to his house and turnoff the power, therefore remote monitoring is not possible.

1.3 Because this system requires more labour, the operational costs will be higher.

1.4 If it is not possible to read the meter in real time.

1.5 In an apartment, and if somebody tries to tamper with any of the meters, there will be no alarm because this system does not have a tampering alert feature.

By using GSM- based automatic meter readers, the above disadvantages can be avoided. This technology mainly helps the service provider to reduce the cost of the customer each month and read meters to produce a fact. This project will involve the automatic collection and transfer of the power consumption readings to a central server database. The data collected will be used later to bill and troubleshoot if there is a problem. This information can also be used to analyse consumer annual consumption.

The main benefit of this system is that it reduces the cost of service provider company personnel who must visit the customer location on a regular basis to obtain meter readings and generate the electricity bill. Another significant benefit is that energy consumption billing is solely based on the customer current power consumption, rather than previous or predicted consumption. This type of data can also be analysed to assist both the service provider and the consumer in better controlling and utilizing electrical energy.

This system is designed primarily to reduce the maintenance costs for the organisation of services and increase consumer awareness regarding their energy consumption, so that they can plan for and practise saving money whenever they find payment savings (which also save electricity).

The core concept behind this method is to lower maintenance costs for service providers while also raising consumer awareness of their power consumption so that if they find a way to save money (while also saving electrical energy), they may plan or practise to do so.

II. MOBILE APP DEVELOPMENT AND WIRELESS COMMUNICATION TECHNOLOGY

The main advantage of wireless communication is the data security and the speed of data transmission from the end of the transmitter to the end of the receiver. The idea of developing an application environment for energy metering and billing will therefore help to learn more about its energy consumption. Today most of people have to use connections to telephones. The application is designed to ensure that a common person ones not know how much energy and the structure of the process are consumed.

TECHNOLOGY OF WIRELESS COMMUNICATION

In wireless communications, information is transferred between two or more points not connected to an electrical conductor. The term PCS refers to a wide range of wireless access services and personal mobility services offered via small terminals, to wireless communication at anytime, anywhere and in any way. In this work of the project is an important to select an appropriate wireless communication system. All media have issues such as short transmission distance, high transmission and communication costs, difficulty with maintenance and unsafe data transmission.

Here we consider zigbee module, a two-way WIFI protocol system that has been developed recently. zigbee is designed to consume low energy and to reduce costs. zigbee has been developed to meet the increasing demand for wireless connectivity across many low performances devices.

DEVELOPMENT OF MOBILE APPS

The mobile application development term refers to the act or process by which software for handled devices such as mobile telephones is developed. These application can be preinstalled on phones while manufacturing platforms or provided on the server or client-side (e.g. Javascript) as a web application for the purposes of providing an app-like experience in a web browser. An extensive array of screen sizes, hardware specifications and designs must also be taken into account by application software developers as a result if intense competition in mobile software and changes within each platform. The project is mainly divided into two parts

2.1 A personal mobile application

2.2 General web application that increases the safety of apartments.

III. DESCRIPTION OF THE DEVELOPMENT OF THE HARDWARE

The energy meter and billing system developed gives an overview of consumed power units. With the PC and Zigbee receiver module, the consumer measurement is connected to the Zigbee transmitter module & microcontroller. Data transfer from the consumer to the central utility and control commands from the consumer to the utility.

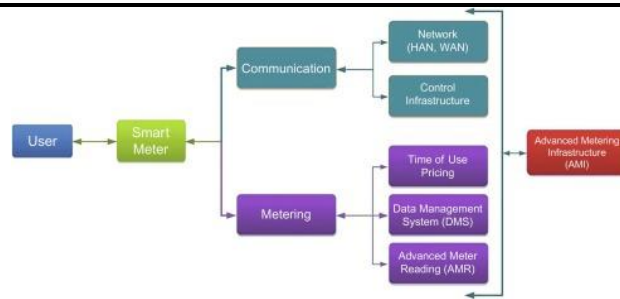


Fig 1. Over view of development reading and billing system

Senser module-All blocks as shown in figure 2 are powered by a regulated power supply of 5v DC. The power supply function is to power the power meter. This part is contained in the transmitter module.

SECTION DATA SENDER

3.1 Energy Meter- The loading power through the energy meter is supplied. The power variations in the electric load meter can be converted into a digital sign and the digital signals can be converted into light pulses by means of electric loads.

3.2 Climation of the signal- The energy meter light pulses. The microcontroller is supplied by the optocouple with power changes in the energy meter. The interrupt signal of the opto-coupler is therefore received by the microcontroller after signal conditioning.

3.3 Microcontroller- Automatic meter reading unit monitors and records the measurement continuously. This can be achieved through the use of a system microcontroller. For the realisation of the project we used the PIC16F877A microcontroller. Under software control, the PIC16F877A is auto programmable. The USART has 9-bit address detection for serial communication. It has two timers for 8bits and a timer for 16bits.

3.4 Relaxation- The relay controller is interfaced with the microcontroller and energy meter. The relay driver can control the Relay Unit to disconnect or resume the power supply, depending on the information received from the Remote Station.

3.5 LCD- Liquid Crystal Display is interfaced with a microcontroller and is used to show readers, power status etc.

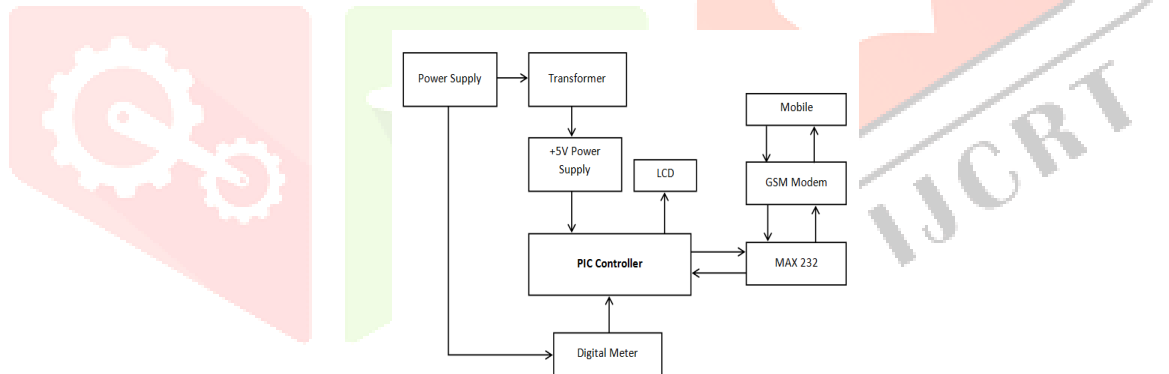


Fig 2. Energy meter reading transmitter block diagram

SECTION DATA RECEIPT

The module for the zigbee receiver received the data through wireless communication from the zigbee transmitter. The control unit decides the power connection according to the information obtained from the zigbee receiver module. The control can be performed by tripping, i.e. the power connection automatically switches without having visited the premises of the consumer.

DETAILS OF THE GSM MODEM

We use the GSM modem and this is useful for wireless communication with the control unit in order to implement the AMR system. We communicate with the GSM modem via serial communication protocol. The AT command sets are supported. GSM supports AT, so that the AT modem will be sent back to the modem. We have also used the Subscriber Identification Module (SMS) on our modem to send several SMS to customers. The modem has the same baud rate of 9600baud. Data is captured via the zigbee module, and then relayed over the GSM connection modem to the central computer. In visual basic 4.0, the software has been designed to demonstrate the created payment process. The power usage details for the display are also displayed on the LCD.

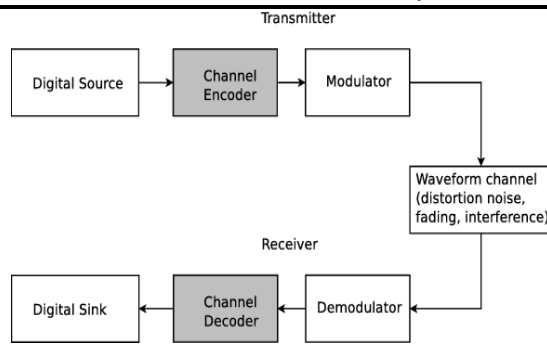


Fig 3. Data receiver block diagram

IV. SOFTWARE DETAILS

The serial communication programming language VB 4.0 is utilised in the visual studio 2015 environment to construct this project. With the C# programming language. The Net 4.5.2 framework is used to create a mobile and web application. Fig4 shows the developed GUI for serial communication.

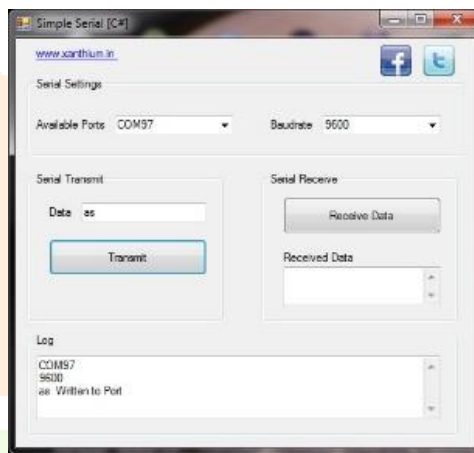


Fig 4. Developing graphic user interface

V. RESULTS OF THE PROJECT UNDER DEVELOPMENT

The entire process of energy meter reading, billing, and bill calculation, as well as notification of the due date and meter disconnection or reconnection, can be automated efficiently with better performance and less manpower in the current concept. As previously stated, this project has two applications. The first is a general purpose web application that aims to improve security. Fig 5 depicts the designed login page for this first web application.



Fig 5. Login page designed for web application

The details that the security person can see after logging are shown in fig 6. Here be able to see the meter ID, customer name, customer name, customer contact number, flat number, and the meter tamper status

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Fig 6. Log in details for web application

Fig 7. Shows the alert message if the meter gets tampered. Here an option is given to edit the status, once the cause for tampering is cleared then the security person can edit this option and restore the tamper status to “false” in the web application. The second element of the project is a personally referenced mobile application with choices such as billing. History of payment and use information. This programme has been designated as the EMSS app security system. The data from 8to 12 show that mobile apps have been developed.

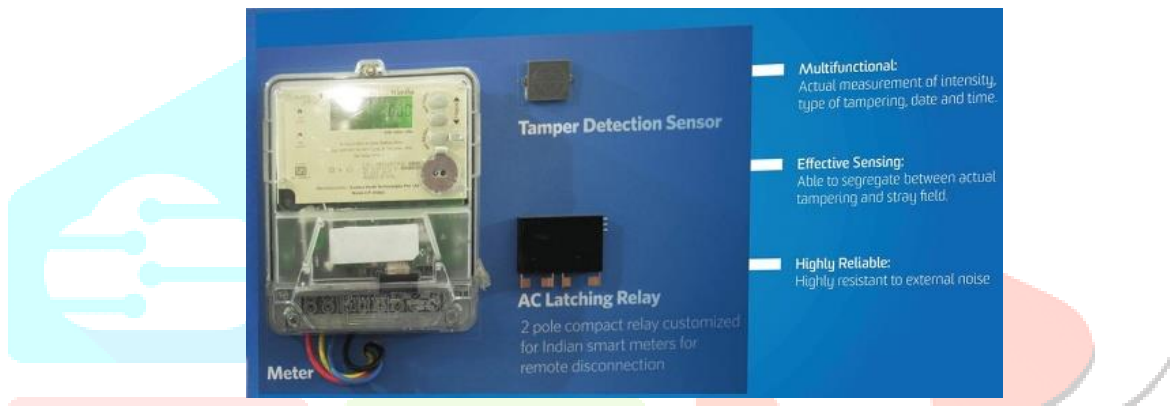


Fig 7. Alert notification in case of tamper

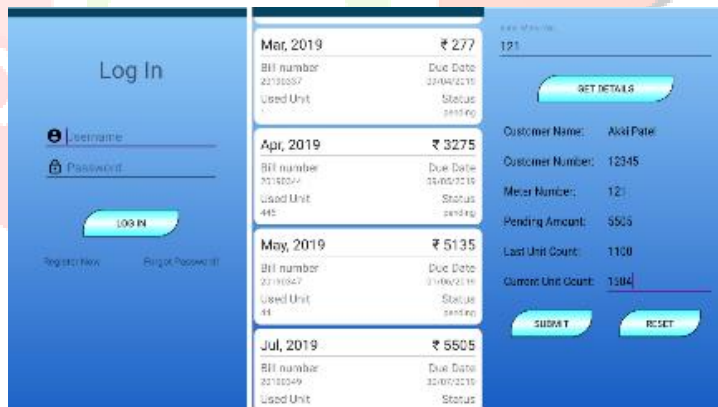


Fig 8. Login page and menu page of mobile application



Fig 9. About EMSS details and home Page of mobile application

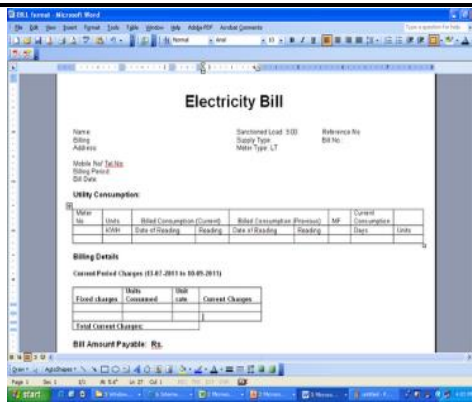


Fig 10. Payment history and bill payment details of mobile application

Fig 11. Displays the bill issued by email with a declaration of power use details to the consumer. Fig 12. Displays the statement which is being sent together with the mail and fig 13 displays the mail sent during the penalty to the consumer because of the failure to pay the bill.

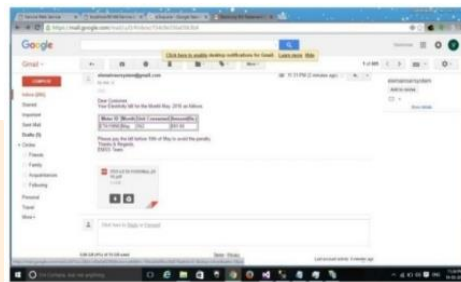


Fig 11. Monthly bill sent to customer through Email

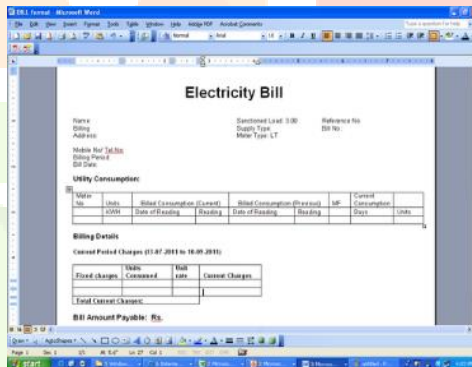


Fig 12. Bill statement attached with the Email

Business Name						
Aging of Accounts Receivable						
AS OF AUGUST 2018						
Customer Name	Total Balance	Currently Due	1-30 Days Past Due	31-60 Days Past Due	61-90 Days Past Due	90+ Days Past Due
Customer A	\$2,598	\$500	\$2,098	—	—	—
Customer B	\$1,720	\$1,720	—	—	—	—
Customer C	\$3,548	—	—	—	\$3,548	—
Customer D	\$4,850	\$1,500	—	—	—	\$3,350
Totals	\$12,714	\$3,720	\$2,098	—	\$3,546	\$3,350

Fig 13. Bill with penalty due to late payment

VI. CONCLUSION

The developed GSM based energy meter reading and billing are beneficial for both energy service providing utility and consumers. This system overcomes the drawbacks of conventional meter reading system and provides additional services such as power cut alert and tampering alert. The system also provides information on every day, monthly and annual power consumption. Daily energy consumption details will assist consumer manage their use of electricity. This designed system is trustworthy and safe because the system can only be accessed by an authorised individual.

VII. REFERENCES

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