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DEVELOPMENT OF A SMART ELECTRICITY METER FOR HOUSEHOLDS BASED ON EXISTING INFRASTRUCTURE

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Abstract

This research has focused primarily on creating an IOT-based Prepaid Smart Metering System that would be ideal to alleviate some of the issues now existing in the conventional digital automated metering system in Eurasia. With its special ability to work with the Internet of Things (IoT), smart metres are a reliable system for tracking and real-time remote monitoring as well as an efficient system for running electricity. Thus, this design task is completed by evaluating the current functions and journals on the design of Smart Metering and making suggestions for a more advantageous future operation. The current system requires human workers to travel from home to home and block to block to read the electrical cadence for use in operation and invoicing.The goal of this idea is to use GSM to create a Smart Electricity cadence. This helps to recover the real-time cadence value over GSM and send it to visitors' cell phones, which can decrease fatal crimes. Additionally, this allows the power board to change the variable package pricing for a set period of time. The director can analyse the visitor power usage information and generate the report using online data. The prototype will be appropriate for introducing the guest billing system, gathering data on electricity usage from smart cadence, storing data in a centralised database, and producing reports

Introduction

One of the essential elements for maintaining life's essential components is electricity. For it to function properly, it should be used with extreme caution. However, in our nation there are many places where there is a strong need for energy while several places do not actually have access to it. Due to the fact that power theft is still a problem and we are still unable to accurately predict our exact demand, our distribution programmes are also partially to blame. On the other side, customers are also dissatisfied with power firms' services. They frequently complain about statistical crimes appearing in their monthly invoices. With this, we can monitor the metre and determine whether a fault is present or not. in the past A circular material strip rotates on the metre, and we calculate the consumption based on that revolution. However, our metre relies on pulsations that are produced based on usage, and we have previously linked an Android board that covers the pulsations. The bill is then generated based on the pulsations. We hope to admit the monthly energy usage from a remote location straight to the central office with the aid of this design. By doing this, we can lessen the agonising labour required to record the metre readings, which are now taken by visiting each and every residence individually.

The most precise way to measure the electricity used by a building's roof, a business, or any other electrically driven item is with a smart energy metre. Using a smart metre as a source of maximum accuracy in energy consumption data that minimises the possibility of error in the billing system.

LITERATURE SURVEY:

For automating billing and managing the gathered data comprehensively, Ashna.K's "GSM Based Automatic Energy Metre Reading System with Instant Billing" proposes the construction of a straightforward, low-cost wireless GSM energy metre and its accompanying swell interface.

Inder Kumar Vivek Postpaid energy metres that automatically detect the energy consumed in the residence and disconnect the power line when they reach a value that is first fed into an attack were first introduced in 'Electronic Energy Metre with Instant Billing'. For users who will engage with the attack, there is a user interface that allows them to set values.

,The design and functionality of a GSM-based remote operation of the "GSM predicated Prepaid Energy Metre" was proposed by Mr Sachin G. Jagdale and Ms Sunita D. Giri.an energy metre that reports power theft, consumption monitoring, machine billing and payment, data logging, and manpower savings in power distribution and operation.

The primary drawback of the current systems is that they are postpaid base services. As a result, the Electricity Board provides the service before receiving payment from the visitors, making it difficult for the Electricity Board to collect the unpaid balance from the visitors while continuing to provide the service. Consequently, a system service is required after payment.

Proposed System

The Smart cadence's armature was made up of the ESP8266 and GSM. Energy usage is calculated using the ESP8266 and the Metering block (unit). The energy cadence includes the

following components: a TV, an ESP8266, a GSM modem, two relays, and two dimension units. While the alternative is designed to take into account electricity from a local network of connected houses that use renewable energy sources, an external electrical network, etc., the first is built to take into account power from an external electrical network.

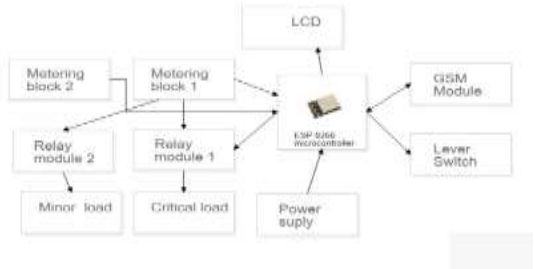

Fig 1: architecture of smart energy meter

A)Arduino Mega

The ATmega2560 is supported by a microcontroller board known as the Arduino Mega 2560. It has 54 digital input/ affair legs, 15 of which can be used as PWM labours, 16 analogue inputs, 4 UARTs (attack journal harbours), a 16 MHz demitasse oscillator, a USB port, a power jack, an ICSP title, and a reset button...

Fig 2: Arduino mega

B)Relay Module

SSR solid state relays, which only permit a switchover when the sine wave of the current crosses zero, are used to turn on and off power loads. As a result, the pulsation current and impulse noise of the switching operation are reduced. Relays should, however, be safeguarded against overvoltage, overcurrent, and temperature rise.(8). The entire SSR relay is electronic(9). As connectors, power transistors, high-power thyristors, or triacs are used. The control circuits are cut off from the power circuits using an optocoupler. However, they must be mounted on radiators during installation to guard against excessive loads harming the power switch..

Fig 3:Relay Module

C)Micro controller ESP8266

The TCP/IP protocol stack and the IEEE802.11 b/ g/ n standard are supported by the versatile microcontroller ESP8266. It features a 32-bit low-power MCU, 10-bit ADC, 2.4 GHz Wi-Fi, and UART support(4) built in. The module and Pall platform may communicate more easily thanks to an integrated Wi-Fi module. If the Wi-Fi network is down, it will immediately switch to the GSM channel. By acting as a backup route, this reduces the possibility of readings being lost. The metre is GSM-enabled with the GSM/GPRS Module(5). Use the GSM/GPRS module to send SMS, make calls, and exchange data over GPRS. In this case, it is used to deliver SMS messages with metre readings.

Fig 4: microcontroller ESP8266

D) **GSM Module:**

The GSM-900 GSM/GPRS module is a widely accessible GSM/GPRS component that can offer network connectivity for your design. It can make and receive calls, send text messages, and use GPRS to connect to the internet. It has all the features of a mobile phone. The SIM900A GSM Module is the smallest and least priced module for GPRS/GSM communication. Arduino and microcontroller are typically utilised in the last stages of bed operation. GPRS/GSM technology is provided by the module for usage in mobile SIM-based communication. It allows stoners to send and receive SMS and make mobile calls by utilising the 900 and 1800 MHz frequency bands. The keypad and display interface allow the formulators to modify the process. In a similar vein, it has two modes: data mode and command mode. Every country uses a different set of GPRS/GSM operating frequencies and protocols. Formulators can modify the dereliction setting to suit their needs by using the command mode. needs.

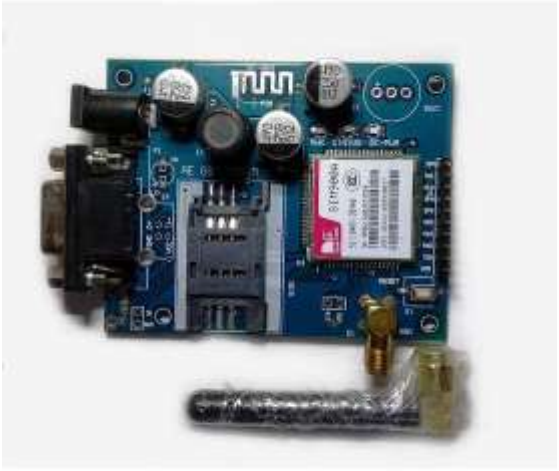

Fig 5 :GSM module

Block Diagram

The Arduino MEGA serves as the model's CPU. The Arduino MEGA platform is used throughout the system. The controller, which serves as the communication module between the user and the provider, is serially connected to the GSM modem. The GSM transfers data over its own network. Arduino uses specialised coding to programme the AT89S51 microcontroller. Relays are utilised as switching mechanisms to interrupt and resume power flow. A similar connection is used to link the television to the microcontroller. This design uses a microcontroller-based system to continually measure the readings, and it allows the electricity department to request the transfer of the current metre reading. In the event that electricity is not paid for, this device can also be used to turn off the power to the house bills. Each energy metre requires a GSM modem with a SIM card.

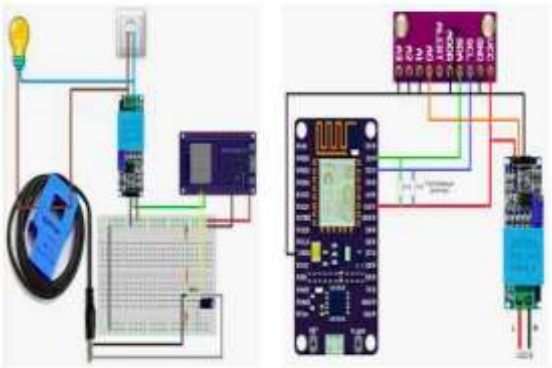

Fig 6:Block diagram

Working:

A)Interface:

A genuine prototype was used to test the suggested outcome.

The proposed data transfer system consists of an ESP826 microcontroller and a GSM module..

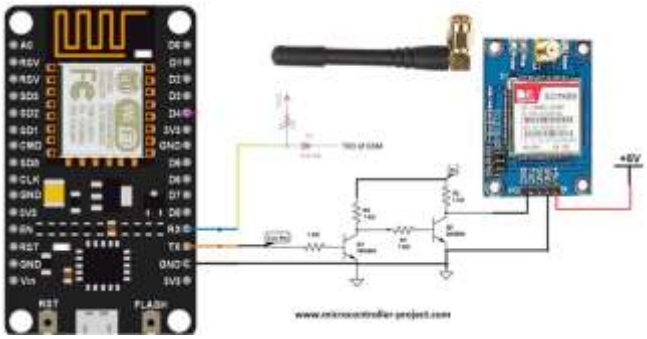

Fig 7: interface

Energy metering equipment mounted on the power circuit that include a current and voltage motor provide data that is entered onto the ESP8266 microcontroller..

B)Measuring unit:

A detachable sensor (SCT-013-030), which may be put on a phase line without disrupting the circuit, measures current. A voltage sensor measures voltage. Continuous data transfers are made to the ESP8266 board, where they are reused and multiplied by the installed current and voltage sensors' transformation factor. The programme converts energy into kW/h and sends the information to a cloud storage system on the internet.However, if a Wi-Fi network is not available, the readings are sent using a GSM modem. Consequently, redundant communication routes are established. By sending orders to the ESP8266 via the available Wi-Fi or GSM channels, the relay can be controlled remotely. The metre guarantees impartial metering of energy entering from a a nearby household using renewable energy. A unique measuring module is provided to the metre for this. On the ESP8266 controller's instructions, a relay switches between power circuits. This is the first step towards implementing the "P2P energy request generality" at this time. The capacity to connect two different types of weight—the primary (critical) and non-critical—that are not essential to the operation of the household is provided by the smart metre. It is planned to use "demand response" generally at this time. weight slipping at the network driver's request to balance the weight schedule with a later cost to the customer who consented to such shedding.

Figure 8: Scheme of the measurement unit

Final Output:

Fig 9:Final output

Conclusion:

This essay addressed the generality of a smart metre that will permit the rapid and correct transfer of information to the energy force corporation. The duty for data delivery is ensured by two key communication channels that can use GSM technology or a Wi-Fi network. An intelligent metering system will make electricity theft less likely and reduce the cost of subscriber service controllers, which are used to take readings. New metering systems will support the execution of the P2P request universality once the energy from renewable energy sources may be transferred to surrounding houses (of course, in experimental mode). Due to an integrated link for two, consumers will be able to take part in "demand trading" based on performance kind of weight given to demand response in networks' universality.

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