

Renewable Based Smart Home Control using Modern Technology

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Abstract: One of the most important tasks of today modern technology is to minimize the power consumption used in day-to-day domestic application [1]. In this paper, the aim is to minimize power consumption used by domestic applications such as lighting and fan of smart home by maximizing energy saving through Bluetooth technology [2].

In today’s culture use of renewable energy to power the battery is extensively used and this paper also uses the technology to minimize the use of electricity in par with smart home for its reliable performance with modern software (MPLAB IDE)

In this paper detailed explanation is given about smart home the proposed lighting system where different sensors are used to detect the surrounding temperature, light intensity, room occupancy etc., for automatically controlling the switching-dimming action of LED and speed variations of fan.

The prototype model clearly demonstrates the results with more comfortable, secure, economical and it is flexible, reliable for the smart home in minimizing the energy consumption.

Keywords: PWM, PIC, PIR, LDR, PV Panel

I. INTRODUCTION

The power consumption over the years has gone up rapidly in both domestic as well as industrial areas due to increase in population and comfort living, due to which maximum demand of consumer also increases. It is complex to reach maximum demand of consumer by generating station. One of the reasons for this is not utilizing the renewable energy. And due to the waste of this energy there is huge demand of power. This smart home overcomes the problem of the over power consumption and also gives an idea of proper utilization of the Solar energy.

II. OBJECTIVE

The smart home is designed for energy efficient utilisation. The main Objective of this paper is to minimize the power consumption and to provide a comfort and convenient way of operating the LED and fan through Bluetooth technology

It includes high efficiency fixtures and automated controls that make adjustments based on conditions such as occupancy, daylight availability and temperature of room. It enables to minimize power consumption by allowing the home holder to

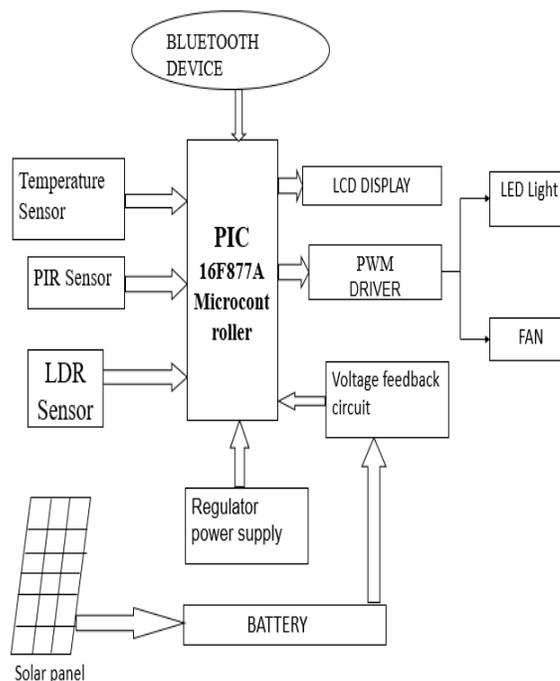
control remotely the speed variations of fan, lighting and the control of appliances.

This ability saves energy and provides a level of comfort and convenience. By combining a PV and Solar Tracking technique we can utilize the PV power at its maximum to charge the battery by using this system with the lighting system we can make more energy efficient lighting system in smart home. All this amounts to better standards of living in the society.

III. SOFTWARE REQUIREMENTS

1. Embedded C
2. MPLAB IDE

DESCRIPTION OF THE EFFICIENT SYSTEM



IV. HARDWARE REQUIREMENTS

- a. Microcontroller PIC16F877A
- b. LCD - 16 x 2
- c. Bluetooth module HC05
- d. LM35 temperature sensor

- e. Relay driver
- f. PIR sensor
- g. LDR sensor
- h. Solar panel
- i. Battery 12V
- j. LED lamp
- k. DC Fan



Fig.1. Complete Hardware to minimize the energy consumption.

V. TECHNICAL SPECIFICATIONS

Operating voltage of embedded circuitry is 5VDC. Current consumption of device in active mode approx. 200mill amp@ no load and approx.1000mill amp@ full load Operating frequency of device is 20 MHZ

VI. MODES OF OPERATION

There are two modes of operation:

1. Manual mode
2. Automatic mode

1. Manual Mode:

The model works under manual mode using a smartphone application where we can control the intensity of light and speed of fan with the help of Bluetooth module connected in the hardware.



Fig.2. LCD displaying manual mode

In the manual mode there are options to increase or decrease the intensity of light and also the speed of fan with the help of a Bluetooth terminal application.

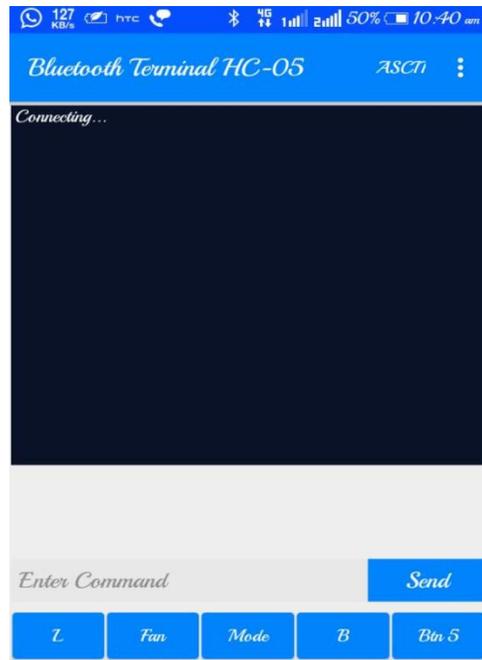


Fig.3. Bluetooth Terminal Application on Android

2. Automatic Mode:

In the automatic mode the operation of the system takes place with the help of sensors used in the model.



Fig.4. LCD displaying Automatic Mode

The PIR sensor detects any movement happening in front of it. This gives signal for the PIC microcontroller to turn on the setup. The LDR sensor senses the intensity of light available from the outdoor passing inside the room. With the intensity level set there will be gradual increase or decrease in the intensity of light.

The temperature sensor placed inside the room senses the temperature of the room and according to the increase or decrease in temperature, the speed of fan also increases or decreases.

The whole operation taking place is shown in LCD display. When the setup is working in manual mode the LCD display shows the mode of operation and also the level of intensity and level of fan speed at which it is rotating.



Fig.5 Model of the paper with hardware configuration

VII. ADVANTAGES

- a. Use of renewable energy resource makes it more reliable
- b. It is efficient
- c. It requires less maintenance
- d. Operation or working is user friendly.

VIII. APPLICATIONS

- a. The concept is very much useful in day to day life for common people
- b. This can be implemented everywhere such as hospitals, libraries etc.
- c. It can be applied to residential and industrial field.

IX. RESULTS & CONCLUSION

By employing the proposed smart home lighting, we can light our home in a smart way in maximizing the energy based upon the illumination level, temperature level in the room using different sensors, we can control light intensity, fan speed automatically through advanced processors.

The prototype model demonstrates that LED lamps employing in this model of less wattage gives equivalent illumination level compared to other conventional lamps of higher ratings. The processor used in this model control the fan speed which change based on temperature of the room.

The Proposed prototype clearly demonstrates that the Lighting system and the fan of domestic appliances used in day-today provide comfort and convenience to the user. All this amounts to energy savings and better standards of living in today's modern world.

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