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Zigbee-GSM Based Automatic Meter Reading System

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***Abstract*-This project is concerned with the electrical board. As the population grows, the number of electric meters is increasing. In India standard meters are widely used to calculate power consumption. Collecting this large amount of data requires extra time and effort. In this way before the bills are made the meter readings are kept by hand in low-level channels, which are time consuming and full of human error. As a result, the consumer always complains about his or her debts. This whole network is full of holes in different categories and cannot be removed or found. To avoid this type of problem, wireless meter reading technology can be used. It also saves staff. Another feature of this meter is that it improves accuracy because it works in real time. It increases the speed of operation because it requires fewer human efforts and especially energy consumption is very low. In this case, the power consumed by the consumer is monitored by low-level channels via a wireless network. In low-level channels, debt is calculated and records are kept. By using this process, we can easily monitor any error in the meter and any interference is used to steal electricity. Eliminates error of any type of data loss during data transfer and acceptance. The main part of the model is "ZigBee", because it has a lower data rate and therefore uses less operating power. As we know from ZigBee devices, no one can use the data, only authorized person or device can read the data. That is why it is so reliable. Therefore, this model is a test to remove all errors created with standard meters.**

***Keywords*- Arduino, current sensor, GSM module, ZigBee model.**

I.INTRODUCTION

Electricity is one of the basic human needs. It is widely used for domestic, industrial and agricultural purposes in everyday life. Most of us know the role of the energy meter in the electric grid. It is an integral part of the distribution grid. Power meter assists consumption (Electricity distribution company) to convert consumer electricity to kw per hour. Power meter is a measurement tool to calculate the amount of electrical energy used by an electric device. A power gauge that measures line voltage, current, and active power calculation can be used to increase power efficiency.

This project introduces a system that provides real-time energy meter readings using ACS712 as a current sensor, Arduino and IoT server with google firebase cloud. The energy meter can show the energy used in kWh and the electricity bills to be paid. The user interface is on Android. Notice of the amount of energy consumption or electricity costs can be made for the user to be shown. If any theft occurs it will be notified.

II. LITERATURE STUDY

Measuring household electricity consumption is a long process and involves many human errors. In line with that there are problems in the process such as power outages and due to human error sometimes false reading is included which leads to huge thousands of electricity bills. In recent times because of this epidemic, it has been impossible to take readings by hand. Therefore, the average consumer has to deal with these problems more than ever before.

Our aim was to find a solution to this problem and to look at the work that has already been done in this department to address this issue. In line with these lines, we had a proposed system using GSM, in which case the current AC was converted to DC and the details were later provided to the microcontroller. The GSM modem is customized using a variety of standard commands.

However, the limitations in this system were that sometimes the current AC had to be measured and the supplier had to calculate the usage and send it to the appropriate consumer. Another suggested system has used the Wi-Fi connection process to send data to a remote server. The Wi-Fi system was supposed to transfer data. What led to the process being expensive and complicated.

While our proposed system uses the ZigBee module to transfer the most secure and efficient data. Consumption is automatically calculated by program and real-time readings are sent to the buyer along with the credit amount of units used. There is no personal involvement at any stage and electrical interference is prohibited.

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III. BLOCK DIAGRAM

1. Transmitter Section:

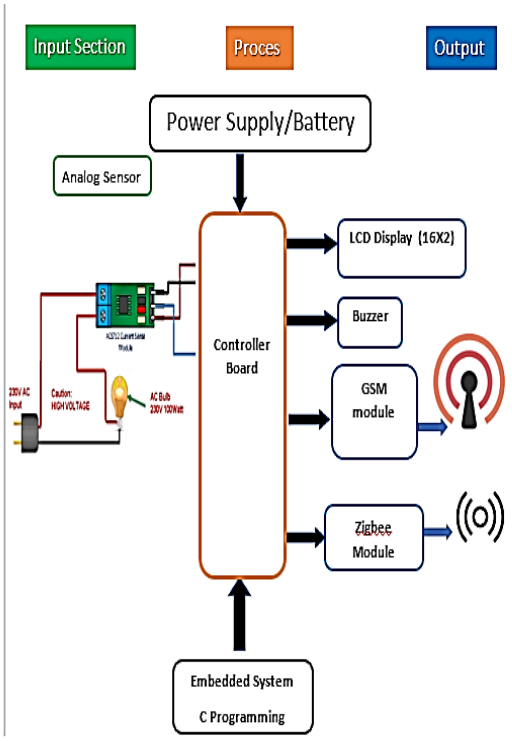

Fig 1.Trasnmitter Section

2. Receiver Section:

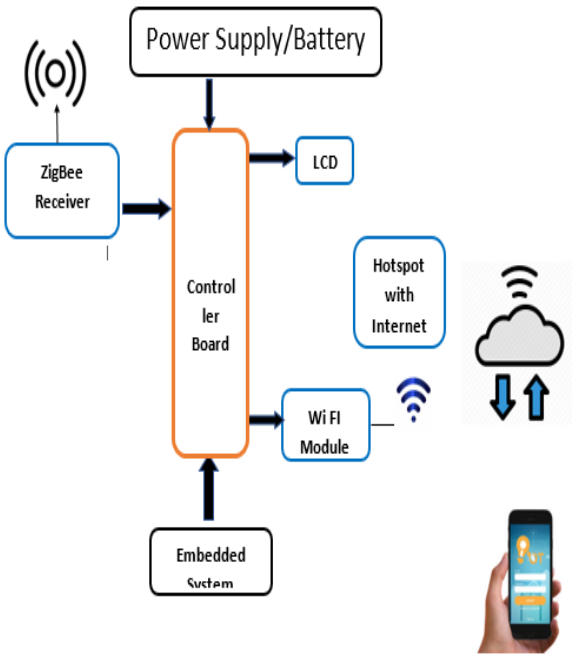

Fig 2. Reciver Section

IV. FLOW CHART

1.Transmitter:

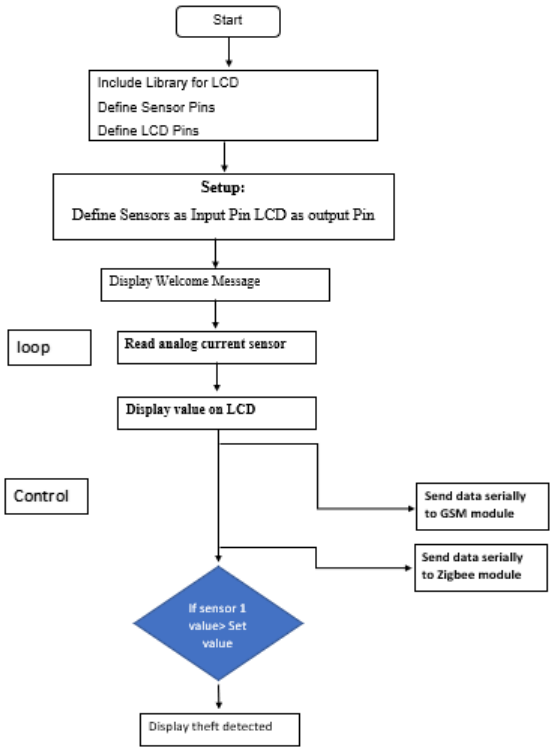

Fig 3.Flow Chart of Transmitter Section

2.Receiver:

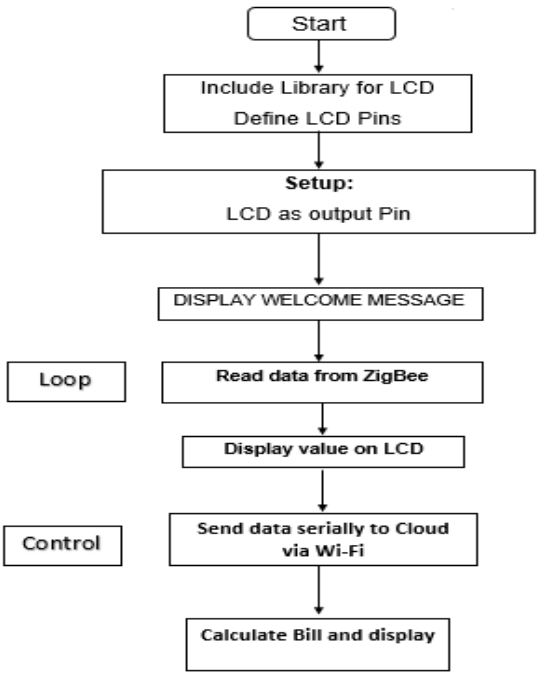

Fig 4. Flow Chart of Reciver Section

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V. COMPONENTS

1.Analog Sensors:
There are number of sensors that produce a continuous analog output signal and these sensors are considered analog sensors. This continuous output signal produced by analog sensors is equivalent. There are many different types of analog sensors; Examples of which are as follows: accelerometers, pressure sensors, light sensors, sound sensors, temperature sensors.

- An economical and accurate AC or DC solutions that are currently sensitive to industrial, commercial and telecommunications systems are provided by Allegro® ACS712.
- This device contains direct, low, direct rotation of the Hall with a copper conductor near the dye area. Currently the current flow through this copper transfer system produces the magnetic field that the IC converts into equal energy. The accuracy of the device is determined by the proximity of the magnetic signal to the Hall transducer.

2. Arduino NANO:
Arduino Nano is a small, board-based ATmega328P board. It provides the same connection to the UNO board specs in a small form format. Arduino Nano is designed to use Arduino Software (IDE), our Integrated Development Standard across all our boards and operates online and offline.

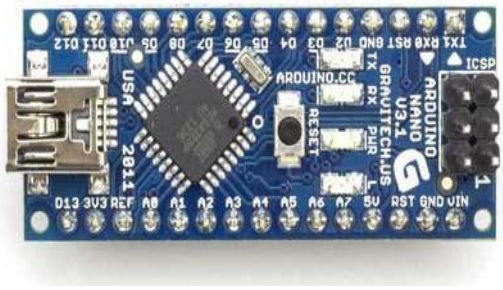

Fig 5. Arduino Nano

3. LCD 16X2:

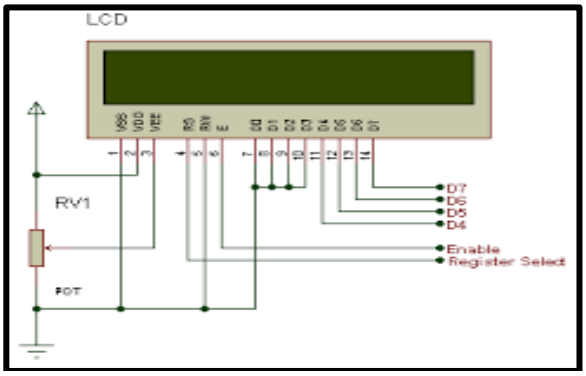

Fig 6. LCD Display

An LCD is an electrical module that uses liquid crystal to produce visual imagery. The 16 × 2 LCD display is a basic mode that is widely used in DIY and regional circuits. 16 × 2 translates o to show 16 characters in each line in 2 such lines. In this LCD each letter is displayed on a 5 × 7-pixel matrix.

4. WI fi Module:
The ESP8266 Wi-Fi Module is used in this System. Which is a self-contained SOC with an integrated stack of TCP / IP protocols that can give any microcontroller access to your Wi-Fi network. ESP8266 is able to host applications or download all Wi-Fi network activities from another application processor.

5.GSMModel:
This GSM modem is a flexible plug and plays a quad band GSM modem for direct and easy integration into RS232. Supports features such as Voice, Data / Fax, SMS, GPRS and TCP / IP integrated stack.

GSM, the Global Mobile Communication System, is today the most effective form of digital communication. This second-generation (2G) system provides unlimited voice services and utilizes digital flexibility with improved audio quality.

Fig 7. GSM Model

6. Power Supply:

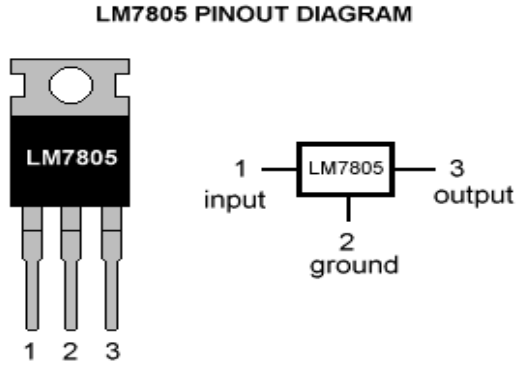

Fig 8. IC LM7805

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Circuit power sources can have fluctuations leading to the delivery of energy results. The output power at a constant value is maintained by the voltage regulator IC. The xx to 78xx shows the output power it provides. The 7805 IC provides 5-volt power by inserting a heat sink. To work we need 5v electricity when we use a car or transmission where we need 12v electricity.

VI. SOFTWARE LANGUAGE AND PROGRAMS

1. Arduino Programming Software:
Arduino IDE is a special software that works on your system that allows you to write drawings (synchronization program) in different Arduino boards.

Arduino programming language is based on a very simple application language called processing, similar to C-language Arduino Integrated Development Environment - or Arduino Software (IDE) - consists of a text editor, code message, text console, toolbar with standard function keys and a series of menus. It connects to real Arduino and Hardware to download programs and contacts.

2. ESP 8266 (Wi-Fi Transceiver):
ESP8266 is a Wi-Fi SOC (program on a chip) produced by Espressif Systems. A highly integrated chip designed to provide full internet connection in a small package. The ESP8266 can be used as an external Wi-Fi module, using the standard AT Command Firmware by connecting it to any microcontroller using serial UART, or acting directly as a Wi-Fi enabled controller, by installing the new firmware uses the provided SDK. GPIO anchors allow Analog and Digital IO, as well as PWM, SPI, I2C, etc. Versions ESP8266.

ESP8266 comes in a variety of styles (as shown in the figure below). The ESP-12E or more commonly known as the ESP-12E NodeMCU Kit is currently the most useful version, in our opinion. ESP-12E

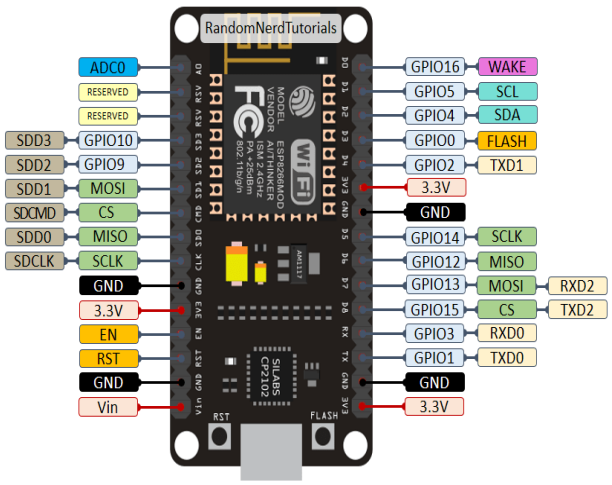

Fig 9. Pin Diagram of ESP8266

VII. ADVANTAGES

- This program shows the energy used on a daily basis; which is why it helps to reduce consumption by comparing daily use.
- Reduces human intervention to collect monthly readings and saves time and money.
- The already announced shutdown information helps to take appropriate precautionary measures and helps to charge important equipment.
- Estimates are always taken at the right time. Unlike a human being, the monitoring system will not forget to take readings or take readings too late or too early. • Mistakes are not made by reading the results.
- Data can be accessed online.
- Multiple fields can be added to multiple parameters.
- Flexibility for receiving data from various platforms e.g. mobile phone.

VIII. CONCLUSION

In this paper, ZigBee-GSM's automatic meter reading system explained how we can replace old meters with this new technology. Our model works very well compared to older models and time and savings. Our system also undermines the large number of employees included in previous programs. Data is secure due to ZigBee's unique id process.

These customers also receive their credit details via SMS and application platform. Touching the electric meter is secure, and this program helps consumers to know and control the monthly energy consumption on their devices at all times.

IX. ACKNOWLEDGMENT

It gives us a tremendous pleasure to bring out this project named as “Zigbee-GSM Based Automatic Meter Reading System”. We wish to express our profound thanks to all those who helped us in making our project reality. Much needed moral support and encouragement is provided numerous occasions by our families.

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