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Renewable Energy Based Home Automation Using IOT

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Abstract

The advancement in earlier years in communication and electronics, computer science and information technology domain has resulted, that we can generate the energy by using renewable energy sources. By using this energy we can manage the home equipment's. However in the past systems don't allow a user to get a practicability to actively reduce the energy consumption of home equipment. In the past, the electric home equipment's can be controlled and monitored with the help of domestic power lines by using power line communication technology. But now days a Wi-Fi communication technology is used for controlling and monitoring of electric home equipment for more probable than before. This paper describes the methodology of renewable energy based home automation. In our project two things are consider. One is energy consumption and another is energy generation. In this, for monitoring power consumption of home equipment Wi-Fi is used. Hence the system gives more efficient energy saving and home energy cost will reduce.

Index Terms: Solar panel, Battery for storage, Booster circuit, Wi-Fi module, Android application, Arduino kit, Inverter circuit, PIR sensor etc.

I. INTRODUCTION

Automation is today's fact, where more things are being completed every day automatically. The home automation system conception remains for several years. The control of the appliances when completely taken over by the machines, the process of monitoring and controlling becomes more eventful. Renewable energy is generally defined as energy that comes from resources which are naturally available such as sunlight, wind, rain, tides, waves and geothermal heat. Renewable energy replaces conventional fuels in four distinct areas: electricity generation, hot water/space heating, motor fuels, and rural (off-grid) energy services. This project is fully based on renewable energy resources. The energy consumption in home areas is greater as more home equipments are used. For solving this home energy problem, we consider energy saving and another one is energy renewable sources. At the same time we also have to save the home energy cost. For this, two things must be considered and these are energy consumption and energy generation. Also we are going to apply IOT concept by using Wi-Fi module. For that we used home automation with the help of renewable energy sources as well as IOT that we implement a new system, called it as renewable energy based home automation by using IOT.

II. OBJECTIVES OF PROJECT

The major objectives of project are as:
Generation of electrical energy using renewable energy source
Inverter design of 100 watt
Home Automation using IOT

SPECIFICATIONS
Table 1. Specifications of Renewable energy based home automation system using IOT

Sr. No.	Particulars	Description
1.	Solar Panel rating	30 watts
2.	Battery type	Rechargeable battery
3.	Inverter	100 watts
4.	Sensor type	PIR sensor
5.	IOT module	Wi-Fi module

III. SYSTEM DESCRIPTION

The proposed home automation system consists of three main modules. The server, the hardware interface module, and the software package. The proposed system layout is shown by the block diagram as given below. Secure Wi-Fi technology is used by server, and hardware interface module to communicate with each other. User may use the same technology to login to the server web based application. if server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser.

The proposed home automation system has the capabilities to control the following components in users home and monitor the following alarms, Light, Fan etc.The proposed system is a distributed home automation system, consists of server, hardware interface modules. Server controls hardware one interface module, and can be easily configured to handle more hardware interface module. The hardware interface module in turn controls its alarms and actuators. Server is a normal PC with built in Wi-Fi card, acts as web server. Wi-Fi technology is selected to be the network infrastructure that connects server and hardware interface modules. Wi-Fi is chosen to improve system security (by using secure Wi-Fi connection), and to increase system mobility and scalability. Even if, user intends to add new hardware interface modules out of the coverage of central access point. The main functions of the server is to manage, control, and monitor distrusted system components, that enables hardware interface modules to execute their assigned tasks (through actuators), and to report server with triggered events (from sensors). In setup mode, user can add and remove hardware interface modules, and can create basic macros involving simple triggers and to customize the macros to perform complex series of events.

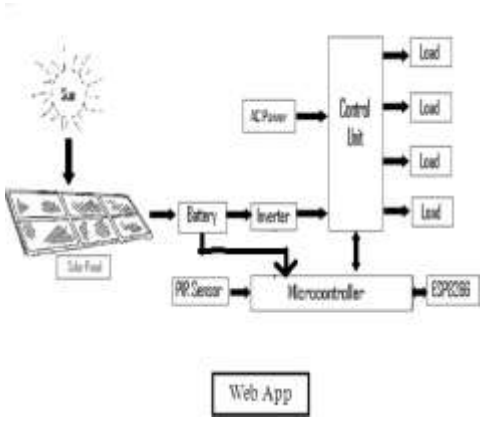
IV. SYSTEM PERFORMANCE

Proposed system block diagram is shown in figure 1. It consists of microcontroller, PIR sensor, ESP8266 Wi-Fi module, Battery, Booster circuit, Solar panel, home appliances. It is illustration of how we have implemented the project and the various parts involved in it. In this system, it has two main sections i.e. energy consumption and energy generation.

Energy consumption: This section contains home equipment and lights which are monitored with the help of energy measurement and communication unit Wi-Fi. Energy measurement and communication unit sends the measured value after some specific time span towards the home server with the help of Wi-Fi. PIR sensor detects the movement of the person and sends signal to the microcontroller. Depending upon PIR sensor output that data will be send to server and server will give feedback to control unit for controlling the home appliance.

V. SOLAR PANEL

Solar panels are made up of small unit called as solar cells, the most common source are made from silicon. In solar cell crystal & silicon is sandwiched between conducted layers. Each silicon atom is connected to its neighbour by four strong bonds which kick the



electron in place, so current cannot flow. A silicon solar cell uses two different layers of silicon as N-type and P-type. N-type of silicon has extra electrons and P-type silicon has extra spacing for electron which is known as holes. Where the two types of silicon meets, electron moves across P-N junction creating a positive charge on one side while negative charge on other side. We can think about the light as flow of tiny particles called as photons shooting out from the sun. When one of this photons bombards on silicon cell with enough energy it conducts an electron from its part leaving a hole. The negatively charged electron in the location of positively charged hole are never free to move around. But because of the electric field at P-N junction they are only flow through one way. The electrons drawn to the N-side while holes drawn to the P-side. To get more power string the silicon cell. To charge a cell phone, 12 V PV cells are enough while it takes many

margins to power entire house.
The solar panels consists of few layers. The first layer is nothing but an upper side which is main frame used for protection purpose. The next layer is glass which is attached with the frame because to get it stronger. After this layer there are two encapsulation one is upper side of solar cell and other is lower side of solar cell for the protection of solar cell. After this layer there is black sheet which is also called as mean sheet used for to protect the reflection. At the end there is a junction box. These all are placed inside of the solar panel.

VI. WORKING

When sun light falls on solar panel photovoltic cell generate the voltage, this voltage is a variable voltage.Then Its Output is given to the Dc booster, which can gives constant voltage to battery and battery can save the energy and send it to inverter. The output voltage of inverter is230 V which is given to control unit, MSEB 230V is also given to control unit. Control unit is controlled by using microcontroller. TheFour relay circuit which is connected to control unit for the contol of 3 LED lamps and one fan. The overall operation i.e ON/OFF lamp and fan is controlled through ESP 8266. Wi-Fi module works in the bidirectional way.The ESP 8266 take the signal via mobile application and it gives to microcontroller to switching the lamp and fan via relay circuit. For operation of the project, turn ON Wi-Fi module after mobile connect to free Wi-Fi open the application and press connector button. When the battery fully charged at that time the lamp and fan should ON through solar energy.If the solar energy is not available at that time load is shift to MSEB.Whenever the both solar and MSEB supply is available that time the load is ON eighter MSEB or solar as per our requirement, we can also change the priority. In this project we can select two mode of operation i.e.automatic mode and manual mode. The PIR sensor detect the motion of person and if personis absent automatically load will be OFF.To see the output of project on the computer following procidure should be follows,
First it connect to the Arduino USB to PC.
Open Arduino complier
In tool menu connect port.
Open serial terminal.

ADVANTAGES

The Renewable energy based home automation system using IOT has following advantages:

User friendly
Energy consumption is low
Energy cost reduced
Easy to control

LIMITATIONS

Solar panel capacity is low so recharging time by only solar is more.

VII. FINAL LOOK OF PROJECT

Photograph 1: Final Look of Project

VIII. RESULT

ESP8266 operating range is 70 meters.for every switching the seperate code is program in arduino such as

Code	Operation
1	via solar energy load on
2	via MSEB load on
3	Mannual Mode
4	LED 1 on
5	LED 1 off
6	LED 2 on
7	LED 2 off
8	LED 3 on
9	LED 3 off
10	Fan on
11	Fan off

IX. CONCLUSION

As to save the energy cost we used renewable energy source. In this system two things are important and i.e. energy consumption and energy generation. The energy consumption includes the energy usesof home

equipments based on Wi-Fi and Wi-Fi send this collected data to home server. Energy generation is based on solar panel. Renewable energy gateway (REG) is suitable for both the consumption and generation. Hence by taking both consumption and generation, the home server optimizes home energy use. Wi-Fi technology provide home security and its cost is more effective as compared to previously existing system. Hence we can conclude that the required objectives of renewable energy based home automation system using IOT have been achieved. Finally, the proposed system is better from the scalability and flexibility point of view than the previously existing home automation system.

FUTURE WORK

We always say that precaution is better than cure so we used renewable energy source to save the energy cost in this system. We are going to design Renewable Energy Based Home Automation System Using Wi-Fi. As this is college level project, so we used Wi-Fi only for local network. In future we are going use Wi-Fi globally, so that we can control our home equipments from throughout the world.

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