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Research paper

IOT Based Energy Meter Reading System with Automatic Billing

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Abstract

In recent time e-meter (electronic meter) place a major role for the power consumption &cost efficient system. In advanced future it has high reliable and productive programmed meter perusing framework (AMRS). This paper aims to plan a straightforward ease. IOT based energy meter reading system which includes fault indication. Unit usage after (i.e. for 15 days once). Mode selection (automatic& manual) and SMS alert to user. Mode selection option is included. To avoid more power consumption automatic mode is used to cut-down the appliances for the user convenience. If there is a fault in the e-meter it sends a notification to the user. If there is any fault in E-meter the LED will glow. EEPROM (Electrically Erasable Programmable Read Only Memory) used as flash memory to store a data. The proposed system neglects the regular digital meter reading system and allows remotely access the electronic meter. Legiti mate validation, user can get to the created webpage points of interest from anyplace on the planet. The advantages of this project are to reduce cost and save more power and also reduce man power and time consumption. This project is implemented is hardware and software used are ARUDINO IDE (using embedded C language).

Keywords: *ARMS (Automatic Meter Reading System), IOT (Wi-Fi) as communication, Real Time Clock (RTC), Arudino IDE.*

1. Introduction

The systems consists of a microcontroller ATMEGA328P Wi-Fi module, LCD display, V/I controller. EEPROM, RTC. In the system Microcontroller continuously reads the energy meter using the Wi-Fi module. It is used to transmit the information to the receiver. Irregularities of bills and reduce man power are overcome by AMR system in high buildings and luxury housing plots. There is cost of chance for missing bills, non-appearance of buyer and so on … to avoid this problem meter replacement is needed with more efficient and accuracy is also need to avoid further occurs in future. In this AMR system the e-meter will sense the energy consumed and automatically generate bill in the user mobile as SMS or e-mail and etc… Methods are used to represent the bill for the consumer knowledge and this method is more useful for the current scenario. The increase in power or energy consumption is automatically increase the cost to avoid these types of problem this paper will be helpful to protect our house more save and save more energy and cost.

Cayenne.com is used as a cloud server to communicate between the consumer and Electricity board. Voltage and current values are sensed by the sensor and stored in the server.

2. Related works

Internet of things (IOT) based and highly desirable in field of energy, in this framework customer can do control administration by Knowing vitality utilization time to time, the buyer needs to pay the bill on plan. On the off chance that couldn't the electric power availability can be killed self-ruling from the far off host. [1] Explained the modelling and working of different units of the system and also discussed the components and their functions such that IOT and its working microcontroller and its architecture. Reducing energy consumption and monitors the units consumed. To make the electrical apparatuses insightful and give solace to devoured and to lessen control utilization in web applications. [2] Suggested it in light of ARDUINO UNO controller and IOT innovation. On the off chance that any altering happens the controller will send to information to the server and in addition it is chopped down the vitality supply naturally.

At the point when most extreme request of vitality expends will be shown in the meter utilized by the customer. [3] Clarified in the wake of surpassing the greatest request, the meter and subsequently the association will be consequently disengaged by an installed framework embedded in the meter sensor. The LDR (Light Dependent Resistor) sensor placed on energy meter which

sense LED blinking pulse. At that time microcontroller sending this reading via GSM module and its send this message to electricity board.

In this framework a keen vitality meter is introduced in each customer unit a server is kept up at the specialist co-op side. [4] Implemented both the meter a server furnished with GSM module which encourages bidirectional correspondence between the two closures utilizing the current GSM foundation. Shopper can without much of a stretch energize their vitality meter by sending a stick number covered up in a scratch card to the server utilizing SMS.

In order to avoid all these drawbacks we have intended to construct an IOT based energy meter so that proposed energy meter measures the amount of power consumed and uploads it to cloud from which the concerned person can view the reading .The power reading send to cloud using ESP8266, a Wi-Fi module. [5] Explained the power reading from digital wattmeter is read using the coupler and transmitted digitally to the Arduino. So it automates the process of measuring the power consumption at homes using IOT.

3. Proposed System

In the proposed technique the customer can deal with their vitality utilization by knowing their vitality use time to time. The strategy not just gives two path interchanges amongst utility and purchaser yet in addition gives different capacities that are if the customer neglects to pay the power charge the vitality supply would be chopped down from the utility side and once the bill is paid the vitality supply is reconnected**.**

In addition with the existing system innovative to include an alert message to the user energy consumed for 15 days once, constant alert message with payments details and power usage until the payment is done. To avoid the further consumption of energy, we are setting a limit for each household and if the limit exceeds methods are used to cut down the appliances according to the user convenience both automatically and manually. If there is a fault in e-meter it also sends a notification to the user.

IOT Server

Cayenne.com is used as a cloud server. Cayenne is a first online builder/tool to create IOT projects. Voltage and current values are continuously stored in server. Alerts can be scheduled in a server.

The proposed framework for the most part works in two modes.

1. Automatic Mode
2. Manual Mode

Mode Selection

- Automatic Mode: In this mode it crossed to the limit automatically device will cut-off. The device is selected by user convenience.
- Manual Mode: In this mode the switch is manually turned to manual mode. During the manual mode the customer can consumed as much as it is required by the presence of customer known.

Problem Analysis

The power board have used to the manual procedure and they oblige it despite the fact that there are numerous worries combined with it. In light of the human blunders in the wake of getting staff charge, it is the issue of client to get yet adjusted from the vitality supply board. All things considered client needs to visit the workplace, remain in line and get it rectified. The issue is a result of human intercession. To maintain a strategic distance from human mistakes in the building procedure, in this new age a programmed perusing meter perusing framework came in to the existence and explained in the following figure(1).

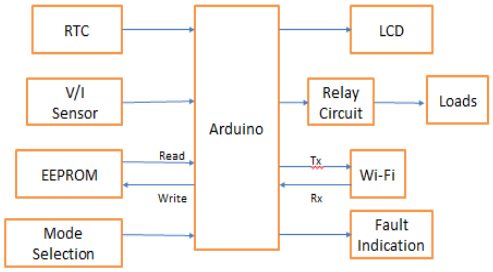

Fig. 1: Block diagram of e-meter

Working of E-Meter

The meter which is utilized for estimating the vitality and uses by the electric board is known as the vitality meter. The vitality is the aggregate power expended and used by the heap at a specific interim of time. It is utilized as a part of residential and mechanical AC circuit for estimating the power utilization. The meter is more affordable and precise.

Essential unit of energy is watts. One thousand watts is one kilowatt. In the event that we utilize one kilowatt in 60 minutes, it is considered as one unit of vitality devoured. These meters measure the prompt voltage and streams. This power is incorporated over a period which gives the vitality used over that day and age.

Result and Discussion

(I).Automatic Mode

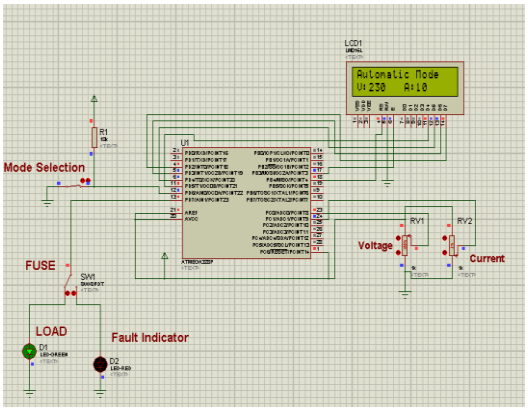

Fig. 2: Output of automatic mode

(ii). Manual Mode

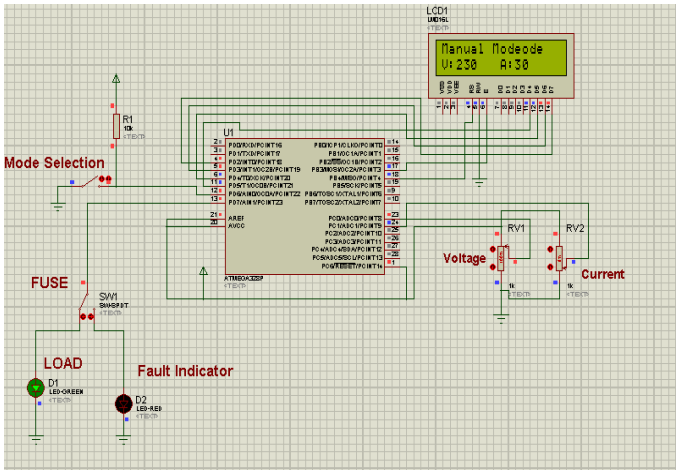

Fig. 3: Output of manual mode

(Iii). Fault Indication

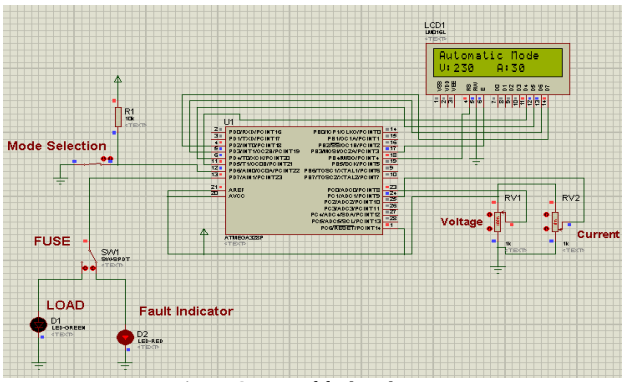

Fig. 4: Output of fault indication

Hardware Structure

(I).Automatic Mode

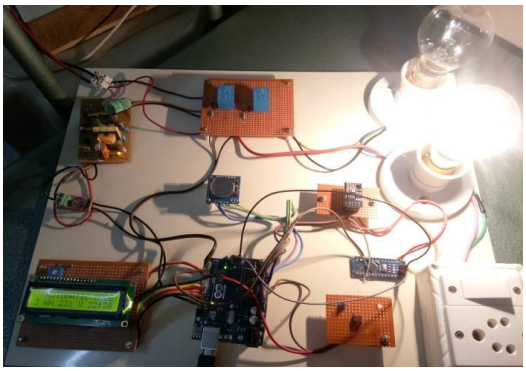

Fig. 5: Output of automatic mode

(ii).Manual Mode

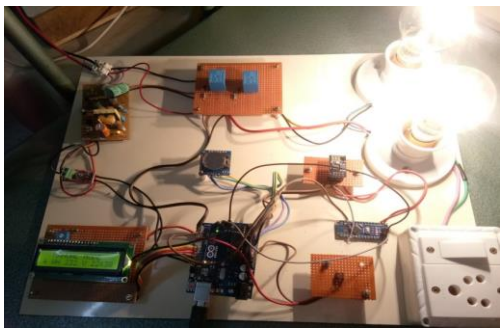

Fig. 6: Output of manual mode

(Iii).Mobile Compatability Output

Fig. 7: Output of mobile notification

(iv). E-mail Notification

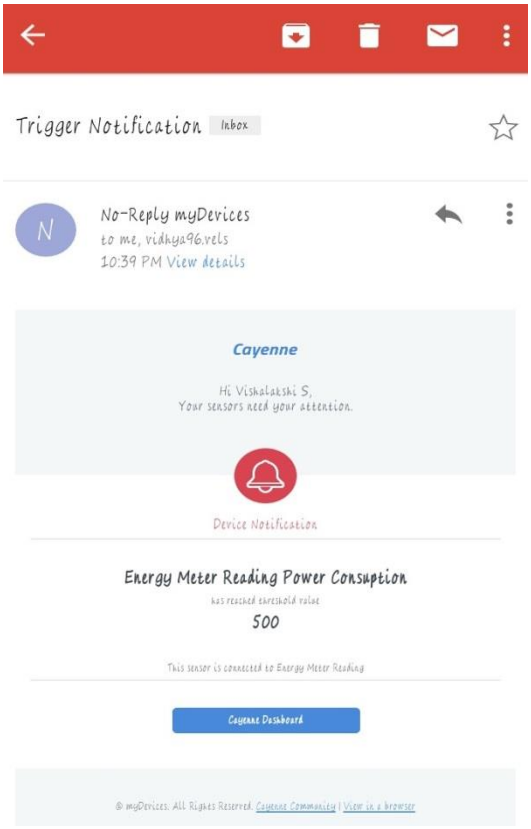

Fig. 8: Output of e-mail notification

(v). Power Usage Chart

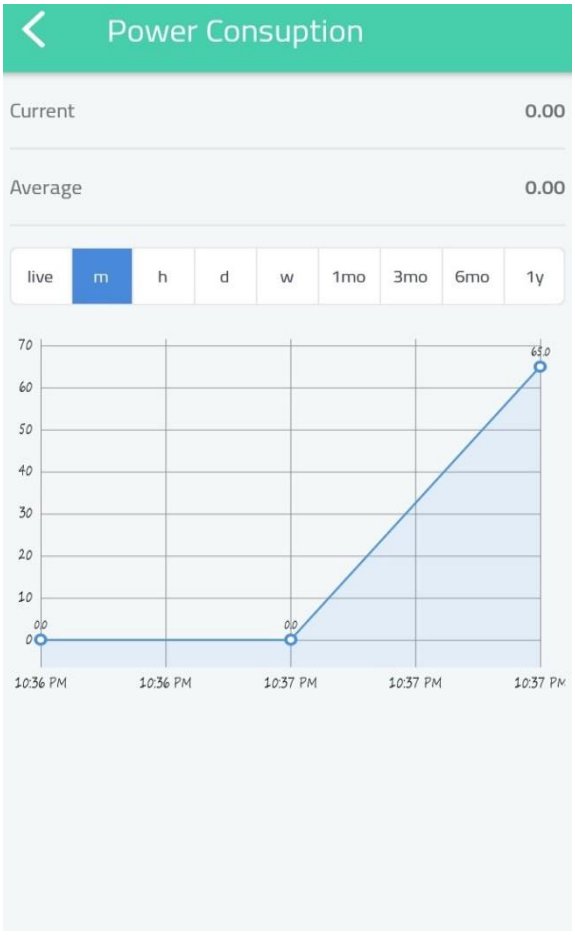

Fig. 9: Output of usage chart

(Vi).Output of Power Consumption

Fig.10: Output of power consumption

1. Hardware Description

Arudino ATMEGA328

The Arudino ATMEGA 328 is a low power CMOS 8-bit microcontroller in light of the AVR upgraded Reduced Instruction Set Computer (RISC) design. It is low power and advantageous size.

EEPROM

EEPROM memory also has a special chip erase mode by which entire chip can be erased in 10ms. This time is quite small as compared to time required to erase EPROM and it can be erase and reprogrammed with device right in the circuit. However, EEPROM's are most expensive and the least dense ROM's.[10]

Regulated Power Supply

The power supply plans contain a substantial mains transformer (which likewise gives separation between the information and yield) and a dissipative arrangement controller circuit. The controller circuit could comprise of a solitary zener diode or a three terminal direct arrangement controller to deliver the required yield voltage.

LCD

A Liquid Crystal Display (LCD) is additionally has 64 bytes of character-generator (CG) RAM. This memory is utilized for characters characterized by the client.[11]

RTC

A Real Time Clock (RTC) is used to reset the data and it's stored in online and offline mode.

Relay Circuit

The hand-off works just if the positive and the ground are associated with the proper terminals of the hand-off loop. In its least complex shape a hand-off comprises of a loop utilized as an electromagnet open and close switches contacts.

IOT Server

Cayenne.com is used as a cloud server. Cayenne is a first online builder/tool to create IOT projects. Voltage and current values are continuously stored in server. Alerts can be scheduled in a server.

Wi-Fi Module (ESP8266)

ESP8266 is a Wi-Fi module which appropriate for adding Wi-Fi usefulness to a current microcontroller venture by means of a Universal Asynchronous Transmitter Receiver (UART) serial association. The module can even be reinvented to go about as an independent Wi-Fi associated gadget.

Voltage Sensor

To get DC motion from an AC framework for contribution to a microcontroller, we are utilizing this voltage detecting circuit. The circuit gives a precise technique to making this DC flag. The voltage is detected by utilizing a potential transformer and the got flag is amended at the primary operation amp stage and enhancer at the second operation amp arrange.

Current Sensor

The current is detected from by utilizing current transformer and it is corrected at the main operation amp stage and enhancer at the second operation amp arrange.

2. Conclusion

The main cause for the design of IOT based E-meter is to reduce the power consumption in house. It avoids the human intervention reduces the cost, save human power. It works both automatically and manually. This meter sends billing directly to mobile before due date without causing human intervention.
This computerization for diminish the work costs as well as makes the framework more effective and exact.

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