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Design and Implementation of Smart Energy Meter Using IOT

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ABSTRACT: In the actual world of today, automatic frameworks are preferred to human framework. IoT is the most recent and growing online innovation, and the rapid growth in the number of web users over the past ten years has made the Internet a necessity for daily living. One of a person's basic needs is electricity, which is frequently used for household, commercial, and agricultural reasons. The greatest issue today is power theft, which costs energy companies a lot of money and creates some payment issues for customers. These circumstances occur more frequently in our nation. Lots of electricity can be conserved if these thefts are stopped. Utilizing a smart energy meter, this is done (SEM). An electronic instrument called a SEM has an energy metre chip for calculating the amount of electricity used and using a cellular algorithm for data transmission. A smart energy metre for an automated metering and invoicing system is presented in this study. This energy metre communicates with the controlling base station and sends the power used and the associated number to both the consumers and the electricity board via an Android application and a web application, respectively. To assist vendors in looking into, identifying, and stopping theft, additional policy measures and suggestions are included. The entire system helps prevent crimes and uses a worldwide linked means to effectively portray the metre measurement to its clients. IOT devices are used for contact between the user/household and the centre.

KEYWORDS: IOT Module, Arduinomicrocontroller, Current Sensor

I.INTRODUCTION

Home energy management systems (HEMS) manage energy use to achieve a balance between energy saving and a comfortable life in the Home. In addition to reducing energy consumption by using rainfall, detector, and other types of information to identify gratuitous energy use and controlling Home appliances consequently, HEMSs also work laboriously to make the stylish use of electric power by, for illustration, operating heat pump water heaters or washer-dryers during times when solar panels are generating redundant power. As the quantum of power generated by rainfall-dependent renewable energy sources increases, the installation of batteries, and their operation in an optimum way to deliver energy savings while also maintaining comfort, will have an important part to play in maintaining a dependable force of electric power. In addition to furnishing " visualization " of electric power use to give the stoner an easy way to view their own operation on a television or computer screen, by performing centralized operation of energy consumption, an ends can also give advice on how to make more effective use of electric power grounded on factors similar as the rainfall or the stoner's geste patterns.

Renewable energy

Renewable energy is generally defined as energy that comes from coffers which are naturally replenished on a mortal timescale similar as wind, rain, runs, swells and geothermal heat. Renewable energy replaces conventional energies in four distinct areas electricity generation, hot water/ space heating, motor energies, and pastoral(off- grid) energyservices.Renewable energy coffers live over wide geographical areas, in discrepancy to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy effectiveness is performing in significant energy security, climate change mitigation, and profitable benefits. In transnational public opinion checks there's strong support for promoting renewable sources similar as solar power and wind power. At the public position, at least 30 nations around the world formerly have renewable energy contributing further than 20 percent of energy force. National renewable energy requests are projected to continue to grow explosively in the coming decade and beyond.

II. LITERATURE SURVEY

2.1 Jinsung Byun, Insung Hong, and Sehyun Park More effectively changing energy networks are green IT and smart grid technologies. Context-aware power management systems are made possible by recent advancements in cellular and mobile communications technologies, which enable situation-based services in the digital household. In

this article, we suggest a novel hybrid sensor network-based smart home energy management system (SHEMS). The term "smart place" refers to an energy-efficient location that offers power-aware and user-centric services in accordance with demand response (DR) on the basis of an advanced metering infrastructure (AMI) between the end-users and the power supplier. The infrastructure that controls different devices, provides power usage data, and keeps an eye on digital metres is known as the AMI. In hybrid sensing networks, there are two different the topography information monitoring detector (TIMD) and the power information monitoring detector (PIMS) are two different kinds of detectors.(EIMS). We suggest a novel routing algorithm called the CPER that is based on collaboration between PIMS and EIMS in order to maximise the mongrel detection network continuance. We implemented our system in an actual test bed and carried out some experiments in order to verify its efficacy. According to the findings, there has been an approximately 29.8, 42.3, and 17–22 percent reduction in the average amount of packet transmissions, service reaction time, and energy usage.

2. Namsik Ryu, Jae-Ho Jung, and YongchaeJeong Jae- Ho Jung, YongchaeJeong, and Namsik Ryu It is suggested to use a power amplifier (PA) with irregular bias. The amplifier that is being suggested comprises of a motorist amplifier, class-D power stages for the primary amplifier, and Class C bias in addition to an additional amplifier with AB bias. In contrast to other CMOS amplifiers, this one uses a current-mode motor- grounded combiner to minimise affair stage loss and bulk. The amplifier can therefore increase efficiency and decrease inactive current. A force signal of 3.3 V is used to impose the fully integrated CMOS Dad using the commercial Taiwan Semiconductor Manufacturing Company's 0.18-m RF-CMOS process. The observed gain at P1dB and the efficacy at P1dB, respectively, are 29 dB, 28.1 dBm, and 37.9. A 25-dB error vector magnitude biddable affair power of 22 dBm and a 21.5 efficacy can be obtained when the PA is evaluated with 54 Mbps of an 802.11 g WLAN orthogonal frequency division multiplexing signal.

2.3 Basil Hamed A "smart home" is a residence that makes use of information technology to keep an eye on its surroundings, manage its energy appliances, and interact with the outside world. The technology of the "smart home" is complicated and still evolving. To create a more pleasant and simple living environment, a smart home control system has been created to autonomously complete some everyday tasks. This article discusses a model home environment monitor and management system, one component of the smart home. The system, which is built on the LabVIEW program, can serve as a house protection guard. The system can keep an eye on the house's gas density, temperature, humidity, lighting, fire and intruder alarms, and infrared sensing to protect the family. security. The device also has an internet link, allowing remote monitoring and management of the home's appliances. In this paper, LabVIEW is used to physically build a multiplatform control system for home automation. Such a device falls under the category of smart house technologies. The strategy blends software and hardware innovations. The system's test findings have demonstrated that smart house automation applications can be implemented with ease.

III. EXISTING SYSTEM

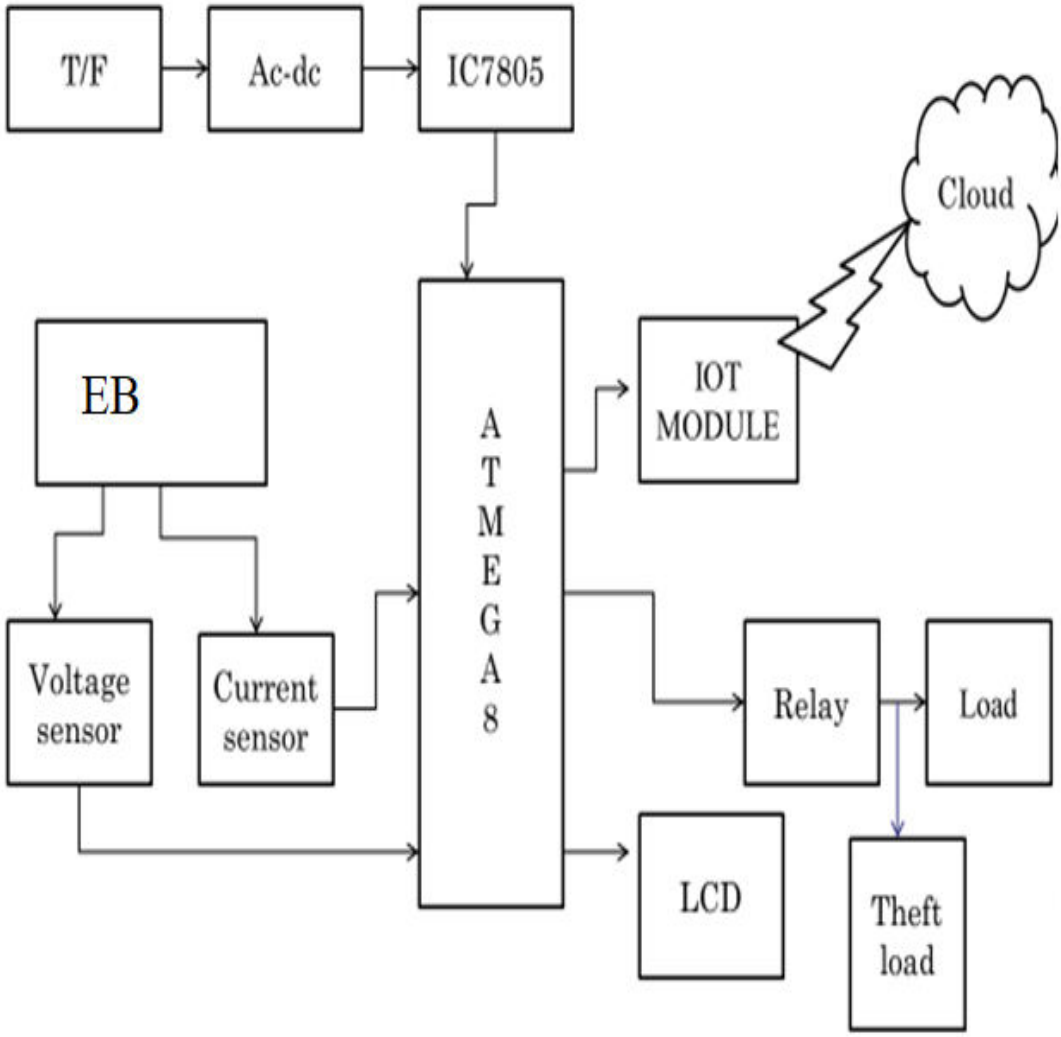
The best home electricity control system To make house energy consumption simple to obtain, optimisation of home power consumption based on power line transmission has been explored. a module for controlling connected household equipment. a green household appliance monitoring and management system (HEMS). The power system should handle demand response and load balancing with the power storage device as renewable energy production and storage systems grow in number. These power networks combine the electricity generated by green energy sources with the electricity delivered by the utility. When integrating renewable energy sources into standard power networks, the varying frequency and voltage are significant issues. It is necessary to conduct research on distribution and transmission with the incorporation of the green energy infrastructure.

IV. PROPOSED SYSTEM

In order to give the user direct control of different lights and utilities in their house, this paper suggests a home automation system that integrates multi-touch mobile devices, cloud networking, wireless communication, and power-line communication. This system combines a mobile phone application, a portable cordless remote, and a PC-based programme to give the user a way to interact with it. The suggested system, which comprises of a server and sensors, is a distributed house control system. The server manages and keeps track of the different instruments, and it is simple to set it up to handle more hardware interface modules. (sensors). the online server into which the credit card is entered. Any local PC in the same LAN can reach the Automation System through its web browser by using the server IP.or from a distant computer or mobile device using a web browser that is compatible with the server's actual IP (internet IP). The network architecture used to link the server and the devices is WiFi technology. WiFi is selected to increase system mobility and scalability as well as to increase system security (by using a safe WiFi link). IOT, or the "internet of things," is a new technology that uses the internet to track and manage cars, other physical objects linked to the

internet, as well as electronic and mechanical devices. IOT enables users to easily manage non-digital objects via an inviting GUI over the internet. We are among the innovators conducting study in the internet of things. Our efforts are focused on studying cutting-edge IoT initiatives that could be beneficial to humanity. Students and scholars can be inspired by these IoT project ideas to conduct additional IoT study.

BLOCK DIAGRAM



V. SYSTEM REQUIREMENTS

5.1 HARDWARE DESCRIPTION

5.1.1 NODE MCU

Fig 5.1 Node MCU

NodeMCU is an open-source Lua based firmware and improvement board uniquely focused on for IoT based Applications. It remembers firmware that runs for the ESP8266 Wi-Fi SoC from EspressifSystems, and equipment which depends on the ESP-12 module.

5.2 LCD Display

Fig 5.2 LCD

LCD can show numbers, characters and designs. The showcase is interfaced to I/O port of microcontroller (P0.0-P0.7). The presentation is in multiplexed mode . Inside 1/tenth of a second the following showcase turns on. there show will bring about constant showcase of tally because of industriousness of Vision.

5.3 Current Sensor

Fig 5.3 Current Sensor

In electrical engineering, current sensing is any one of several techniques used to measure electric current. The measurement of current ranges from picoamps to tens of thousands of amperes. The selection of a current sensing method depends on requirements such as magnitude, accuracy, bandwidth, robustness, cost, isolation or size. The current value may be directly displayed by an instrument, or converted to digital form for use by a monitoring or control system. Current sensing techniques include shunt resistor, current transformers and Rogowski coils, magnetic-field based transducers and others.

5.4 Power Supply

The AC supply is applied to 12V advance step-down transformer. The transformer is the 12V AC which is corrected utilizing a diode connect. The yield of Diode Bridge of 12V DC is separated by capacitor.

5.5 ARDUINO UNO R3 MICROCONTROLLER

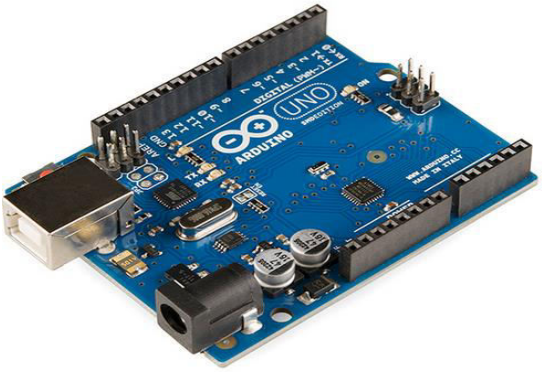


Fig 5.5 Arduino Board

The Arduino Uno R3 is a microcontroller board based on the ATmega328 IC. It has been 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contain everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

VI. CONCLUSION

The home mechanization utilizing Internet of Things has been tentatively demonstrated to work attractively by uniting straightforward machines to it and the apparatuses were effectively controlled remotely through web. The composed framework not just screens the sensor information, similar to temperature, gas, light, movement sensors, additionally impels a procedure agreeing to the prerequisite, for instance exchanging on the light when it gets dim. It additionally stores the sensor parameters in the cloud (Gmail) in an auspicious way. This will help the client to break down the state of different parameters in the home whenever anyplace.

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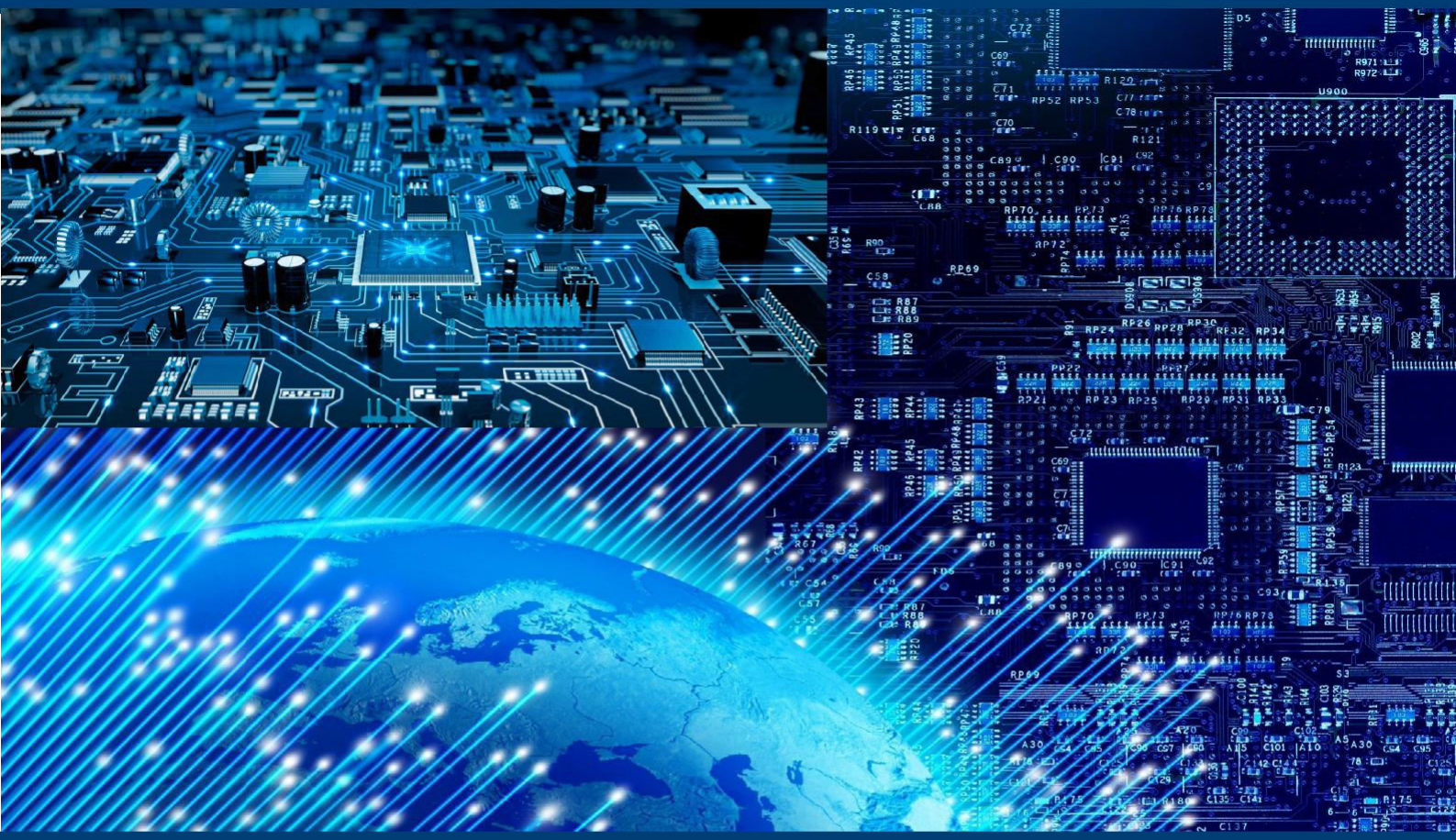

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