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VOICE CONTROLLED DC BASED SOLAR POWERED SMART HOME

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Abstract

The planning and implementation of a smart home intelligent system using solar power is presented here. The monitoring and controlling of the electrical and electronics dc appliances based on the important function of device tracking. The projected outcome of this technique aims at multiple benefits of saving electricity bills of the house and also to keep the users updated about their home security. The system works with a decision of controlling the switching of devices in two ways as, First, by using their simple toggle touch on their Smartphone or computers. Secondly, by using voice commands through Smartphone to control the dc appliances like DC fan and light which are taken for implementation here. In this proposed model, system is often controlled by using our voice with the assistance of the google assistant. Smart Monitoring using Arduino helps in displaying the usage of energy. This helps us to regulate the switching of the devices with the assistance of IOT.

Keywords: Voice control, Smart Home, Solar Power, DC Appliances.

1. INTRODUCTION

The Solar energy is being used worldwide and the generation of electricity from it is increased popularly. The Solar cells also called as PV cells [13] are the electronic devices that convert sun light in to electricity. The converted energy is stored within the battery and is used when required. Nowadays solar energy provides a stimulating solution for all people to meet their energy needs. Currently we are in use of solar power to save our electricity. The increase in energy prices and environmental growth concerns make solar energy more attractive for the householders. With the on-going advancements in PV cells technology[14,15], the use of PV cells rises and its cost keeps on drop down. Hence the Solar PV systems requires less maintenance and long lasts, the electricity production remains stable and predictable for a certain period of time. Because of these benefits the use of Solar energy is encouraged. An energy efficient home reduces the amount of power used from any other sources. Therefore apart from the Solar street light, solar energy can be used for charging the DC electric appliances such as dc light and dc fan.

The major advantage of using dc based solar power is the back-up energy storage. As the appliances are dc based the solar power can be directly given to the load. As per these concepts this paper focuses the dc-based solar powered smart home. In Smart homes, real time monitoring and

controlling plays a major role for energy management. The recent development of monitoring and controlling leads to the energy consumption at home and also reduction in electricity bill. Therefore in order to monitor and control the system IOT devices are used. The controlling of the dc appliances can also been done by using voice control.

In this paper, it is explained that how renewable energy (Solar) in used effectively without the assistance of the inverter. The battery which is been used may be a rechargeable and it's been charged from the solar energy which is been easily affordable. The other sections of this paper propose the hardware design and the control methodologies. Finally the conclusion of the system is given followed by the working and obtained output of the system through voice control. This paper gives exposure to the dc based solar power system using voice recognition which makes easy access to the reliable power.

2. HARDWARE DESCRIPTION

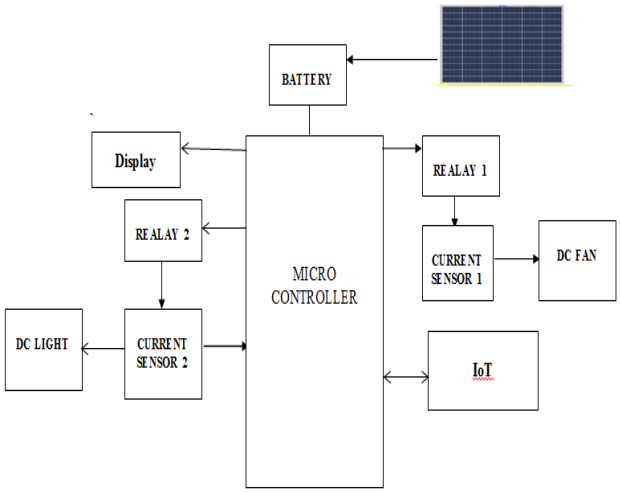

Fig : Block Diagram

IOT based[1] solar powered BLDC FAN and DC light are automated control systems[2] that are designed to increase the efficiency. Also improves the accuracy of an industry by automatically timed controlled Switching of FANS and lights. This proposed system describes a new economical solution of home appliance. The control system consists of IOT devices, control circuitry and the electrical devices.

In this system the main components used are Arduino board, LCD board, relay, current sensor[3], battery, solar panel. The energy from the sun is been collected in the battery using the solar panel[2]. The supply from the battery is given to the relay and the current sensor which is been interconnected to the fan and light. These things are been controlled and monitored using the Arduino program[8] and using the IOT. The device is also been controlled by our voice using the google assistant. [11]

Since we are using dc-based devices the consumption of the power is been less compared to ac-based devices. Due to the usage of renewable energy,[2] the energy we get from the substation is been minimized. Due to this the electricity bill can be reduced.

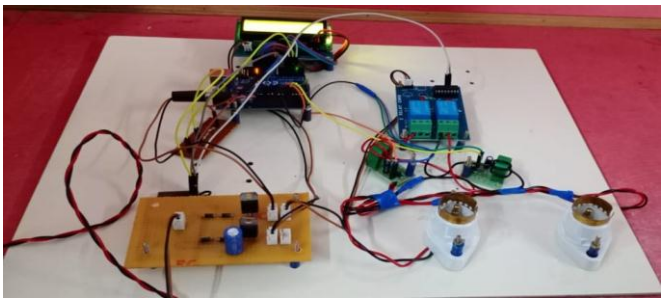

Fig : Hardware Setup

2.1 ARDUINO -MICROCONTROLLER-ATMEGA258.

The Arduino named Uno is a microcontroller[8] board based on the ATmega328P. It has 14 digital input/output pins in which 6 can be used as PWM outputs, 6 analogy inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. This supports microcontroller in a simpler way that contains everything needed. It is simply connectted to a computer with a use of USB cable or power it with an AC-to-DC adapter or battery to get started.

Technical Specifications:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

2.2 RELAY – ULN2003

The Relay ULN2003 is a high voltage and high current Darlington array IC[6,7,8]. This relay is meant for 5V TTL, CMOS logic devices. These ICs are used for the purpose of driving a wide range of loads. Thay can also be used as relay drivers, display drivers, line drivers etc. Each channel or darlington pair in ULN2003 is rated at 500mA and can withstand peak current of 600mA. The inputs and outputs

are provided opposite to each other in the pin layout. Voltage spikes are dissipated while driving inductive loads with a suppression diode provided with each drive.

2.3BATTERY

The lead acid battery is employed for constant current constant voltage (CC/CV) charge method.[4] Lead acid batteries should be charged in three stages, such as constant-current charge, topping charge and float charge. The majority of the charge is applied by constant-current charge. It takes up roughly half the specified charge time. The saturation is provided by topping charge which continues at a lower charge current. Lastly, the float charge compensates the loss caused by self-discharge.

3. METHODOLOGY

In this proposal both remote based and voice based control is been involved.
Using the remote[5] we will ON and OFF the device. The remote is formed available within the mobile by providing a link which is had been created [11,9].

In Voice Control, the devices are controlled by our voice using the google assistant. The device can recognize everyone's voice and from any quite distance the device are often controlled. For this process we involve installing an app called "IFTTT". Using this app we will register the command that what we should always say within the google assistant.The commands are going to be registered in English phrase and connected to the google assistant. The commands
as like
***Turn ON the load & *Turn OFF the load.**
In the "IFTTT" app, which even have the google assistant and web hooker in it. Hence the command looks as like:
*** Ok, activate the load & *Ok, close up the load.**

4. WORKING

The proposed system consists of current senso[4]r, relay, IOT[1], Arduino board[7], LCD board, battery in it. The battery is connected to solar through which it's charged. The battery is connected to relay and therefore the relay is connected to current sensor through which the flow of the present is monitored. The IOT and Arduino board [1,2] are been connected and therefore the Arduino board and LCD board are been connected. Through USB probe the program is updated to the Arduino board[2].

The dc current based fan and therefore the light are connected to relay. The fan and lightweight run and stops consistent with condition uploaded within the program. Using the google assistant the applicants are been monitored and controlled. The on and off of the applicants can been done anywhere by the usage of the IOT [1,5].

5. OUTPUT

The output is obtained as follows.
The Light is on and Fan is on using voice control when
the command is given as
"Switch on Load 1 and cargo 2".

Here Load 1 indicates Light and cargo 2 indicates Fan.

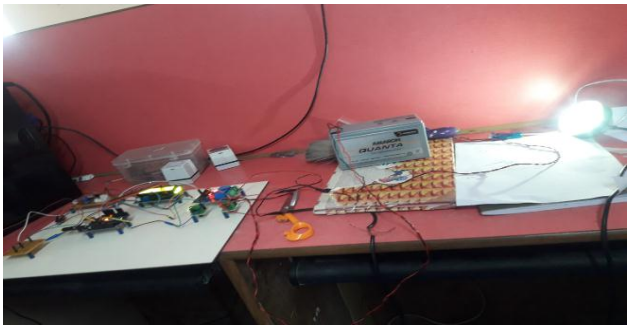

Fig: Snapshot of Hardware Output

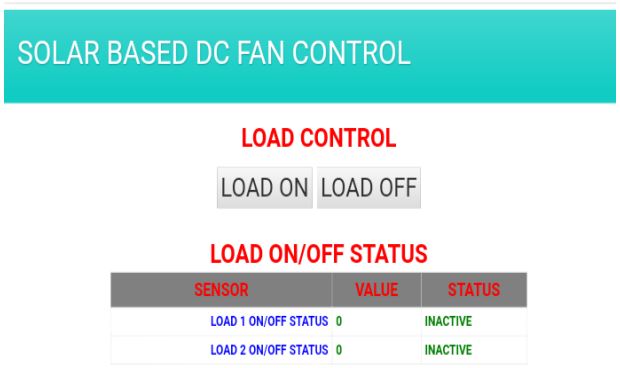

Fig : Various output load conditions displayed in mobile.

6. CONCLUSION

The output obtained above achives the main objective as to monitor and control the electric appliances This proposal has an efficient solar operated fan with reduced power consumption as compared to classical fans. In this proposed system, a ceiling fan powered with a 40-watt PV module of solar array that was designed is used for implementation. The planning was necessitated to possess a fan and light that could be powered with a renewable energy source. A 12V DC battery was included as a source of power backup to be used within the design when there's no sunlight-in the night. In order to provide minimum power consumption, the fan was made to not oscillate, but rather was made such that it might be tilted up and right down to change its orientation.

The major advantage is that the electric bills are been reduced thanks to power is employed from the solar. The solar plant used is been less and therefore the area of installation is additionally been low.

This is often applicable to all or any sort of DC based systems and therefore the energy we obtain from the solar which is renewable and it's easily affordable. Also the energy from substation to defined area are often minimized and therefore the money is saved.

Moreover, the system can monitored and controlled from varies places by the usage of internet. The control is additionally been done using the voice.

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