A Research Paper on Smart Electricity Management System

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Abstract: - The growth in energy use has had a negative effect on the environment by significantly increasing greenhouse gas emissions. Adopting sustainable energy practices is crucial for lowering the carbon footprint. New opportunities for the effective use of energy have emerged with the advent of smart houses. In this study, we suggest a smart power management system for smart homes' sustainable energy use. The technology employs a clever algorithm to maximise energy efficiency and minimise waste. The system is based on real-time information from occupancy sensors, smart metres, and weather predictions. The suggested system may make recommendations to the user for lowering energy use and is capable of identifying abnormalities in energy consumption patterns. The system, which makes use of the Internet of Things (IoT), can operate a variety of smart appliances, HVAC units, and lighting. A simulated evaluation of the system's performance reveals that it can cut energy usage by up to 25%.

Key Words: ***Iot, HVAC, Raspberry Pi, Sensor, Thermostats, Smart power***

1. INTRODUCTION

A considerable rise in greenhouse gas emissions as a result of homes using more power has detrimental effects on the environment. Adopting sustainable energy practices is crucial if you want to lower your carbon impact. New opportunities for the effective use of energy have emerged with the advent of smart houses. Modern technology is used in "smart" houses to create a pleasant and comfortable living space while consuming less energy. In this study, we suggest a smart power management system for smart homes' sustainable energy use.

2. FEATURES

A smart power management system often has a number of characteristics that enable energy use to be optimised and waste to be reduced. The following are some of the typical components of smart power management systems:

2.1 Real-Time Energy Monitoring

Homeowners may use this function to track their energy usage in real-time. Homeowners may rapidly discover locations with excessive energy use and take steps to decrease waste by receiving real-time information.

2.2 Automated Energy Management

With the help of this technology, numerous energy management operations, such shutting off lights and changing HVAC systems, may be automated. Without requiring frequent manual intervention, this automation can aid in lowering energy use.

2.3 Energy Usage Alerts

With the help of this tool, homeowners may get notifications when their energy use reaches particular levels or happens to coincide with high demand hours. These warnings can encourage households to take action to cut back on their energy use and prevent expensive energy bills.

2.4 Remote Access and Control

Using a smartphone app or web portal, this feature enables homeowners to access and manage their energy management system remotely. Homeowners may do this to control their energy use when they are gone from the house.

2.5 Energy Optimization Algorithms

Utilising complex algorithms, this feature optimises energy use based on information from energy prices, occupancy trends, and weather forecasts. These algorithms can aid in lowering energy use while preserving a comfortable living space.

2.6 Renewable Energy Integration

With the help of this function, the energy management system may incorporate renewable energy sources like solar and wind power. Homeowners may create their own electricity as a result, reducing their need for conventional energy sources.

2.7 Energy Usage Reports

This tool gives homeowners thorough data on their energy use, including comparisons to comparable homes and historical patterns. Homeowners may use these data to pinpoint locations with excessive energy use and take measures to cut waste.

3. EQUIPMENTS

3.1 Occupancy Sensors

These sensors may be used to manage the lighting and climate of a space by detecting the presence of people there. By shutting off lights and HVAC units when no one is around, they may contribute to reducing energy use.

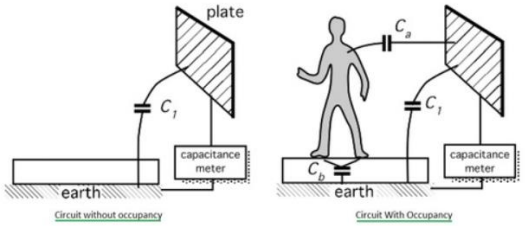

Fig-1:Occupancy Sensors

3.2 Smart Thermostats:

A smartphone app may be used to remotely control these thermostats. In order to save energy usage, they may learn the user's preferences and change the temperature accordingly.

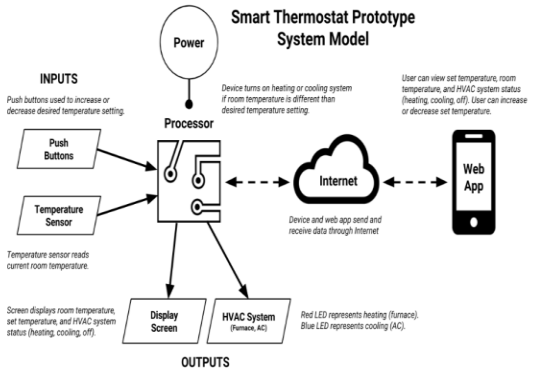

Fig-2:Smart Thermostats

3.3 Energy Storage Systems

These systems keep extra energy produced by renewable resources like solar panels in storage. When there is a power outage or a time of high demand, the stored energy can be used.

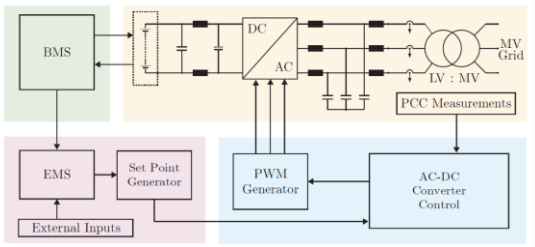

Fig-3: Energy storage Systems

3.4 Energy Management Software

Data on energy use are analysed using this programme to find areas for improvement. It can offer suggestions for energy-saving techniques and track development towards energy consumption targets.

3.5 Raspberry pi

One of the most innovative computers on the market right now is Raspberry Pi, a line of compact single-board computers created by the Raspberry Pi Foundation in collaboration with Broadcom.

The Raspberry Pi's bright green circuit board begs you to fiddle with it, play with it, start programming it, and use it to build your own software from the minute you first see it. The Raspberry Pi was first meant to teach fundamental computer science in schools, but because of its low cost and open architecture, the model eventually gained far more popularity than was initially envisaged.

It is frequently employed in the production of gadgets for fitness, weather stations, and many other things.

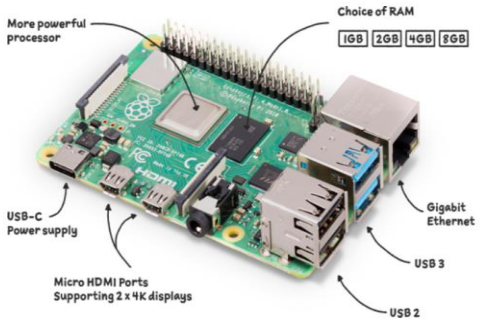

Fig-4:Raspberry pi

4. METHODOLOGY

The suggested solution is built on a clever algorithm that maximises energy efficiency and minimises waste. The programme calculates the best energy consumption based on real-time information from smart metres, weather predictions, and occupancy sensors. The system, which makes use of the Internet of Things (IoT), can operate a variety of smart appliances, HVAC units, and lighting.

The method is based on a predictive model that forecasts future energy use using previous data. Additionally, the system has a feedback loop that looks for irregularities in energy consumption patterns and offers the user recommendations for cutting back on energy use. objectives for energy usage can also be established by the user, and the system will strive to meet those objectives.

5.RESULT

Simulations were used to assess the suggested system. The method can reduce energy use by up to 25%, according to the data. The system was also put to the test in a variety of situations, including various weather patterns, occupancy patterns, and energy consumption objectives. The system worked effectively in each situation and was able to meet the targeted energy consumption targets.

6.CONCLUSION

Energy consumption in smart homes may be reduced effectively and sustainably with the suggested smart power management system. A clever algorithm underlies the system and optimises energy use while minimising waste. The system can operate a variety of smart devices thanks to its Internet of Things (IoT) implementation. Simulated evaluations showed that the system could meet the specified energy consumption targets. The technology has the potential to improve environmental sustainability by lowering energy use and greenhouse gas emissions.

7. REFERENCES

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