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DUAL AXIS SOLAR TRACKING SYSTEM WITH WEATHER SENSOR

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Abstract: Energy crisis is one in every of the major problems in world developing countries like Republic of India. There's a huge gap between generation and demand of current. Nearly half of the population of the country cannot get the power supply. Renewable energy is one of the answers to solve this issue. Solar power is one in every of the foremost effective resources of the renewable energy that might play a big role to resolve this drawback. This analysis presents a performance analysis of the dual axis solar tracking system using Arduino and led & servo motors. The most objective of this research is whether the solar tracker is better than a solar panel. This work is split into 2 light dependent resistors (LDR) is employed to observe the almost source of illumination from the sun. Two servo motors put together accustomed move the electrical device to most source of illumination location perceived by the LDRs. In the other half, the software part is written by using C programming language which head towards to the Arduino UNO controller. The result of the solar tracking system has analyzed and compared with the mounted or static solar panel found higher performance in terms of current, power and voltage. Therefore, the solar tracking system is evidenced additional sensible for capturing the most daylight provide for star gathering applications. The result showed dual axis solar tracking system made further 10.53- watt power compared with mounted (fixed) and single axis solar tracking system. Components hardware and computer code.

INTRODUCTION TO EMBEDDED SYSTEMS

An embedded system can be defined as a computing device that does a specific focused job. Appliances such as the air-conditioner, VCD player, DVD player, printer, fax machine, mobile phone etc. are examples of embedded systems. Each of these appliances will have a processor and special hardware to meet the specific requirement of the application along with the embedded software that is executed by the processor for meeting that specific requirement. The embedded software is also called “firm ware”. The desktop/laptop computer is a general purpose computer. You can use it for a variety of applications such as playing games, *word* processing, accounting, software development and so on. In contrast, the software in the embedded systems is always fixed listed below:

· Embedded systems do a very specific task, they cannot be programmed to do different things. . Embedded systems have very limited resources, particularly the memory. Generally, they do not have secondary storage devices such as the CDROM or the floppy disk. Embedded systems have to work against some deadlines. A specific job has to be completed within a specific time. In some embedded systems, called real-time systems, the deadlines are stringent.

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Missing a deadline may cause a catastrophe-loss of life or damage to property. Embedded systems are constrained for power. As many embedded systems operate through a battery, the power consumption has to be very low.

· Some embedded systems have to operate in extreme environmental conditions such as very high temperatures and humidity.

PROJECT INTRODUCTION

AIM:

The main aim of this project is to design and develop the energy free solar street led light system from solar panel by tracking the sun rays according to manual mode.

PURPOSE:

The purpose of the project is to implement a system to continuously track the sun rays with the help of the solar panel and grasping the maximum power from the sun by rotating the solar panel according to the manual given timing angles through pressing switches.

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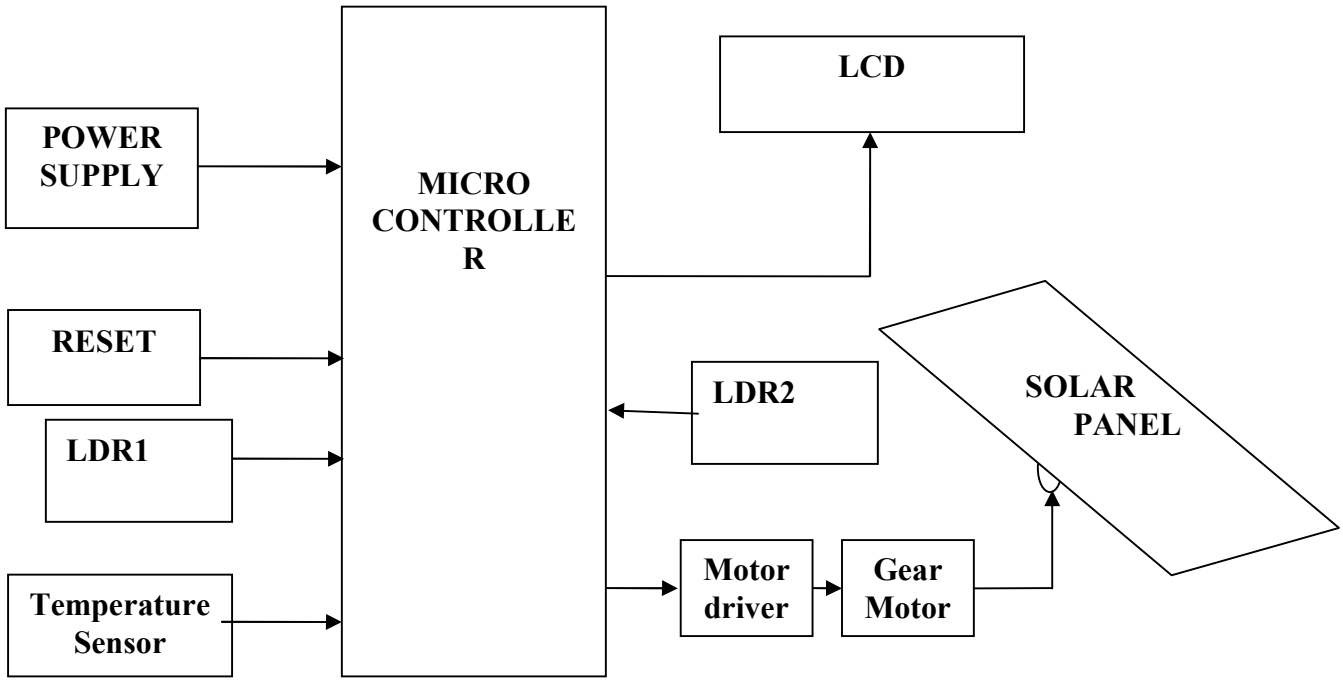
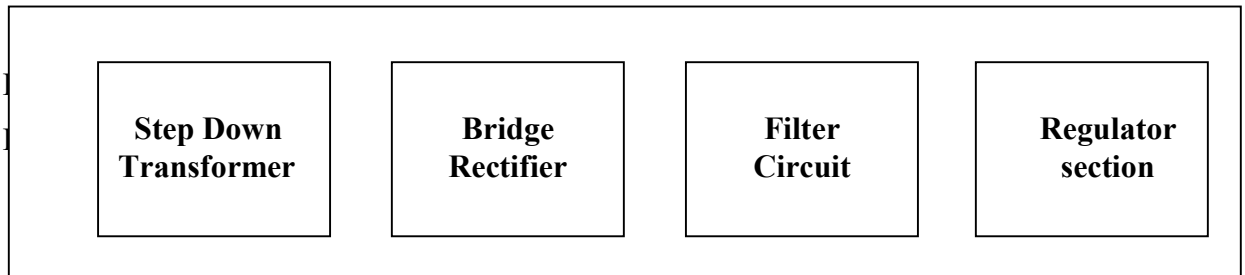


POWER SUPPLY:



DESCRIPTION:

In present situation everyone is facing the problem with power cuts which is creating very much trouble to the people. So, to solve this problem a standalone solar street LED light system is proposed in this paper.

In this system solar panel will turn according to the user given signals through switches with predefined angle. So by using Gear motor we are going to turn the panel according to the manual requirements. Whenever the radiation of the sun falls on the solar panel it grasps the radiation and stores in it. And the solar panel converts the sun rays into electrical energy, by that energy the lights will ON.

SOFTWARES:

1. Embedded C
2. Express PCB
3. Keil IDE
4. Uc-Flash or ISP

HARDWARES:

1. Micro controller
2. Power Supply
3. LDR Sensor
4. Temperature Sensor
5. Solar Panel
6. Gear Motor
7. RESET
8. LCD

ARDUINO

Overview:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

The board has the following new features:

1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future,

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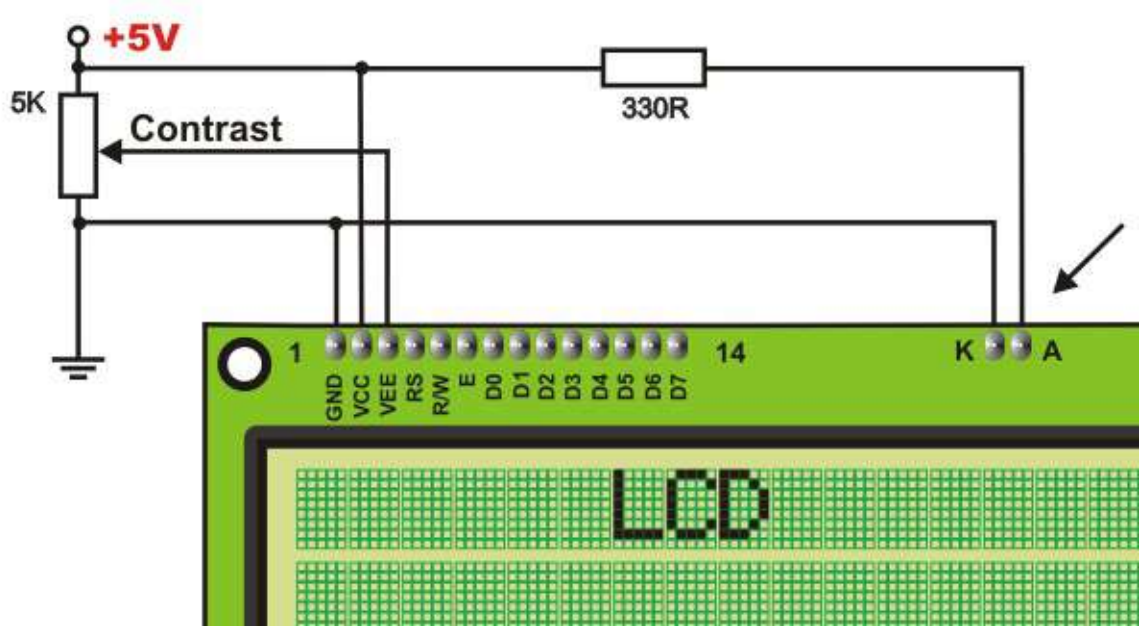
shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

LCD screen:

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).



L293D

- 600mA OUTPUT CURRENT CAPABILITY PER CHANNEL

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- 1.2A PEAK OUTPUT CURRENT (non repetitive) PER CHANNEL
- ENABLE FACILITY
- OVERTEMPERATURE PROTECTION
- LOGICAL "0" INPUT VOLTAGE UP TO 1.5 V
- (HIGH NOISE IMMUNITY)
- INTERNAL CLAMP DIODES

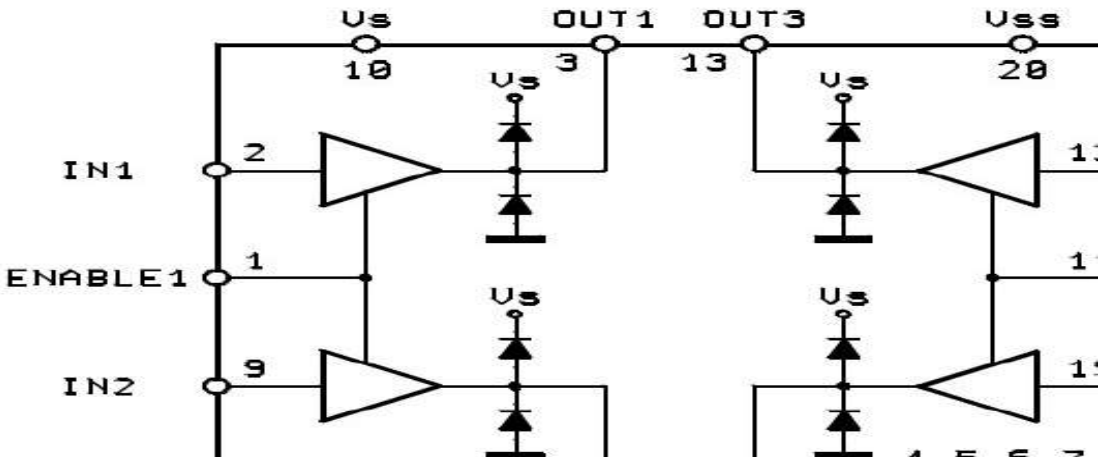
DESCRIPTION

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors.

To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking. The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

BLOCK DIAGRAM



PIN CONNECTIONS

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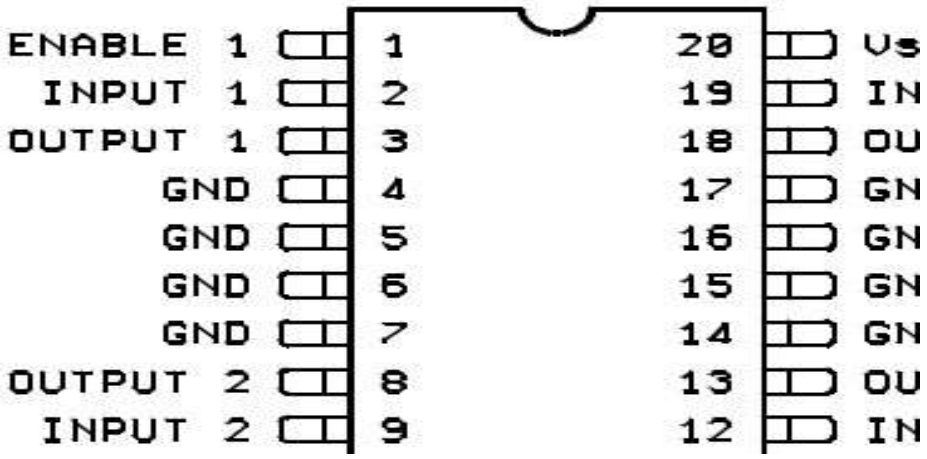


DC MOTOR

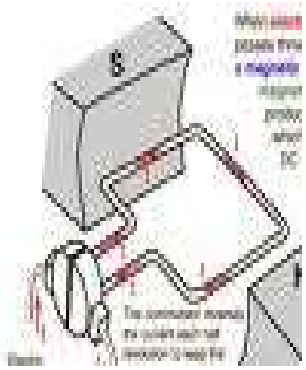
WORKING PRINCIPLE OF A DC MOTOR

A DC motor is an electric motor that runs on DC electricity. It works on the principle of electromagnetism. A current carrying conductor when placed in an external magnetic field will experience a force proportional to the current in the conductor.

OPERATION OF A DC MOTOR

There are two magnetic fields produced in the motor. One magnetic field is produced by the permanent magnets and the other magnetic field is produced by the electrical current flowing in the motor windings. These two fields result in a torque which tends to rotate the rotor. As the rotor turns, the current in the windings is commutated to produce a continuous

Torque output this makes the motor to run.



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Temperature Sensors

LM35 is an exact IC temperature sensor with its out-put related with the temperature (in C). The sensor device is fixed and hence it isn't introduced to oxidation and specific structures. With LM35, the temperature can be evaluated more as it should be than with a thermistor. It besides has low self-warming and does not extend to than 0.1oC temperature upward air.

The working temperature value is from - 55°C to 50°C. The out-put voltage shifts by 10mV considering each upward high/fall in appropriate incorporating temperature, i.e., its scale to.01V/C

No	Function	Name
1	Supply voltage; 5V (+35V to -2V)	Vcc
2	Output voltage (+6V to -1V)	Output
3	Ground (0V)	Ground

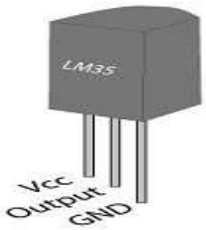

FIG: TEMPERATURE SENSOR LM35

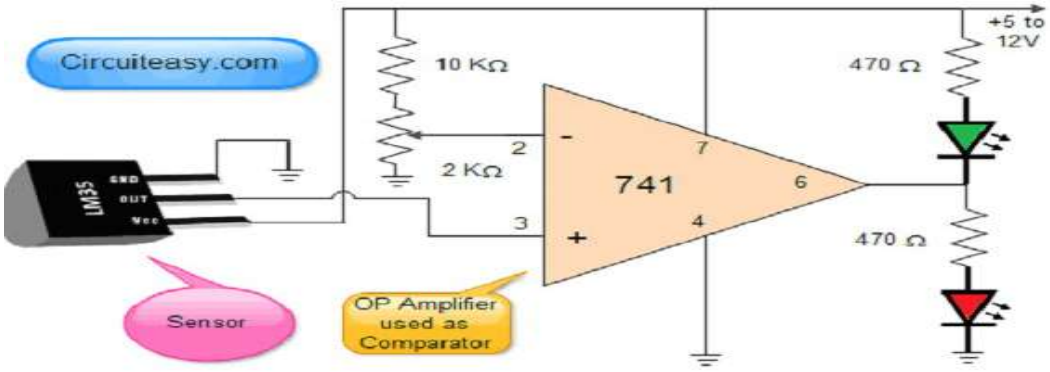

Fig. 4.2. Circuit Diagram of temperature sensor

LIGHT DEPENDENT RESISTOR

INTRODUCTION:

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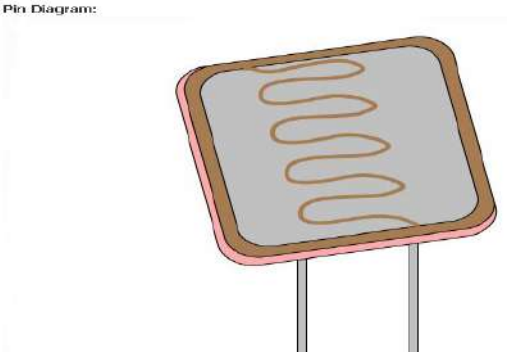
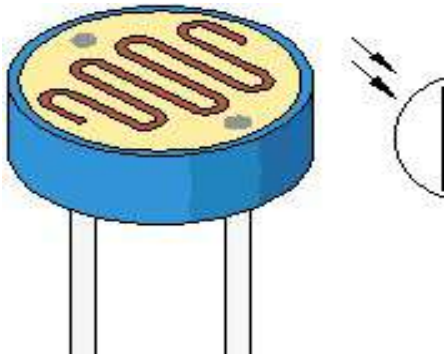
An LDR (Light dependent resistor), as its name suggests, offers resistance in response to the ambient light. The resistance decreases as the intensity of incident light increases, and vice versa. In the absence of light, LDR exhibits a resistance of the order of mega-ohms which decreases to few hundred ohms in the presence of light. It can act as a sensor, since a varying voltage drop can be obtained in accordance with the varying light. It is made up of cadmium sulphide (CdS).

An LDR has a zigzag cadmium sulphide track. It is a bilateral device, *i.e.*, conducts in both directions in same fashion.

Pin Diagram:



A **Light Dependent Resistor** (aka LDR, photoconductor, or photocell) is a device which has a resistance which varies according to the amount of light falling on its surface.



A typical light dependent resistor is pictured above together with (on the right hand side) its circuit diagram symbol. Different LDR's have different specifications, however the **LDR**'s we sell in the REUK Shop are fairly standard and have a resistance in total darkness of 1 MOhm, and a resistance of a couple of kOhm in bright light (*10-20kOhm @ 10 lux, 2-4kOhm @ 100 lux*).

Uses for Light Dependent Resistors

Light dependent resistors are a vital component in any electric circuit which is to be turned on and off automatically according to the level of ambient light - for example, solar powered garden lights, and night security lighting. *An LDR can even be used in a simple remote control circuit using the backlight of a mobile phone to turn on a*

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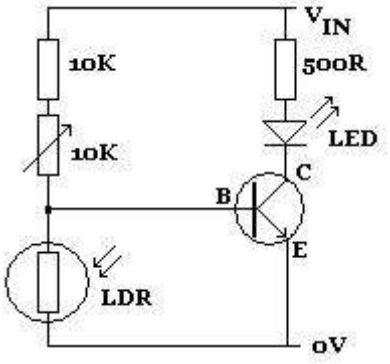
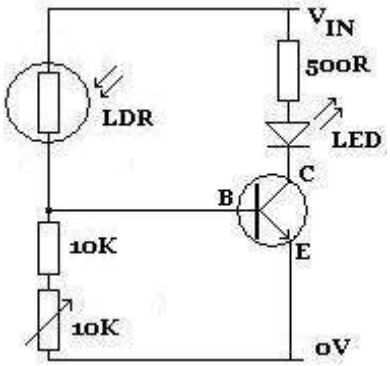
device - call the mobile from anywhere in the world, it lights up the LDR, and lighting (or a garden sprinkler) can be turned on remotely!

Light Dependent Resistor Circuits

There are two basic circuits using **light dependent resistors** - the first is activated by darkness, the second is activated by light. The two circuits are very similar and just require an **LDR**, some standard resistors, a variable resistor (aka potentiometer), and any small signal transistor



In the circuit diagram above, the **LED lights up** whenever the LDR is in **darkness**. The 10K variable resistor is used to fine-tune the level of darkness required before the LED lights up. The 10K standard resistor can be changed as required to achieve the desired effect, although any replacement must be at least **1K** to protect the transistor from being damaged by excessive current.



By swapping the LDR over with the 10K and 10K variable resistors (as shown above), the circuit will be activated instead by light. Whenever sufficient light falls on the LDR (manually fine-tuned using the 10K variable resistor), the LED will light up.

Using an LDR in the Real World

The circuits shown above are not practically useful. In a real world circuit, the LED (and resistor) between the positive voltage input (Vin) and the collector (C) of the transistor would be replaced with the device to be powered.

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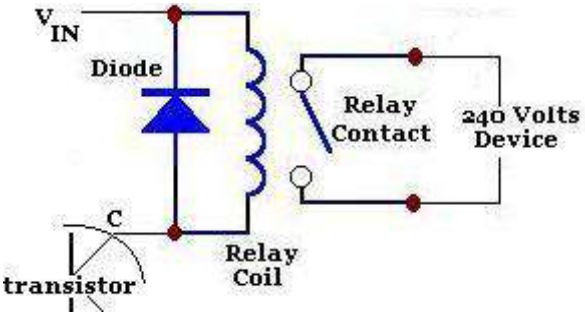
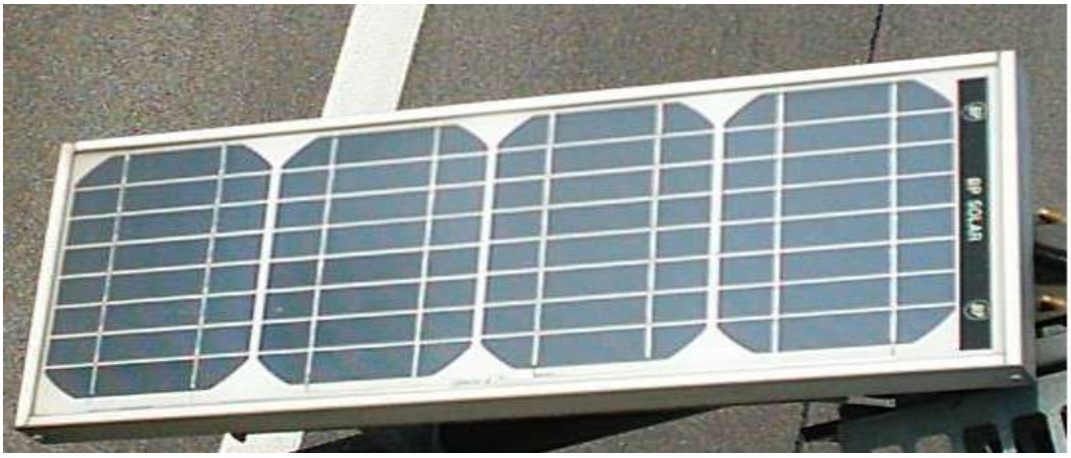


Typically a **relay** is used - particularly when the low voltage light detecting circuit is used to switch on (or off) a 240V mains powered device. A diagram of that part of the circuit is shown above. When darkness falls (if the LDR circuit is configured that way around), the **relay is triggered** and the 240V device - for example a security light - switches on.

SOLAR PANEL

A **solar panel** (also **solar module**, **photovoltaic module** or **photovoltaic panel**) is a packaged, connected assembly of photovoltaic cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each panel is rated by its DC output power under standard test conditions, and typically ranges from 100 to 320 watts. The efficiency of a panel determines the area of a panel given the same rated output - an 8% efficient 230 watt panel will have twice the area of a 16% efficient 230 watt panel. Because a single solar panel can produce only a limited amount of power, most installations contain multiple panels. A photovoltaic system typically includes an array of solar panels, an inverter, and sometimes a battery and or solar tracker and interconnection wiring.



Arduino software

The Arduino Uno can be programmed with the Arduino software. Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board).For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes preburned with a boot loader that allows you to upload new code to it without the use of

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an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).We can also bypass the boot loader and programs the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an .information file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes aWire library to simplify use of the I2C bus.

Conclusion:

We conclude that main objective of this project is to develop an embedded system based application to track the sunlight intensity.

It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

Advantage:

- It is very feasible for general facilities that require no large power.
- To attain maximum power from solar panel

Applications:

- Can be used in remote areas.
-

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