The Electricity Billing System over IOT

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Abstract: In modern days where the world is technology driven there is a need for an effective electricity metering and billing system. In modern times as well as in future the electronic-meter will play a major role for the power consumption & cost efficient system. The proposed system consists of a Wi-Fi module that enables the project to be more efficient. There is mode selection available on the system. This project is implemented using hardware and Arduino IDE using embedded C language.Their are various advantages that can be stated in this project but the main advantage is that this proposed system will save e electricity Keywords: Atmega 328P, IOT (Wi-Fi module) for communication, Arithmetic Logic Control (ALU), Real Time Clock (RTC), Arduino IDE, embedded C.consumption and due to this the the cost of producing the electricity can also be minimized;

I. INTRODUCTION

Electricity is the heart of today's modern world. The world is going to be digital in the future so electricity is a very important aspect. Hence there is a need for an efficient monitoring system for the detailed information of consumption and vitality usage.Electricity meter (E-mter) is used to measure the total electric energy consumed in units by the various appliance in the household and various industries,The system consists of a microcontroller mainly ATMEGA328P, a Wi-Fi module, LCD display to display the details, Voltage and current controller, EEPROM, Real time Clock (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. In future advancement in this project we can connect the module with the GSM module and enable the automatic generation of bills and send the user the data through a SMS or an E-mail.We are using thingspeak platform as a cloud server to communicate and display the data usage of Voltage and current and hence display the price generated after the usage.

This system is a unique adaptation of the working system that can be used in billing the complete usage of electricity on a server and enable the user to be the center of the whole system.

II. RELATED WORKS

Internet of things (IOT) based on collective network of devices and its application can be used effectively to manage power consumption, in this technology user can manage electricity consumption by knowing electricity usage or the vitality consumed from time to time, the user must pay the bill according to the updated data showing the price according to usage by the customer..The model provides daily time to time updates of users power consumption which is displayed on ThingsSpeak app. Defined the modeling and execution of different parts of the model and also discussed with their units and their functions like IOT its functions, specifications and working of microcontroller its architecture and functioning. The model reduces energy consumption by observing the units consumed by the user. To provide insights and lesson on control and utilization of IOT in web application using the arduino controller and various IOT technologies can be used for further advancement.

This new system is being developed and many other types of technologies are added to the proposed system to make it more efficient for future applications

III. PROBLEM ANALYSIS

The electricity board is managed and controlled by manual labor, ignoring many facts and problems that are associated with it. The existing model has many shortcomings like manual work, Human errors, inappropriate meter reading.In some of the cases cameras are being used to take the meter reading but it too comes across various problems like environmental issues, corruption, theft in power corruption.In the proposed system the billing will be automatic through the server-based unit also power can be managed efficiently. In case of altering situations, user electricity connection can be cut through the relay present on the electric meter.To avoid human errors, power theft , corruption that exist in the current system, in this new era a programmed arduino based meter came into existence.

IV. METHODOLOGY

In this system AT-Mega 328 Microcontroller retrieves the data from various sensors and transmits it through IOT. Microcontroller (ATmega328p) acts as a heart piece of the system, and collects the data . The Atmega328p microcontroller IC is connected to a relay circuit, and a liquid crystal display is used to display the details of the project. The schematic connection of the proposed system is constructed then the PCB formation is done. Connection of the PCB is established. When the appliances of the household consume energy the sensor would read the reading continuously and this consumed load can be seen on the graph on Thingspeak platform. Thingspeak is open source platform made for Internet of Things (IoT) devices. The system requires internet connectivity which is given to it using the WiFi module. This platform starts to record meter reading by interfacing ESP8266A with Arduino

V. HARDWARE DESCRIPTION

A. Arduino ATMEGA328P

The Arduino ATMEGA 328P, is a CMOS 8-bit microcontroller in light of the AVR upgraded Reduced Instruction Set Computer (RISC) processor core design. It is mounted on a single chip and act as microcontroller created by atmel cooperation.It is low power and has an advantageous size.The AT89S52 is with 8K bytes of in-system programmable Flash memory and it is cost efficient as all 31 registers are directly connected with the ALU.

B. Voltage Sensor

A voltage sensor is used to calculate and monitor the amount of voltage provided in a system. A 3 phase supply is supplied to the system as input and it converts this supply into 5 volts supply using an in built step down transformer.

C. Current Sensor

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

D. ESP8266 Wifi Module

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. This module comes with AT commands firmware which allows you to get functionality like arduino wifi shield, however you can load different firmwares to make your own application on the modules' memory and processor.

E. LCD

LCD stands for Liquid Crystal Display. LCD is finding widespread use replacing LEDs (seven segment LEDs.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.

F. Relay

The relay module is an electrically operated switch that allows you to turn on or off a circuit using voltage and/or current much higher than a microcontroller could handle. The relay protects each circuit from each other. Controlling a relay with the Arduino is as simple as controlling an output such as an LED.Relays are switches that open and close circuits electro mechanically or electronically

G. IOT Server:- (ThingSpeak)

ThingSpeak is an IoT Cloud platform where you can send sensor data to the cloud. You can also analyze and visualize your data with MATLAB or other software, including making your own applications.The sensors, or things, sense data and typically act locally. ThingSpeak enables sensors, instruments, and websites to send data to the cloud where it is stored in either a private or a public channel.

H. Power Supply

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is stepped down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. This voltage is then further given to a voltage regulator to obtain a constant dc voltage.

VI.   BLOCK DIAGRAM
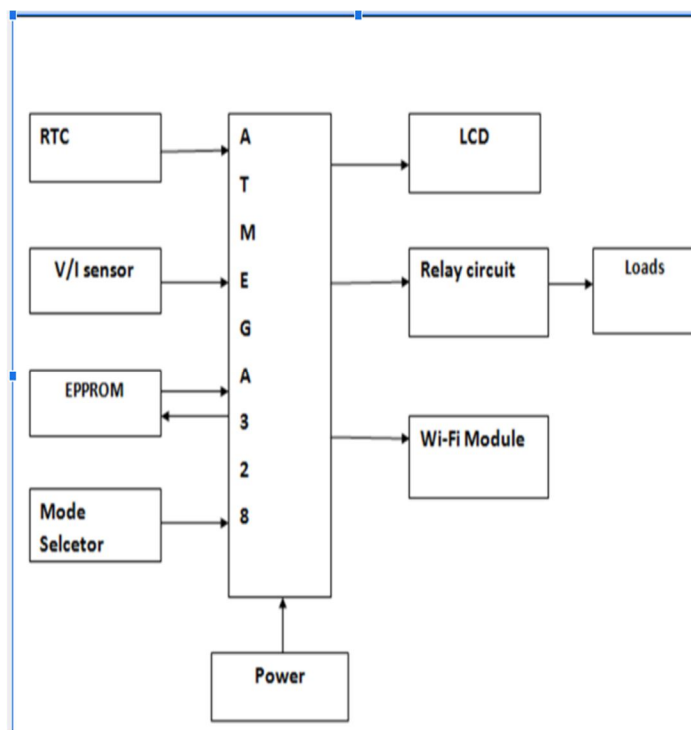
VII. RESULTS AND DISCUSSION

The result will be displayed on thingSpeak platform and will be shown in graphical Form.The first graph will show current details used where the x axis will display the date of usage, Similarly the second graph will display the voltage parameter verses the date it was consumed and the time of consumption whereas the the third graph will display the price details and the time details for the same.
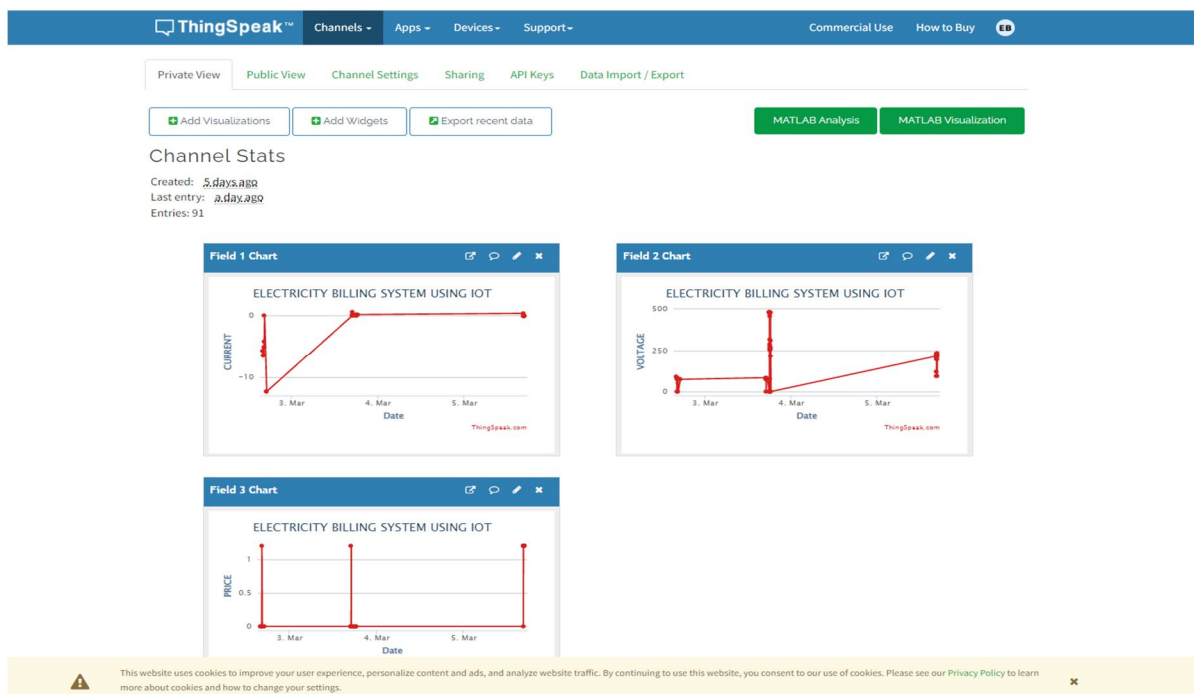
VIII.   ADVANTAGES

A.   Reduce human efforts

B.   Retention from power theft and corrupt bodies..

C.   Human error is minimized..

D.   Control over Power Consumption.

E.   Cost effective system..

F.   Compatible connection without corruption and theft.

G.   Efficient and low cost design.

H.   Low power consumption.

IX.   HARDWARE STRUCTURE

1)   *Stage 1:* The connection is been displayed with respect to the ATMEGA microcontroller and LCD displaying the details for the project.
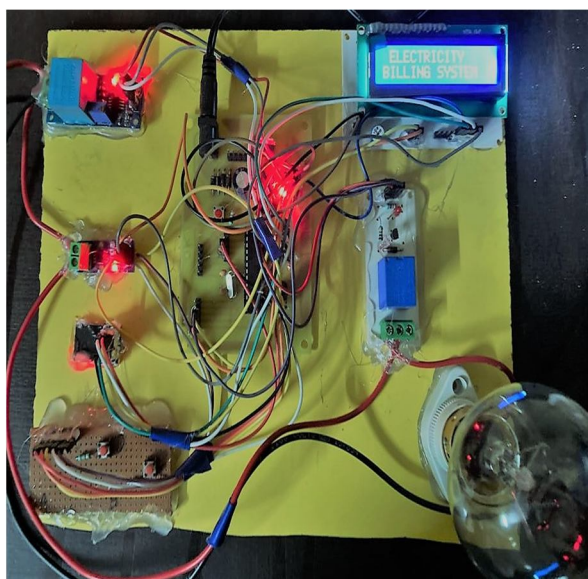
2)   *Stage 2:* When load is provided to the system. The system starts calculating the voltage and current parameter according to the usage and displaying on the LCD screen.
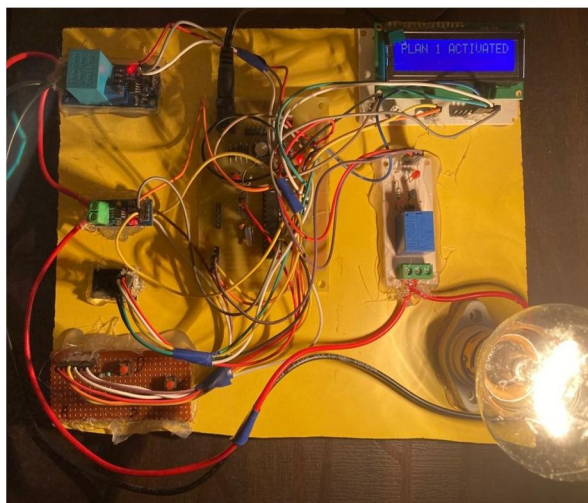
X. CONCLUSION

The main cause for designing such a system is to reduce the power consumption i.e electricity consumed by various appliances in the house. This Wi-Fi module sends billing directly to the thingSpeak and the voltage and current consumption without causing human intervention. The proposed system is used to monitor the consumption of power based on the voltage and current parameters. The units consumed are converted according to the calculation into exact amounts in terms of price i.e rupees and displayed on the ThingSpeak platform.

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