



Research Manuscript Title

**AUTOMATION OF HOME APPLIANCES USING
SOLAR ENERGY - A SMART HOME**

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ABSTRACT

The application design of smart home model system using solar energy here is based on microcontroller. This project mainly focuses on reducing the electricity bill by using solar energy generated from sun for home appliances. Solar panel is made up of PV (photo voltaic) cells, these cells collect sunlight and turn its energy into DC and here DC boost converter is used to boost up the solar energy and the “inverter” converts the DC to AC energy and eventually supplies the current to all appliances, when the solar power is reduced to minimum voltage, then the battery is tripped to EB current immediately and moreover the value (or) range of the current and other related details are transferred to PC using zigbee, so that the current status of the operation can be monitored. Thus the electricity bill is reduced immensely.

Keywords : solar panel , inverter , EB current ,ZIGBEE .

I.INTRODUCTION

In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such alternative is solar energy. Solar energy is the heat and light radiated from the Sun that drives Earth's climate and supports life. Solar technologies make controlled use of this energy resource. Solar power is a synonym of solar energy or refers specifically to the conversion of sunlight into electricity by photovoltaic, concentrating solar thermal devices or various experimental technologies.

The transformation of solar energy into other types of energy doesn't bring any visible pollution to the environment, which makes it very beneficial. Other ways of electricity production are tightly connected with the pollution of environment. We are in need to use the solar power, to save our electricity current and to reduce the electricity bill. Hence here in this project the solar power is preferred to achieve the target of the project.

II. HARDWARE AND SOFTWARE ANALYSIS

A.Hardware Used

- EBMETER
- PIC
- SOLAR PANEL
- DRIVER CIRCUIT
- ZIGBEE

- RS232
- PC
- SCU (SIGNAL CONDITIONING UNIT)
- RELAY
- DC VOLT MEASUREMENT UNIT
- BOOST CONVERTER UNIT

B. Software Used

- MPLAB-FOR PIC MICROCONTROLLER
- VISUAL BASIC-FOR PC

III . SYSTEM ANALYSIS AND ITS PROCESS

A. Overview Of Existing System

Home lighting System is powered by solar energy using solar cells that convert solar energy (sunlight) directly to electricity. The electricity is stored in batteries and used for the purpose of lighting whenever required. The Solar Home Lighting system is a fixed installation designed for domestic application. The system comprises of Solar PV Module (Solar Cells), charge controller, battery and lighting system (lamps & fans). The solar module is installed in the open on roof/terrace - exposed to sunlight and the charge controller and battery are kept inside a protected place in the house. The solar module requires periodic dusting for effective performance.

Here, we are going to use the cheapest method by trapping the solar energy. The trapped solar energy is used to charge the battery for lighting purpose. We have designed and developed a system called solar based lighting system. The charging unit is used to strengthen the signal from the solar panel. The charging unit which in turn delivers the signal which is used to charge the battery. According to the charged unit, the lighting system operates. Then we have given this signal to inverter to convert DC into AC for light. Then by using the switch, the light will controlled by us. Thus is about existing system over solar lighting system the disadvantage of the

Proposed Works

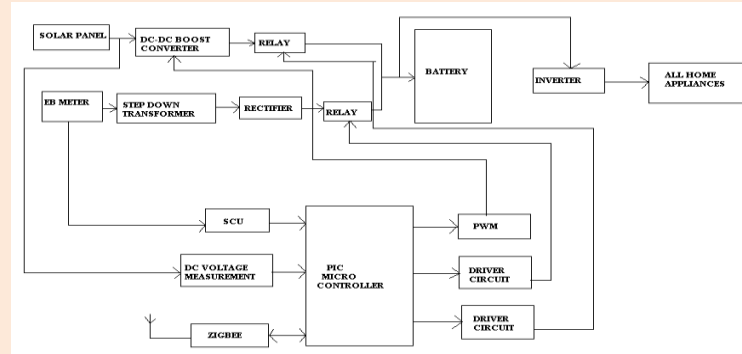
In proposed work the blockdiagram of both the transmitter and receiver is described below,

In our project there are two units. One is working unit another is a monitor unit.

- In a working unit solar panel is given to the battery via boost converter and relay.
- Boost converter is used to increase the solar panel output.
- EB voltage is given to the battery via rectifier and relay.
- EB meter output is given to the PIC microcontroller via SCU. From this we can get the Energy consumption output. And solar panel output is measured with the help of DC volt measurement.
- Relay is used to control the output of solar and the EB to battery.

- Not only control and also this information are transmitting to the PC via ZIGBEE.
- RS232 is a serial communication cable. It is used to interface the PC with ZIGBEE.

Block Diagram Of Transmitter Side :



Receiver Side :

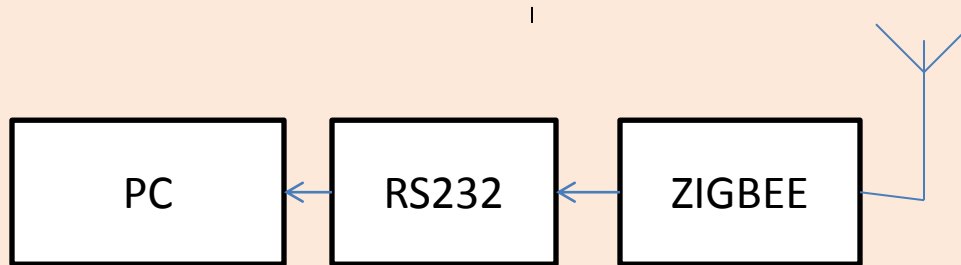


fig 2 : receiver side of the system

C. Solar Panel

A solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel is used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications. Because a single solar panel can only produce a limited amount of power, many installations contain several panels. This is known as a photovoltaic array. A photovoltaic installation typically includes an array of solar panels, an inverter, batteries and interconnection wiring.

Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The structural (load carrying) member of a module can either be the top layer (superstrate) or the back layer (substrate). The majority of modules use wafer-based crystalline silicon cells or a thin-film cell based on cadmium telluride or silicon. Crystalline silicon, which is commonly used in the wafer form in photovoltaic (PV) modules, is derived from silicon, a commonly used semi-conductor. In order to use the cells in practical applications, they must be connected electrically to one another and to the rest of the system protected from mechanical damage during manufacture, transport, installation and use (in particular against hail impact, wind

and snow loads). This is especially important for wafer-based silicon cells which are brittle. Most modules are usually rigid, but there are some flexible modules available, based on thin-film cells. Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired amount of current source capability. Diodes are included to avoid overheating of cells in case of partial shading. Since cell heating reduces the operating efficiency it is desirable to minimize the heating. Very few modules incorporate any design features to decrease temperature, however installers try to provide good ventilation behind the module.

Depending on construction, the photovoltaic can cover a range of frequencies of light and can produce electricity from them, but sometimes cannot cover the entire solar spectrum (specifically, ultraviolet, infrared and low or diffused light). Hence much of incident sunlight energy is wasted when used for solar panels, although they can give far higher efficiencies if illuminated with monochromatic light. Another design concept is to split the light into different wavelength ranges and direct the beams onto different cells tuned to the appropriate wavelength ranges.^[2] This is projected to raise efficiency by 50%. Also, the use of infrared photovoltaic cells can increase the efficiencies, producing power at night.

Existing system is that only the light system can be used by solar energy.

D. Boost Converter

A boost converter (step-up converter) is a power converter with an output DC voltage greater than its input DC voltage. It is a class of switching-mode power supply (SMPS) containing at least two semiconductor switches (a diode and a transistor) and at least one energy storage element. Filters made of capacitors (sometimes in combination with inductors) are normally added to the output of the converter to reduce output voltage ripple.

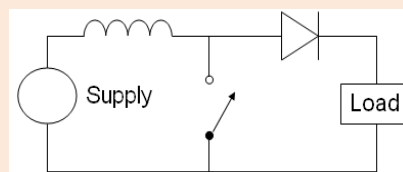


fig 3:Boost converter circuit diagram

E.ZigBee

The mission of the Zigbee Working Group is to bring about the existence of a broad range of interoperable consumer devices by establishing open industry specifications for unlicensed, untethered peripheral, control and entertainment devices requiring the lowest cost and lowest power consumption communications between compliant devices anywhere in and around the home.

The Zigbee specification is a combination of Home RF Liter and the 802.15.4 specification. The spec operates in the 2.4GHz (ISM) radio band - the same band as 802.11b standard, Bluetooth, microwaves and some other devices. It is capable of connecting 255 devices per network. The specification supports data transmission rates of up to 250 Kbps at a range of up to 30 meters. Zigbee's technology is slower than 802.11b (11 Mbps) and Bluetooth (1 Mbps) but it consumes significantly less power.

V. APPLICATIONS AND ADVANTAGES

A. Applications

1. Residential Application

Government subsidy programs (particularly in Germany and Japan) and green pricing policies of utilities or electricity service providers have stimulated demand. Demand is also driven by the desire of individuals or companies to obtain their electricity from a clean, non-polluting, renewable source. These consumers are usually willing to pay only a small premium for renewable energy.

Remote homes in sunny locations can obtain reliable electricity to meet basic needs with a simple system comprising of a PV panel, a rechargeable battery to store the energy captured during daylight hours, a regulator (or charge controller), and the necessary wiring and switches. Such systems are often called solar home systems (SHS).

2 .Commercial Application

On an office building, roof areas can be covered with glass PV modules, which can be semi-transparent to provide shaded light. On a factory or warehouse, large roof areas are the best location for solar modules. If the roof is flat, then arrays can be mounted using techniques that do not breach the weatherproofed roof membrane. Also, skylights can be partially covered with PV. The vertical walls of office buildings provide several opportunities for PV incorporation, as well as sunshades or balconies incorporating a PV system. Sunshades may have the PV system mounted externally to the building, or have PV cells specially mounted between glass sheets comprising the window.

3 .Industrial Application

For many years, solar energy has been the power supply choice for industrial applications, especially where power is required at remote locations. Because solar systems are highly reliable and require little maintenance, they are ideal in distant or isolated places. Solar energy is also frequently used for transportation signaling, such as offshore navigation buoys, lighthouses, aircraft warning light structures, and increasingly in road traffic warning signals. Solar is used to power environmental monitoring equipment and corrosion protection systems for pipelines, well-heads, bridges, and other structures. For larger electrical loads, it can be cost-effective to configure a hybrid power system that links the PV with a small diesel generator.

4 .Remote Applications

Remote buildings, such as schools, community halls, and clinics, can benefit from solar energy. In developing regions, central power plants can provide electricity to homes via a local wired network, or act as a battery charging station where members of the community can bring batteries to be recharged.

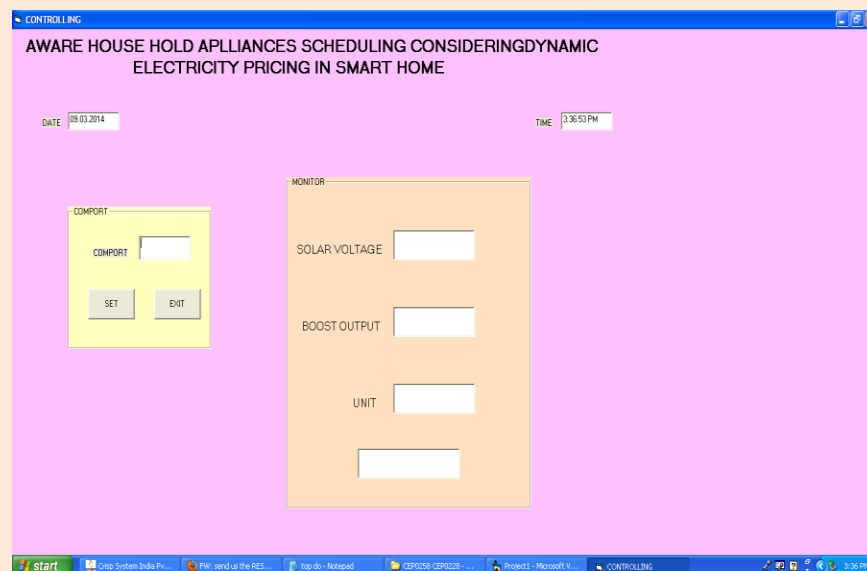
PV systems are sometimes best configured with a small diesel generator in order to meet heavy power requirements in off-grid locations. With a small diesel generator, the PV system does not have to be sized to cope with the worst sunlight conditions during the year. The diesel generator can provide back-up power that is minimized during the sunniest part of the year by the PV system. This keeps fuel and maintenance costs low.

B. Advantages

1. Dramatically reduces your utility bill.
2. System is reliable.
3. High accuracy.
4. Highly précised system

V. RESULT

The result of this project is that the electricity bill is reduced by supplying solar power to all the appliances in home and thereby the below shown is the display of the solar energy output range, boost output ,date and time that is displayed on the pc by means of zigbee. The output display is shown below,



VI. CONCLUSION AND FUTURE ENHANCEMENT

The output of the proposed algorithms the desired that approximates the probability distribution of customer energy consumption practice, and the expense efficient appliance energy consumption schedule. The proposed appliance operation scheduling algorithm also accelerates the generation of the desired operation schedule by paralleling the computing process. The future work seeks to investigate the game theory based scheduling to reduce peak-to-average ratio for a smart community based on the scheduling technique proposed in this project. To fit for the future the GSM or GPRS technology is used instead of ZIGBEE which is used now in our project.

VII. IMPLEMENTATION MODEL OF PROPOSED SYSTEM

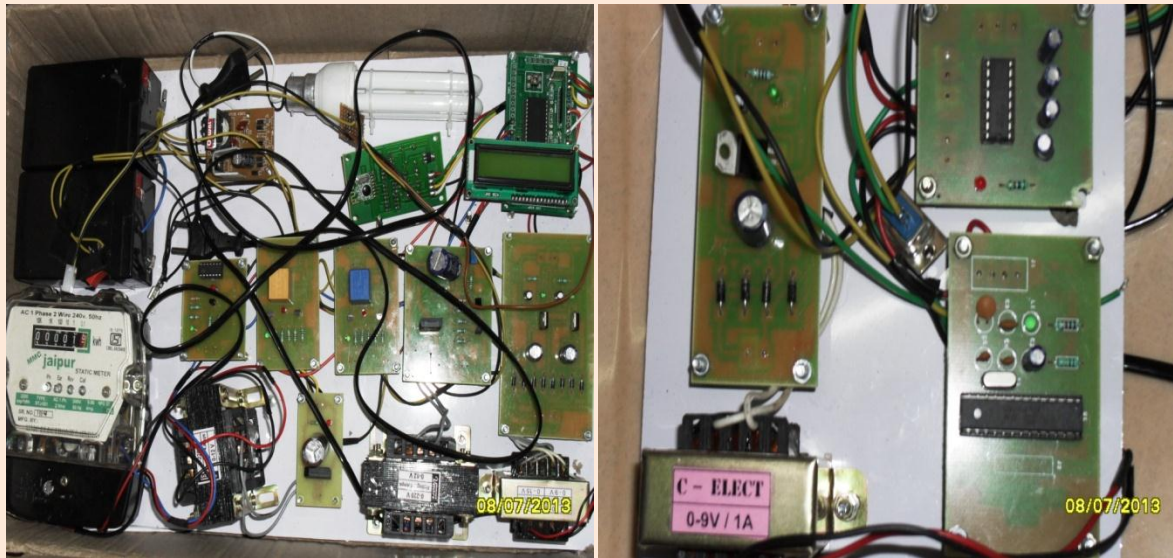


fig 5 : Both transmitter and receiver part .

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