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Electricity Monitoring and Controling Management by Using IOT

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Abstract — **Since the proliferation of the Internet, the development of IoT applications has now become an update for researchers. These technologies include the advancement of the internet and the use of technology to increase the usability of applications. This project provides a smart system for home energy management based on IoT, allowing remote access and control of home appliances/electronics. IoT integration switch box will play an important role in energy and water management. With the adoption of smart home devices, the Internet of Things is rapidly becoming widespread, creating a strong demand. Most smart home appliances, including smart TVs, refrigerators, smart dishwashers, air conditioners and heaters, are connected to the internet and help improve people's quality of life. The ability of smart homes to manage connections and control devices has come a long way in recent years. The system planned in this project can instantly monitor the energy used in our home and collect information including the working time and effort of each project. This project introduces a smart home energy management system that can be used to access and control all home devices from anywhere. It also controls water and electricity for smart homes. All devices connect to the main box and collect data from the Internet of Things. An application was created to monitor, track and manage energy consumption. Therefore, our main goal is to prevent energy waste caused by human negligence and provide smart energy management for home use.**

Keywords:**IOT(Internet of Things),SHEMS(Smart house Energy management System,EMS,SMPS,Smart House.**

INTRODUCTION

A global grid is a futuristic demand solution that collects data from numerous digital Internet of Things (IoT) sensors. Key findings from such a data are then utilized to successfully handle resources, mineral wealth, and operations; the info is being used to enhance operations throughout the city. It includes information gathered from residents, gadgets, houses, and property, which is centrally managed but also handle urban mobility systems, energy plants, utility services, water system networks, waste, surveillance, data management, institutes, library resources, healthcare facilities, and other social service. One of the most popular applications in the IoT paradigm is the smart home.Smart Things by Samsung, HomeKit by Apple, and Android Things by Google are three of the top home IoT systems that have developed in recent years. These systems save power, link disparate protocols and devices, provide Automation and online control, and also enables third force software development. The increased need for smart home devices is propelling the Internet of Things forward. Majorly smart home gadgets, for example, such as smart televisions, refrigerator, kitchen appliances, air conditioners, and heater units, are connected to the Internet to make people's lives more pleasant and convenient.The integration of IoT in electricity monitoring systems marks a significant milestone in the quest for sustainable energy practices.

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OBJECTIVES:

Building a Sustainable Smart Home: An IoT-based Energy Management System Our homes are becoming smarter, and with that comes the responsibility to manage energy efficiently. This project tackles this challenge by developing a smart home energy management system powered by the Internet of Things (IoT). Our primary goal is to create a sustainable solution that empowers users to monitor, control, and understand their energy consumption, ultimately promoting responsible practices within the domestic environment.The system will achieve this through several key objectives:

Real-time Insights:

Using strategically placed IoT sensors, the system will gather real-time data on energy usage. This includes individual appliance statistics like operating time and energy draw, providing a comprehensive picture of electricity and water consumption throughout the home.

Remote Control for Efficiency:

A user-friendly mobile application will seamlessly integrate with the system, enabling remote control of connected appliances and utilities. Users can adjust settings, turn devices on or off from anywhere, eliminating energy waste from forgotten appliances left running. This fosters responsible energy use and convenience, allowing users to manage their home's energy profile even when away.

Centralized Hub for Control:

An IoT-integrated switchbox will act as the system's brain. This hub collects data from sensors, controls devices via relays, and communicates with the mobile app. This centralized approach simplifies user interaction and streamlines system operation.

Data-driven User Awareness:

The collected data will be translated into clear and concise information within the mobile app. Users can track historical trends, identify areas for improvement, and gain valuable insights into their home's energy consumption patterns. This data-driven approach empowers informed decision making, fostering sustainable practices.

Automated Efficiency:

The system will offer the potential for automation based on user preferences or real-time data analysis. For instance, automated features could adjust thermostat settings based on occupancy or environmental conditions, or turn off lights in unoccupied rooms. These automations further reduce the possibility of energy waste due to human forgetfulness.

EXISTING SYSTEM:

A Smart Home Energy Management System with Enhanced Efficiency using Voltage Monitoring The rising popularity of smart homes necessitates efficient energy management solutions. This work proposes a novel smart home energy management system that leverages the Internet of Things (IoT) and integrates voltage sensors for enhanced efficiency. The system offers real-time monitoring of energy consumption through strategically placed sensors, including voltage sensors. This allows for not only tracking overall power usage but also identifying potential voltage fluctuations. Voltage fluctuations can impact appliance performance and lifespan, and the system can alert users to potential issues, promoting preventative maintenance and improved appliance longevity. The integration of a user-friendly mobile application facilitates remote control of connected appliances and utilities. Users can adjust settings, turn devices on or off from anywhere, and eliminate energy waste. Furthermore, the system can potentially implement automated functionalities based on real-time data analysis, including voltage levels. This approach fosters a sustainable and eco-friendly environment by promoting responsible energy consumption, reducing waste, and potentially extending appliance lifespan. By combining real-time monitoring, remote control, voltage awareness, and data-driven insights, the system empowers users to take charge of their home's energy profile and contribute to a more sustainable future.

PROPOSED TECHNIQUE:

Smart home energy management system with smps(switched mode powered suppy)

Expected Advantages:

- Enable users to monitor their electricity consumption even when they're away from home.
- It’s required a less cost for installation process.
- It gives a alert message to users when the predefined voltage unit has been reached.
- We doesn’t need to get a permission for fetch the device.

METHODOLOGY

We offer an intelligent, energy-efficient connected home system that enables remote access to and management of the home's equipment. An online-accessible Internet connectivity module is coupled to the basic power supply of the home network for this system. Intelligent Energy Managing. This system enables simultaneous real-time monitoring of household energy use and the ability to gather information on operating times and individual item energy use.

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The operating characteristics of the used electrical equipment, such as current, voltage, and power, are continuously recorded by the cloud system. Further efforts can be taken to reduce the cost of energy by using backward working knowledge.

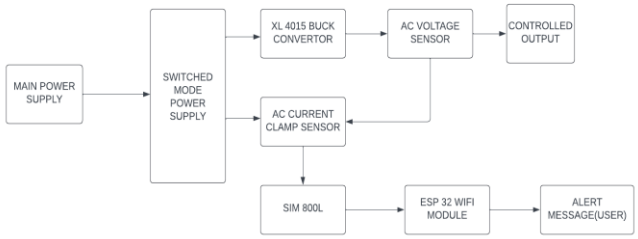

Figure 1: Overvall Architecture

COMPONENTS OF HARDWARE

1. Switched Mode Power Supply

A Switched-Mode Power Supply (SMPS), sometimes referred to as a switch-mode power supply or switcher, is a type of electronic power supply that includes a switching regulator. An SMPS, like all other power supplies, transforms voltage and current properties as it delivers power to DC loads such as personal computers from either an AC or DC source (typically mains electricity; see AC adapter). In contrast to a linear power source, a switching-mode power source cycles the pass transistor among full-on and full-off stages with moderate dissipation and spends proportionally less time in phases with higher dissipation, minimizing lost energy. In a hypothetical switched-mode power supply, no power is lost. Voltage is controlled by adjusting its proportion of on-to-off time, often known as duty cycles. In contrast, a linear power source constantly releases electricity from the power transistor to regulate the output voltage. The higher electrical efficiency of the switched-mode power supply is a significant advantage. Because the transformer may be far smaller, switched-mode power supplies can also be significantly lighter and smaller than linear supplies. This is because, unlike the 50 or 60 Hz mains frequency, they operate at a high switching frequency ranging from several hundred kHz to several MHz. Although transformers are smaller, commercial models usually have more hardware and circuit complexity due to control of power architecture and electromagnetic regulations.

Figure 2: 12 V Switched Mode Power Supply

The output current flow in an SMPS is influenced by the input power signal, the circuit topologies and storage components employed, as well as the pattern utilized to drive the switching elements (for example, pulse-width modulation with a variable duty cycle). These switching waveform spectral densities have energy concentrated at very high frequencies. Due to this, ripple and switching transients added to a very small LC filter may be used to filter the output waveform.

2. Buck Converter

In SMPS circuits, the Buck Converter typically used when the DC voltage that is output has to be less than that of the DC input voltage. When electric separation between both the power converter and the outputs is not necessary, it is useful. A primary isolating transformer, however, could provide electrical connection between the Ac supply and the rectifier if the input is from a corrected AC source.

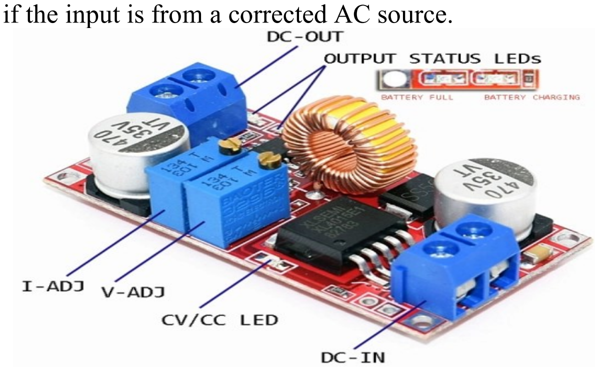

Figure 3: XL 4015 Buck converter

Any DC source or rectified AC can serve as the DC input. A type of DC-to-DC converter known as a "buck converter" may accept an input straight from a DC source, like a battery. As illustrated in Fig.3, the input might alternatively be obtained as DC from the AC mains (line). The AC input to the rectifier circuit may be directly from the high-voltage AC mains supply, or it could come via a step-down transformer at a lower voltage.

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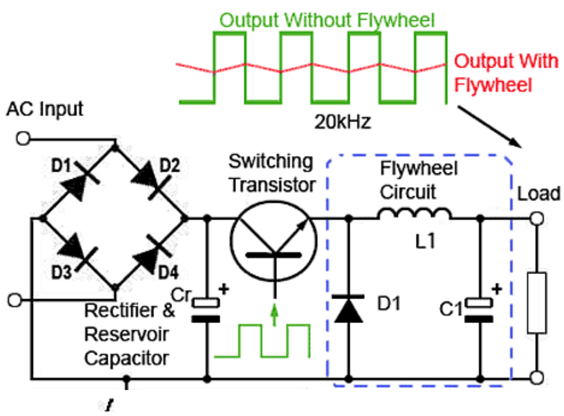

Figure 4: Buck converter circuit

3. ESP 32 Wi-Fi Module
ESP32 series SoC microcontrollers are affordable and feature built-in Wi-Fi and dual-mode Bluetooth. The ESP32 series utilizes Tensilica Xtensa LX6 dual-core or single-core processors, Tensilica Xtensa LX7 dual-core or discrete processors, or discrete RISC-V processors. They also provide antenna connections, RF baluns, operational amplifiers, low-noise receive power amplifiers, and filters, along with expansion and power management modules. Designed and manufactured by Espressif Systems, a Chinese company based in Shanghai, and fabricated by TSMC on a 40nm process, it replaces the ESP8266 microcontroller. The port operates easily. According to Espressif, the Espressif ESP32 Wi-Fi and Bluetooth Development Board are powerful and versatile, suitable for low-power devices to demanding applications such as voice, music streaming, and MP3 decoding. It's described as a universal WiFi-BT-BLE MCU module.


Figure 5: ESP 32 Wi-Fi Module

4. AC Voltage Sensor
A material's voltage level can be determined and monitored via a voltage sensor. Voltage sensors can measure the amount of AC or DC voltage. The sensor takes voltage as an input and produces switch, analog signal , related conditions, or audible signals.


Figure 6: AC Voltage Sensor

The best voltage transforms to measure AC voltage is the ZMPT101B. It measures voltage and power with great precision and strong consistency up to 250V AC.

5. AC Current Clamp Sensor
Current clamps are instruments with jaws that release and grip around an electrical line to measure current. These are useful because you can clamp the probe to the con ductor design without having to cut and rewire. Clamps can now be used to read waveform, phase shift, direct current (DC), and alternating current (AC). In this article, you'll learn the ins and outs of contemporary clamping technologies, applications, and the finest contemporary clamps to use in challenging situations.


Figure 7: AC Current Clamp Sensor

6. SIM 800L
SIM 800L is a compact and versatile GSM/GPRS modulewidely used in IoT (Internet of Things) and communication projects. It serves as a communication interface between embedded systems and mobile networks, enabling devices to send and receive data over cellular networks.

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Figure 8: SIM 800L

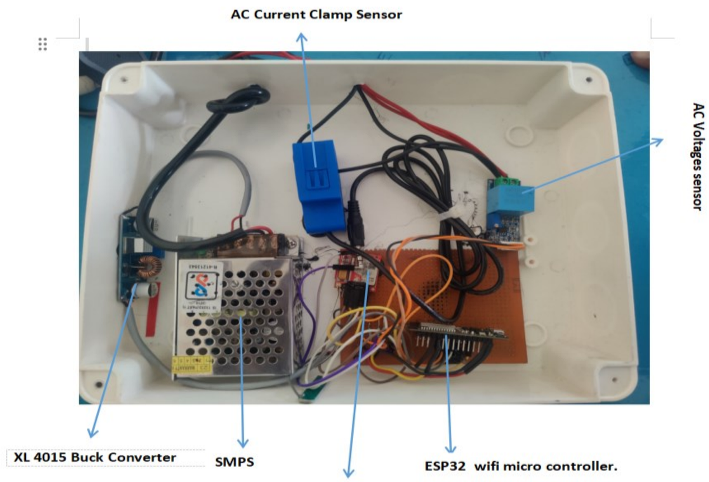

Figure 9: Overview of System

RESULTS

TABLE 1: OUTPUT TABLE

VOLTAGE UNIT	MESSAGE	MESSAGE ALERT
LESS THAN 100 UNIT	NO MESSAGE ALERT	OFF
MORE THAN 100 UNIT	YOU HAS BEEN CONCEED A 100 UNIT	ON

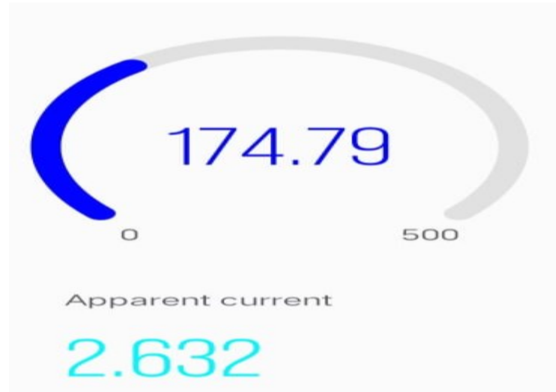

Figure 10: voltage meter measurement

Figure 11: kwh meter measurement with uptime

CONCLUSION

The system designed provides safety of the riders, by And the bike will only start if the rider wears the helmet. In conclusion, a smart home energy management system with multi-sensor data fusion has the potential to revolutionize the way we consume energy in our homes. By using multiple sensors to collect and analyze data about energy usage, such a system can optimize energy consumption, reduce waste, and ultimately lead to cost savings for homeowners. Additionally, the integration of smart home devices and artificial intelligence can enable the system to learn and adapt to users' behavior, further increasing energy efficiency. The evolution of smart house management systems has been characterized by technological advancements, expanding capabilities, and evolving user expectations. From simple automation to intelligent ecosystems, these systems have transformed the way we interact with our homes, offering convenience, efficiency, and sustainability.

This article provides a comprehensive analysis of the evolution of smart house management systems, highlighting key developments, challenges, and future trends shaping the smart home landscape. As technology continues to evolve, smart homes will play an increasingly integral role in our daily lives, offering enhanced comfort, security, and efficiency.

FUTURE SCOPE

IoT devices can provide real-time data on electricity consumption, voltage fluctuations, and power quality. Advanced analytics algorithms can process this data to identify patterns, anomalies, and opportunities for optimization. It may deployed at the grid edge (substations, distribution transformers, etc.) can gather data on local conditions and grid performance. Blockchain technology ensures secure, transparent transactions, allowing individuals to buy, sell, or exchange surplus energy directly with each other.

Integration with Smart Grids: Smart house management systems will increasingly interface with smart grid infrastructure, enabling dynamic energy management and demand-response mechanisms.

Sustainability Focus: Future developments will emphasize energy efficiency, renewable energy integration, and eco-friendly practices to reduce environmental impact.
Augmented Reality and Virtual Assistants: Emerging technologies like augmented reality and virtual assistants will enhance user interaction and immersion, offering intuitive control and personalized experiences.

Enhanced Energy Efficiency: SMPS technology allows for higher efficiency in converting electrical power, resulting in reduced energy losses compared to traditional linear power supplies. Integrating SMPS into electricity monitoring systems can minimize energy wastage within the monitoring equipment itself, contributing to overall energy conservation efforts.

Compact and Lightweight Designs: SMPS are known for their compact size and lightweight construction compared to conventional linear power supplies. This characteristic enables the development of sleeker and more portable electricity monitoring devices, suitable for both residential and commercial applications.

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