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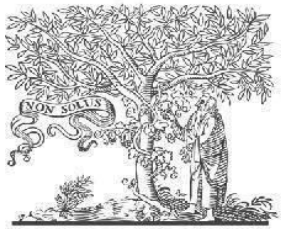

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ADVANCED SOLAR POWERED FLOOR CLEANING ROBOTIC

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ABSTRACT:
The supply of energy has been a major concern for both urban and rural people in India, and it is one of the planet's major difficulties. A little over 60% to 70% of the nation's energy needs are met by fuelwood and agricultural wastes. The sun releases solar energy, a constant supply of power with enormous potential. In order to replace the use of petroleum-based electrical energy, renewable energy is essential. Solar power is now a renewable energy source, and its applications need to be expanded. In dusty environments, such as those found in tropical nations like India and the United Arab Emirates, solar photovoltaic modules are often installed. The accumulation of dust on the module's top surface prevents the sun's direct light from entering the space. It reduces the solar PV module's facility generating capability. If the module is not cleaned for a month, the power output decreases by up to 50%. An autonomous cleaning system has been created to detect dust on the solar array and clean the module on its own, therefore reducing dust every day. Compared to our approach, the automated cleaning equipment that is being provided is more expensive and large in terms of daily energy production.

I. INTRODUCTION OF PROJECT

When employing installed solar photovoltaic modules, a number of environmental conditions, including wind speed, humidity, ambient temperature, solar radiation, air dust, and direction, affect how much electricity is generated. One major concern is the accumulation of dust on the surface of solar modules, especially in desert areas where dust storms are sporadic to frequent. The accumulation of dust on the PV module's surface reduces the glass cover transmittance, which in turn reduces the quantity of solar radiation that reaches the cells. The decrease in glass transmittance is determined by the site's meteorological conditions, predominant wind direction, orientation, tilt angle, exposure time, and dust density. The impact of dust on PV module power output and current-voltage (I~V) characteristics is determined by the density, content, and particle dispersion of the dust that has been deposited. Research conducted in arid areas to examine how dust accumulation affects solar module power output has shown that dust accumulation causes a steady decrease in module power. Pmax, or the average monthly peak power production for each day throughout the study period, is shown in Fig. (1). Furthermore, if water is present in such dry areas, it includes a highly soluble salt that corrodes the panels.

There are many of solar power sources in nature since the sun is a great source of energy. Providing the world's energy needs would be more than possible if all solar energy could be harnessed. But this isn't feasible because of the surrounding environmental circumstances. Solar energy

is often transformed into more useful forms of energy using solar arrays. There is a lot of interest in renewable energy, particularly solar power as it produces electricity without affecting greenhouse gas emissions. A lot of options have looked at the photovoltaic approach to generating power from solar radiation. It claims to meet the steadily rising need for energy. Weather-related restrictions on the solar array's effectiveness make elements like temperature, moisture content, and dust level crucial. In this regard, dust buildup and no dust accumulation were both used in the solar array efficiency research. We will employ the design and execution of an automated dust cleaning system in this project. The primary goal of the project is to provide a system for automatically clearing dust from the solar array. The effectiveness of photovoltaic (PV) electricity is influenced by a number of elements, including dust, dirt, pollen, snow, and extreme temperatures. The primary element influencing PV panel efficiency is dust, which may lower performance by up to 50% depending on the location. Historically, cleaning has been done by hand. The drawbacks of manual cleaning include poor maintenance, mobility issues, accident and panel damage, etc. The problems with traditional cleaning methods have been overcome by the automated dust cleaning system of solar panels. It also produces excellent cleaning and prevents fluctuations in efficiency caused by dust deposition. Studies were done to evaluate the solar array's effectiveness after one week and one month of dust accumulation. A week and a month after the surface was cleaned, the solar array's efficiency was also computed. Lastly, comparing the two efficiencies shows that the solar array's efficiency rises noticeably. The created model enhances the solar array's performance.

II. LITERATURE SURVEY

A) the whole planning and building of an automated solar panel tracking system using microcontrollers. There is no automated tracking of sun light dependent on intensity; the solar panel is stationary.The LDR sensor in the system design detects the maximum solar power, which is then sent to the Arduino, which digitizes the LDR output. Its active sensors track the sun's rays continuously and spin the screen in the direction of greatest solar intensity.The earth's rotation prevents the panels from staying in front of the sun at all times. It is necessary to have an automated system that is able to rotate solar panels continuously. This method is special in that it uses the sun as a guide rather than the earth as a point of reference.

B) A) The Boston University Study detailed the advantages and disadvantages of the three available solar panel cleaning techniques. These techniques include hand washing, cleaning with an electrodynamics system (EDS), and cleaning naturally via rain and snowfall. Interdigitated Electrodes (made of indium oxide) inside a transparent dielectric film make up an upcoming technology known as an EDS. Three phase pulsed voltages with low power (5 to 20 Hz) are used to control the cleaning process. While a multi-phase electric curtain-based system or electro-dynamic screen (EDS) needs a high-voltage external power supply

to function, the PV cell's power output may often make the EDS self-sufficient. In order to be sustainable, it combines a transparent EDS with a photovoltaic array as its power source. In only a few minutes, our procedure restored 90% of the reflectivity.

C) B) Although manual cleaning isn't strictly a robot, it's nevertheless vital to mention since it's one of the most popular methods for cleaning home solar panels in use today. It's dangerous and needs the proper equipment, so standing on ladders or climbing on rooftops is usually a job for the experienced. However, unless it is done on a regular basis, this strategy could not have much of an impact on the annual yield. This might be a very poor investment if the work is done by a contractor since the labor expenses will be higher than the profit margin.

D) C) In dry places, sprinkler systems are often used to maintain clean panels. It may clean panels at a comparatively cheap cost and has the same cleaning effect as rainfall. The system shown on the Heliotex website functions by means of a soap dispensing system and a water filtering system, similar to the majority of systems. They also state that in places with water, it is optional to treat the water and that water hardness has to be evaluated. There are several disadvantages to this method, despite the fact that it frequently works really well. This method won't clean as completely as a brush system, but it works well in really dry sandy places where sand piles up quickly.

III. DESIGN OF HARDWARE

This chapter briefly explains about the Hardware. It discuss the circuit diagram of each module in detail.

ARDUINO UNO

A microcontroller board based on the ATmega328 is called the Arduino Uno (datasheet). It has a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (six of which may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; all you need to do is power it with a battery or an AC-to-DC converter or connect it to a computer via a USB connection to get going.The FTDI USB-to-serial driver chip is not used by the Uno, setting it apart from all previous boards. As an alternative, it has the Atmega16U2 (or Atmega8U2 up to version R2) configured as a serial-to-USB converter. The 8U2 HWB line on the Uno board is pulled to ground by a resistor, which facilitates DFU mode entry. The Arduino board now includes the following updates:

• 1.0 pin out: two further new pins, the IOREF, are positioned next to the RESET pin, the SDA and SCL pins that were introduced, and they enable the shields to adjust to the voltage supplied by the board. Shields will eventually work with both the Arduino Due, which runs on 3.3V, and the boards that utilize the AVR, which runs on 5V. The second pin is unconnected and set aside for future uses.

• A more robust RESET circuit.

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• The 8U2 is replaced with an ATMega 16U2.

"Uno" is an Italian word for one, and it was chosen to commemorate the impending introduction of Arduino 1.0. Going future, the Arduino reference versions will be the Uno and version 1.0. The Uno is the most recent in a line of USB Arduino boards and the platform's standard model; see the index of Arduino boards for a comparison with earlier iterations.

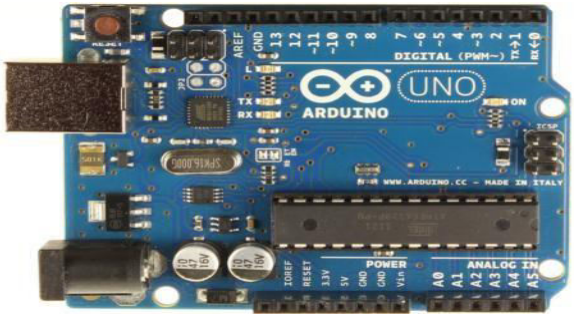


Fig: ARDUINO UNO

POWER SUPPLY:

The purpose of the power supplies is to convert the high voltage AC mains energy into a low voltage supply that is appropriate for use in electronic circuits and other devices. One may disassemble a power supply into a number of blocks, each of which carries out a specific task. "Regulated D.C. Power Supply" refers to a d.c. power supply that keeps the output voltage constant regardless of differences in the a.c. main or the load.

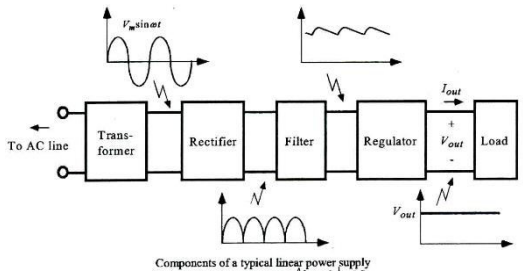


Fig: Block Diagram of Power Supply

LCD DISPLAY

The model shown here is the one that is most often utilized in practice due to its cheap cost and enormous potential. Its HD44780 microcontroller (Hitachi) platform allows it to display messages in two lines of sixteen characters each. All of the alphabets, Greek letters, punctuation, mathematical symbols, etc., are shown. Furthermore, it is possible to show custom symbols created by the user. Some important features are the automatic changing of the message on the display (shift left and right), the presence of the pointer, the lighting, etc.

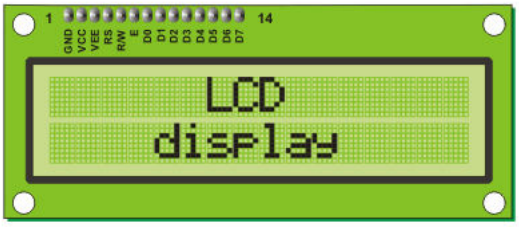
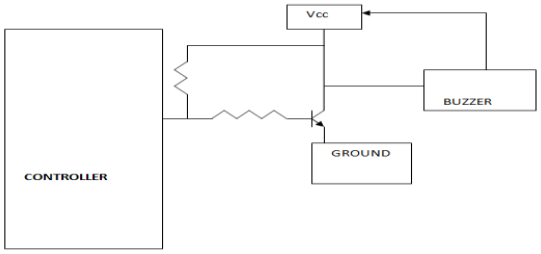


Fig: LCD

BUZZER

Relays, buzzer circuits, and other circuits cannot be driven by the current available on digital systems and microcontroller pins. The microcontroller pin can provide a maximum of 1-2 milliamps of current, even though these circuits need around 10 milliamps to work. Because of this, a driver—such as a power transistor—is positioned between the buzzer circuit and microcontroller.



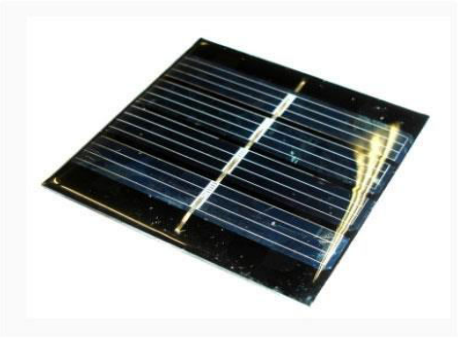
Solar panel :

A solar panel may be any of three types: a solar hot water panel, a photovoltaic (PV) module, or a group of solar PV modules installed on a supporting structure and electrically linked. A PV module is a solar cell assembly that is linked and packed. For both commercial and residential use, solar panels may be utilized as a part of a larger photovoltaic system to create and deliver power. Each module is assigned a rating based on its DC output power, which normally falls between 100 and 320 watts under conventional test settings. Given the same rated output, a module's efficiency dictates its size; for example, a 230-watt module with an efficiency of 8% would have double the area of a module with an efficiency of 16%. A small number of solar panels are on the market with efficiency levels higher than 19%. Most solar setups consist of many modules since a single module can only provide a certain amount of electricity. An inverter, a panel or array of solar modules, a battery, a sun tracker, and connecting wire are the standard components of a photovoltaic system.

Through the process of photovoltaic effect, solar modules employ light energy, or photons, from the sun to create electricity. The vast majority of modules employ thin-film or wafer-based crystalline silicon or cadmium telluride cells. Either the top layer or the rear layer of a module might be the structural (load-bearing) element. Additionally, cells need to be shielded from moisture and mechanical harm. The majority of solar modules are inflexible, while those that are based on thin-film cells are semi-flexible. In 1958, these primitive solar panels saw their first usage in orbit.

To give a specified current capacity, electrical connections are built in parallel or series to provide the necessary output voltage. Silver, copper, or other non-magnetic conductive transition metals may be included in the conducting wires that remove the current from the modules. Electrical connections between the cells and the rest of the system are required. Externally, MC3 (older) or MC4 connectors are used by common terrestrial use photovoltaic modules to provide simple, weatherproof connections to the rest of the system.

In the event that a partial module shade occurs, bypass diodes may be added inside or used externally to enhance the output of the lighted module parts.



L293D:

Half-H drivers with triple high-current include the L293 and L293D. With voltages ranging from 4.5 V to 36 V, the L293 is intended to provide bidirectional driving currents of up to 1 A. Up to 600 mA of

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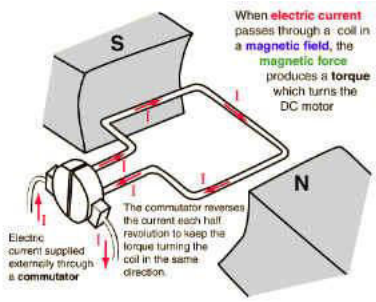
bidirectional driving current may be achieved with the L293D at voltages ranging from 4.5 V to 36 V. In positive-supply applications, these devices are intended to drive inductive loads such solenoids, relays, dc, and bipolar stepping motors, in addition to other high-current/high-voltage loads. Every input is compatible with TTL. With a pseudo-Darlington source and a Darlington transistor sink, each output is a full totem-pole driving circuit. Drivers 1 and 2 are enabled by 1,2EN, while drivers 3 and 4 are enabled by 3,4EN. Drivers are enabled in pairs. The corresponding drivers are activated and their outputs are active and in phase with their inputs when an enable input is high. These drivers are disabled and their outputs are turned off and in the high-impedance condition when the enable input is low. Each pair of drivers creates a full-H (or bridge) reversible drive appropriate for solenoid or motor applications when the right data inputs are provided.

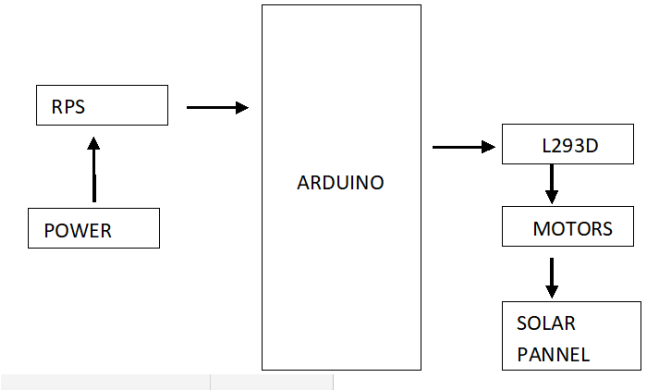
DC MOTOR

A DC motor is intended to operate with DC electricity. Michael Faraday's homopolar motor, which is rare, and the ball bearin motor, which is a recent invention, are two instances of pure DC designs. The two most popular forms of DC motors are brushed and brushless, which are not strictly speaking DC machines since they require internal and external commutation, respectively, to produce an oscillating AC current from the DC source.



IV. BLOCK DIAGRAM AND HARDWARE DISCRIPTION

4.1. BLOCK DIAGRAM:



V. CONCLUSION

Current automatic cleaning systems are primarily designed for big solar energy facilities and are often not suitable for installation on residential roofs with smaller solar panels. This technique gives these smaller solar panels a huge benefit since it means that for individuals with limited space, just a smaller solar array has to be built. Systems for solar panels are often put on the highest part of the roof.

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