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Intelluctual Energy Recoup System

Poovika P[1], Raghavi M[2], Dhinesh kumar P[3], Kannan P[4], Kavitha S[5]

[1,2,3,4]*UG Students, Department of Instrumentation and Control Engineering, INDIA*

[5]*Assistant Professorof Department of Instrumentation and Control Engineering*

Dr. Mahalingam College of Engineeringand Technology, Pollachi, INDIA

Abstract: In this technocratic era we device so many electrical and electronic devices that keeps people much more sophisticated at the excessive usage of electrical energy. But none of them think on the concept of energy reuse or recycling of available energy. During day time light energy of sun is being used to produce electrical energy. But during night time, there is no energy production and they are rested at the roof - top without usage. Likewise light energy from electric blub is also not used in an effective manner other than lightning. In our project we are conjoining both drawbacks and presenting a new way of energy conservation thus in which the solar panels can produce power both at day and night. The position of solar panel is adjusted to bulb and sun light by using servomotor setup. The DC output of solar cell is stored in battery for future usage. The DC output is converted into AC using inverters and then given to AC appliances through relay circuit. The usage of other appliances can be controlled using IR operation. IR transmitter sends a code in form of train of encoded pulses when a button press is detected for turning on a particular appliance. These pulses are received by IR receiver and read by ARDUINO. It decodes received train of pulse and compares it with the predefined value. If any match occurs, then ARDUINO performs relative operation by sending a signal to relay driver circuit to turn on /off the other needy appliance. Thus the Electrical energy is made use of in an efficient manner using the proposed method.

Keywords: Appliances, Controller, Electrical Energy, IR, Inverter, Reuse, Solar.

I. Introduction

With increasing technology and energy crisis, Electrical energy conservation has become a need whether it is home, industry or some other places. In home we come across many appliances, it may be Fan, AC, TV, Lights, etc. which are needed to be used in a smart and efficient way to reduce power consumption and it can be conserved by implementing energy conservation ideas. The appliancesshould be turned off whenever it's not needed and also weneed to stop wastage of power when there is no one inside home. In home, some energy is getting wasted when lightingelectric bulbs during night time though it gives lighting. So, there can be an effective Energy conservation system to save some power.The main objective of this project is to produce power at homes in a smart and efficient way and also to enable control of appliances in a smart way. The method of control should be convenient for all users and also it should be affordable so that everyone can able to use it.Since some energy is getting wasted through lighting of bulbs in night time Energy conservation system should be implemented.

II. Exisiting Methodology

The light energy emitted by the sun is utilized and converted into electrical energy by using solar panel. It absorbs the sun's rays as a source of energy for generating electricity or heating. But the tribulations in solar panel are that it cannot be used in the absence of sunlight and it is also not suitable during rainy seasons.

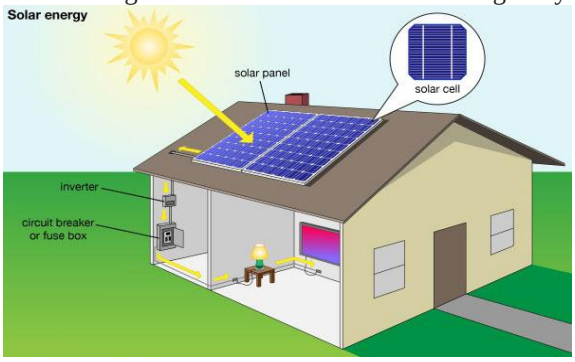

Figure1. Existing method

Solar panels on a building consist of many solar cells. The cells capture energy from sunlight and change it into electricity. The electricity is passed through a device called an inverter that turns it into a form that can be used

by the appliances in the building. The inverter output is passed through the circuit breaker or fuse box that controls the flow of electricity throughout the building.

III. Proposed Model

This project overcomes the above difficulties of the existing methodologies. The Block Diagram of the Energy Recoup System is shown below.

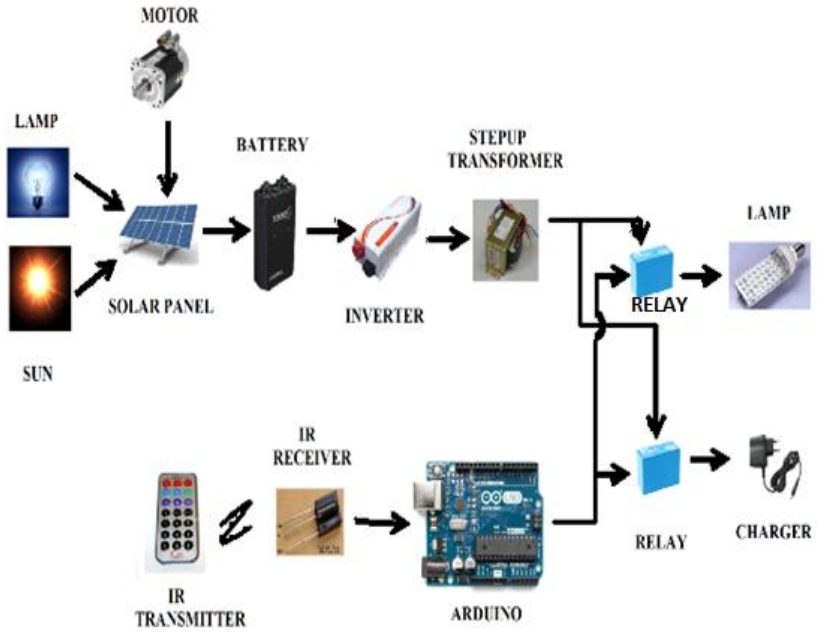

Figure2. Proposed Block Diagram of Energy Recoup System

A. Working of the Proposed System

The solar panel absorbs the light energy and produce corresponding DC voltage. The battery charging circuit is used to store the DC in the rechargeable battery. The DC voltage from battery is used to run the AC appliances by designing the inverter circuit. The usage of the appliances is controlled by the IR remote and microcontroller (Arduino UNO). The remote acts as IR transmitter. The transmitter sends the train of pulses when the button is pressed and it is received by the IR receiver. The IR receiver gives input to the microcontroller. The microcontroller decodes the pulses into corresponding hex codes and compares it with the predefined codes and if any match occurs the controller takes the corresponding actions. This output is given to the relay which is responsible for switching on or off the appliances through the relay driver. In order to utilize the sunlight during the day time the solar panel is moved to face the sunlight by using the DC motor. This can also be controlled by IR remote and Arduino.

B. Solar Panel

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (PV) module is a packaged; connect assembly of typically 6×10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 365 watts. The efficiency of a module determines the area of a module given the same rated output.

C. Battery

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to the power electrical devices such as flashlights, smartphones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected to an external circuit, electrolytes are able to move as ions within,

allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work.

D. Battery Charging Unit

This circuit harvests solar energy to charge a 6 volt 4.5 Ah rechargeable battery for various applications. The charger has voltage and current regulation and over voltage cut-off facilities. The 12-volt DC available from the panel is used to charge the battery. Charging current passes through diode D1 (1N4007) to the voltage regulator IC LM 317. By adjusting its Adjust pin, output voltage and current can be regulated. VR is placed between the adjust pin and ground to provide an output voltage of 9 volts to the battery. Resistor R3 restrict the charging current and diode D2 (1N4007) prevents discharge of current from the battery.Transistor T1 and Zener diode ZD act as a cutoff switch when the battery is full. Normally T1 is off and battery gets charging current. When the terminal voltage of the battery rises above 6.8 volts, Zener conducts and provides base current to T1. It then turns on grounding the output of LM317 to stop charging.

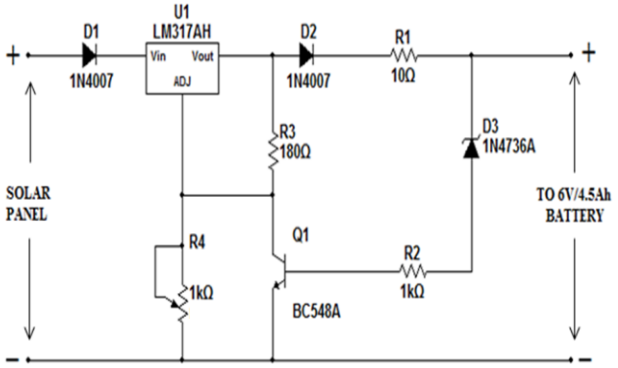

Figure3. Battery Charging Circuit

Inverter Circuit

A power inverter, or inverter, is an electronic device or circuitry that changes direct current (DC) to alternating current (AC). The input voltage, output voltage and frequency, and overall power handling depend on the design of the specific device or circuitry. The inverter does not produce any power; the power is provided by the DC source.A power inverter can be entirely electronic or may be a combination of mechanical effects (such as a rotary apparatus) and electronic circuitry. Static inverters do not use moving parts in the conversion process.A typical power inverter device or circuit requires a relatively stable DC power source capable of supplying enough current for the intended power demands of the system. The input voltage depends on the design and purpose of the inverter. An inverter can produce a square wave, modified sine wave, pulsed sine wave, pulse width modulated wave PWM) or sine wave depending on circuit design.

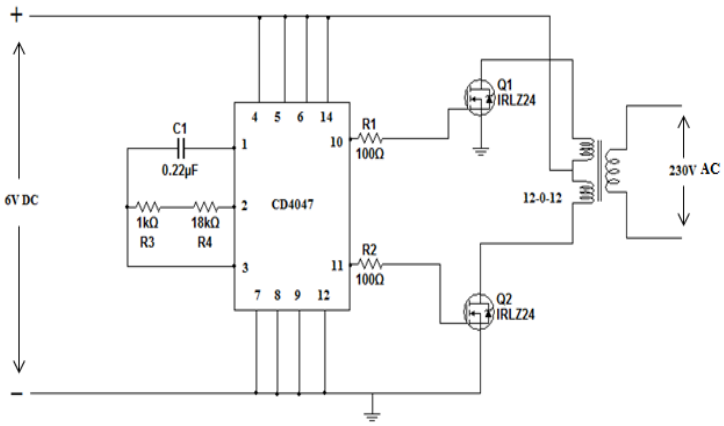

Figure4. Inverter Circuit used

E. IR Sensor Module

IR Transmitter and receiver are used to control any device wirelessly, means remotely. TV remote and TV are the best example of IR transmitter and receiver. TV generally consist TSOP1738 as the IR receiver, which senses modulated IR pulses and convert them into electrical signal. Here in our circuit we are building IR remote and its receiver. We are using IR LED as transmitter and TSOP1738 as IR receiver.

F. IR Leds

Other than emitting IR LED emits infrared light, means it emits light in the range of Infrared frequency. We cannot see Infrared light through our eyes, they are invisible to human eyes. The wavelength of Infrared (700nm – 1mm) is just beyond the normal visible light. Everything which produce heat, emits infrared like our human body. Infrared have the same properties as visible light, like it can be focused, reflected and polarized like visible light. IR LED looks like a normal LED and also operates like a normal LED, means it consumes 20mA current and 3vots power. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimeters to several feet's, it depends upon the type of IR transmitter and the manufacturer. Some transmitters have the range in kilometers.

G. IR Receiver (Tsop17xx)

TSOP17XX receives the modulated Infrared waves and changes its output. TSOP is available in many frequency ranges like TSOP1730, TSOP1738and TSOP1740 etc. Last two digits represent the frequency (in KHz) of modulated IR rays, on which TSOP responds. Like for example TSOP1738 reacts when it receives the IR radiation modulated at 38Khz. Means it detects the IR which is switching On and Off at the rate of 38Khz. TSOP's output is active low, means its output is remains HIGH when there is no IR, and becomes low when it detects IR radiation. TSOP operates on particular frequency so that other IRs in the environment can't interfere, except the modulated IR of particular frequency. It has three pins, Ground, Vs (power), and OUTPUT PIN.

IV. Results Obtained

The solar panel is placed under two different bulbs (LED and Incandescent lamp) and the readings are taken for about one and half hours. The readings are tabulated in the following table.

Table1. Solar panel output

TIME	LED LAMP	INCANDESCENT LAMP
6.00	15.65	17.85
6.09	15.56	17.90
6.18	15.55	17.89
6.24	15.54	17.87
6.30	15.55	17.90
6.39	15.56	17.89
6.50	15.57	17.85
7.00	15.59	17.88
7.09	15.59	17.95
7.25	15.60	18.00

The serial monitor output for various button presses are shown in the following figure using IR Remote control for controlling of other appliances.

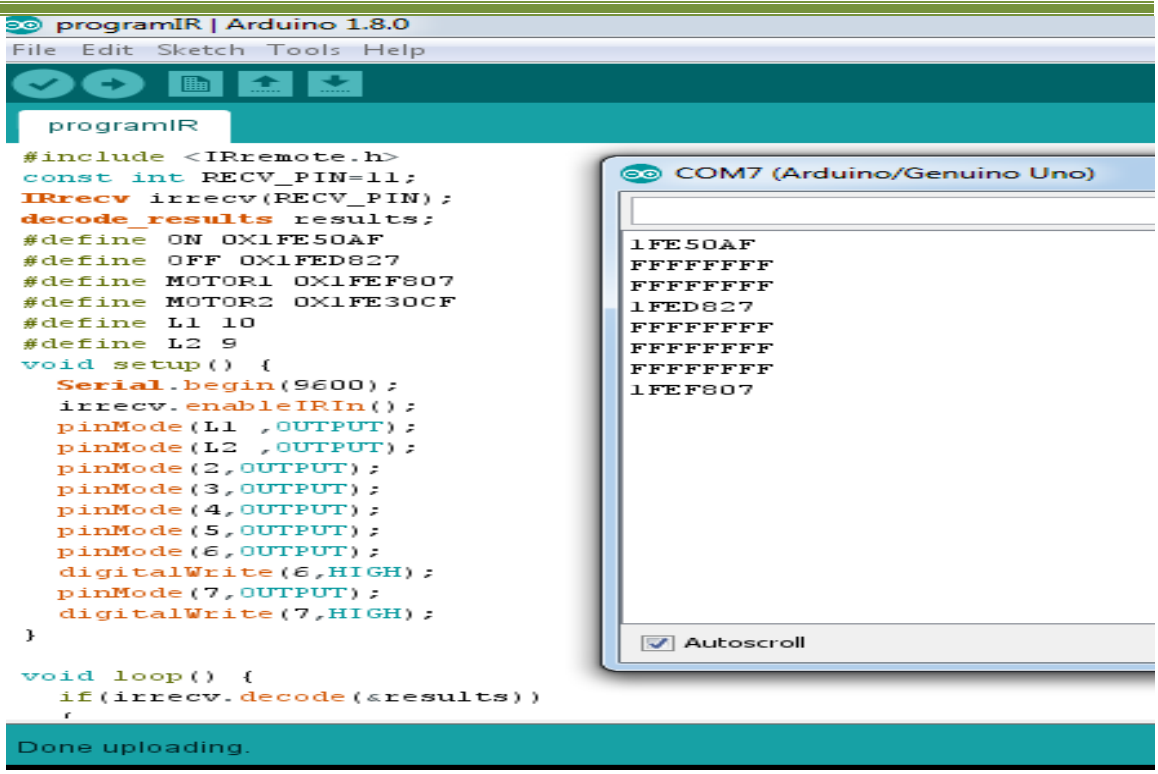

Figure5. Software Output

The total hardware assembly including the motor setup, inverter, IR part is shown in the following figure.

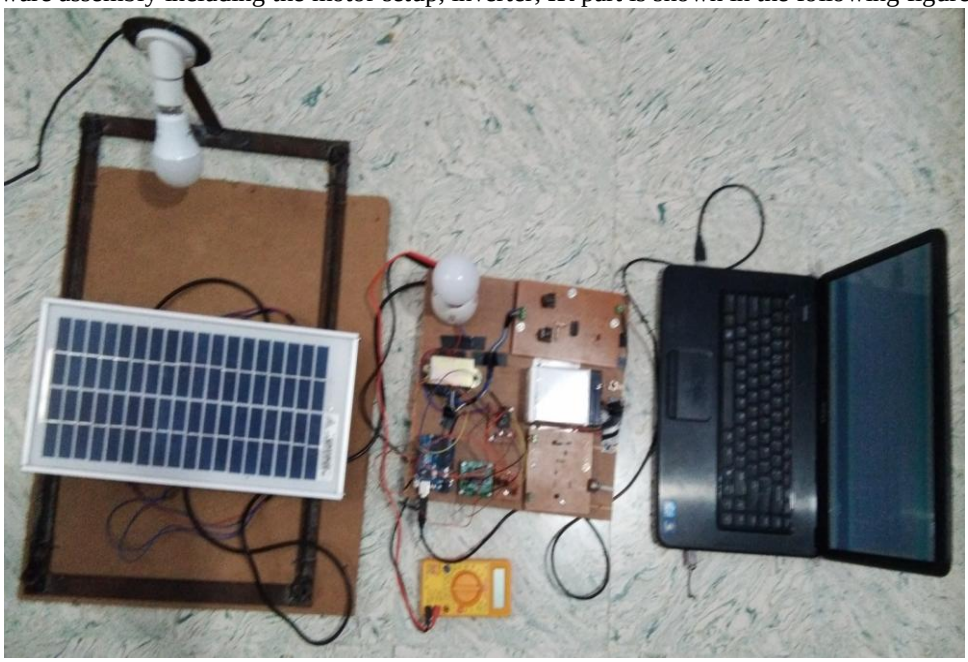

Figure6. Hardware model

V. Conclusion and Future Scope

Thus the light energy blushing from electric bulbs in our house throughout night time is used in an effective way for running other appliances rather than lightening our home. The solar panel is also utilized up both during day and night time effectively.In future, the electrical energy conserved can be increased by integrating more lamps. Internet of things can be introduced in addition to this to control the appliances even in more smart way from remote area.

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