

Automatic Reading and Billing System of Energy Meter Using IoT

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Abstract: *This project describes the implementation of an energy meter with IoT concepts and microcontroller-based designs. The proposed system design eliminates the involvement of human participation in power maintenance. If the purchaser does not pay for the bill within the provided period, power transmission can be switched by the autonomous type of the remote server. The user can control energy consumption in the device from the web page by providing the IP address of the device. The anti-theft recognition unit connected to the energy meter is notified to the company when counter control is performed, and theft recognition information is performed through the modem, and the detected theft is displayed in the terminal window of the company page. The IoT process is carried out by the WiFi unit. The WiFi unit sends data from the energy meter to a web page that can be viewed via an IP address. The hardware interface circuit consists of an ATMEGA 328 microcontroller, MAX232, LCD display, ESP8266 WiFi module and GSM modem. The WiFi unit runs the IOT process by sending data from the energy meter to the website.*

Keywords: GSM, ATMEGA328, MAX232, IoT

I. INTRODUCTION

In the Internet of Things (IoT) model, many living and inanimate objects that surround us somehow exist on the Internet. With the popularity of gadgets powered by wireless innovations such as Bluetooth radio, radio frequency identification, Wireless Fidelity and embedded sensors, the Internet of Things is in its infancy and trying to transform the current fixed Internet into a well-equipped Internet. There are currently nearly 9 billion connected devices, and it is estimated that by 2020 there will be around 50 billion devices. The world today is faced with a problematic environment. The energy crisis is a serious problem in our society. Proper energy management and monitoring systems are one solution to this problem. One approach to overcoming today's energy crisis is to reduce household electricity consumption. The number of consumers is growing rapidly, and the burden on power companies is growing rapidly. Consumers need to be certain of the ideal solution. This means that Internet of Things (IoT) meter concepts and service providers can also use theft detection devices to receive notifications of theft of electricity. By keeping the above factors, the concept of IoT meters consisting of a microcontroller unit and a WiFi unit has flourished. Users can track power consumption per unit of measure on a web page by entering the device's IP address

II. LITERATURE SURVEY

"GSM automatic meter system", "GSM automatic meter system", "International Advanced Research Journal of Electronic and Call System, April 3, 2014

E. Moni Silviya, K.Meena Vinodhini," GSM Automatic Energy with Instant Charges Meter System ", Electrical, Electronics and Tools, International Modern Learning Journal, 2014 4449, April 4449, 4449, 3, 3, 2014. IR Sensor Unit. The IR transmitter is an EB meter It is installed on the radiator. The photo diode is installed in a specific place to determine the number of rotations. You can calculate the current consumption by multiplying by the number of revolutions. The ARM processor decrements the unit given to a particular user after receiving the current consumption. In this case, the unit is a numeric value. When the device is reduced to a minimum, the user is notified with an alarm and LCD display. If the user wants to add more units for themselves, they should contact the EB section and send a message. The required values are passed from the BE section to the AWP controller via the GSM modem. ARM increments a unit of memory based on the

received value. As a result, the reloading process is performed quickly with fewer manual steps. Our technology can be used in a variety of settings including industrial controls, healthcare systems and access control. "Design of a watt-hour meter for long-distance information transmission based on GPRS", ISA 2009. 2009 International Seminar on Intelligent Systems and Applications Yujun Bao and Xiaoyang Jiang, "Designing Electricity Meters for Long-distance Data Transmission based on GPRS", ISA 2009.

Electricity meters transmit data and control commands remotely and wirelessly as the Internet becomes more popular in China and GPRS services improve. It implements TCP/IP protocol by cutting based on ARM core microprocessor that works well with existing watt-hour meters as well as power measurement and processing. The power meter can be connected to the internet via the GPRS service, which uses an ARM core microprocessor to control the GPRS module. Because it is handled by the C/OSII operating system, the entire system is stable and reliable. This is especially true in some rural areas where cable networks have not yet gained momentum. This not only improves the efficiency of electricity meter data collection and transmission, but also greatly improves national energy management.

III. WORK DONE

3.1 Working Principle

The computerized clever power meter is evolved with the assist of ARDUINO NANO processor. The processor is the coronary heart of the gadget as, all of the gadgets are linked to the processor. Energy meter pins are linked to the virtual pins of D5. Program calculated the unit pulse coming from the power meter and displayed at the LCD module. On the LCD, additionally the month displayed on it. GSM Modem is used to ship the popularity of the power meter, just like the invoice has been paid via way of means of the purchaser or not. GSM Modem is attached to the USART pin of ARDUINO NANO. GSM Modem get initialized thru AT Commands. When we initialize the gadget, GSM Modem ship a message to the purchaser tele cell smartphone number, that his power meter gets initialize. ESP8266 module i.e. WIFI Module is used to initialize with the WIFI Router. When the router receives initialize, at the serial monitor, popularity of connection suggests on it i.e., WIFI Module receives linked to router. The WIFI Module receives linked with the person call and password of the router. The XAMPP Server is used as an internet server. The database is created like meter id, purchaser call, devices, month via way of means of the usage of myphp admin. For the reference to database Hypertext Preprocessor language is used. WIFI Module is used to attach the webserver through IP deal with of the webserver. In this challenge localhost is used. When the month get change, at that time, WIFI module get command from the processor, that month has change, ship the devices and month to the database routinely on the specific meter id. If the purchaser doesn't pay the invoice, then the invoice branch can disconnect the power line thru SMS. If purchaser then paid the invoice, then the road may be restored, through SMS.

3.2 Components and Specification

A. Arduino Nano

The Arduino board is meant to make getting started with microcontrollers very simple for beginners. This board is very breadboard friendly, which makes handling the connections a breeze.

B. Energy Meter

An energy metre is a device that measures the quantity of electrical energy consumed by consumers. Utilities install these instruments in a variety of locations, including homes, businesses, and organisations, to charge the electricity usage of loads like lights, fans and other equipment.

C. WiFi Module

Wi-Fi modules provide a simple, hassle-free, and quick method for creating IoT devices. Adding the ability to communicate wirelessly using the reliable and secure IEEE 802.11 b/g/n standard without having to worry about the TCP/IP stack because it is integrated into the module and ready to use using AT commands.



D. GSM Module

The SIM800L module is compatible with a quad-band GSM/GPRS network and can send GPRS and SMS message data over a long distance. The SIM800L uses a UART port to interface with the microcontroller and supports commands like as 3GPP TS 27.007, 27.005 and SIMCOM improved AT Commands.

E. LCD

LCD is a type of flat panel display that operates primarily with liquid crystals. LEDs are widely used in cellphones, televisions, computer monitors, and instrument panels, and they have a wide range of applications for consumers and enterprises.

F. Relay

A 5V relay is an automated switch commonly used in automated control circuits that controls large currents with low current signals. The input voltage range for the relay signal is 0-5V.

G. Router

A router is a physical or virtual network device designed to receive, analyze, and forward data packets between computer networks. The router looks up the destination IP address of a particular data packet and uses headers and forwarding tables to determine the best way to send the packet.

3.3 Layout Design

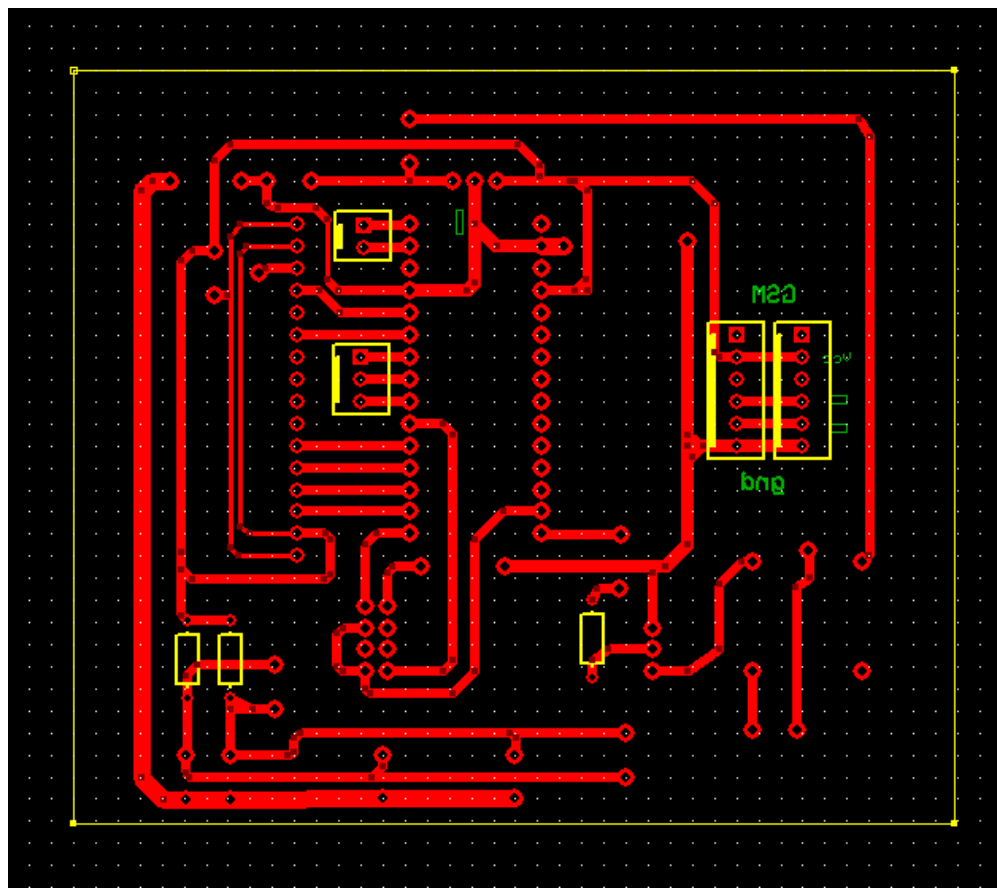


Figure 3.4.1: Layout design of Automatic Reading and Billing System of Energy Meter using IoT

IV. RESULT AND DISCUSSION

Our System provide the electricity readings on an LCD screen as well as SMS can be sent to user and the readings can be updated automatically on the server of electricity provider.

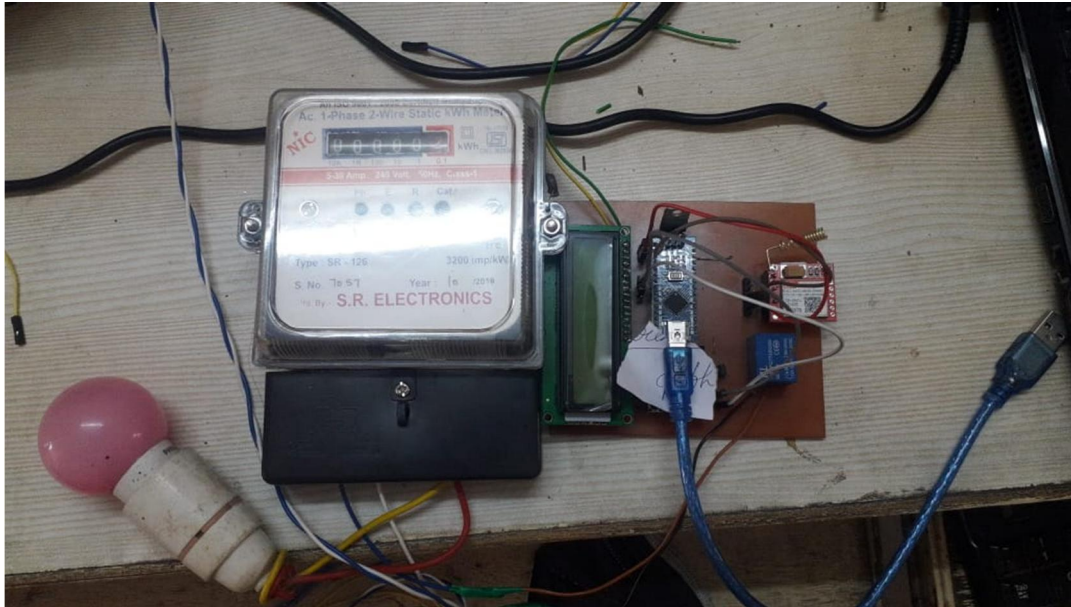


Figure 4.1: Snapshot of hardware structure of Automatic Reading and Billing System of Energy Meter using IoT

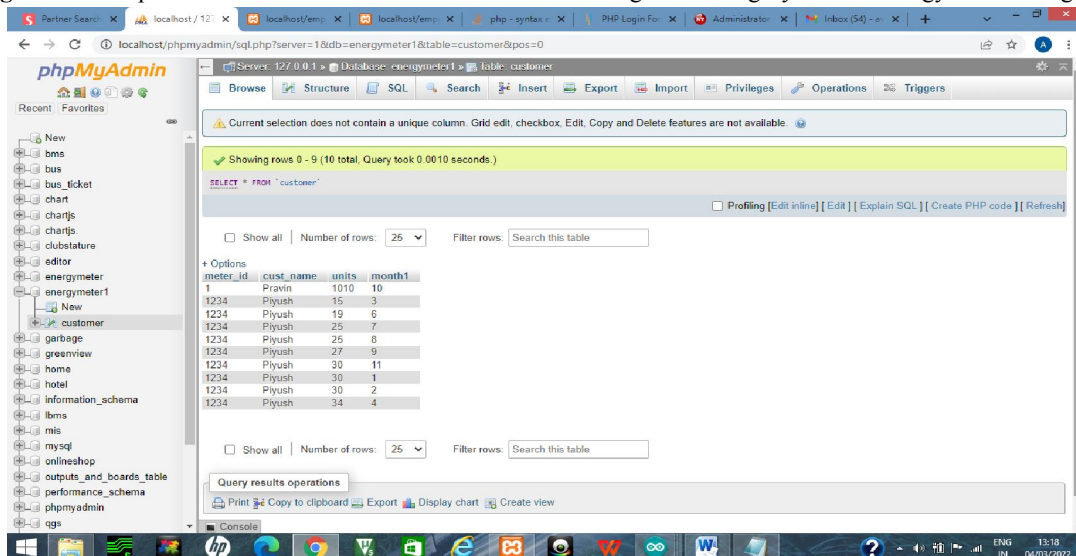


Figure 4.2: Snapshot of database of Automatic Reading and Billing System of Energy Meter using IoT

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