Solar Tracking System For Optimal Power Generation

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Abstract – In this propose paper, we will see the main advantage of this system. When there is power cutoff then the stored power is used. This system is mostly used in farm in villages because there is more power cutoff of electricity in the villages, for saving the power we will use battery as storage device. The solar cell works on the principle of photo electric effect. This system is practically highly feasible (easy) in economic point of view and has an advantage of storing power using renewable source. This system gives reliable, durable, accurate and efficient way of store the power using solar panel.

Keywords- Arduino Uno board, solar panel, servo motor, battery, GSM, renewable energy, DC pump.

I.   INTRODUCTION

Now days the electricity is becoming most important, without electricity not a single electrical or electronic appliances can work. But the major shortage of electricity or cutoff of the electricity is in the rural areas. Because of the unexpected cutoff of electricity, the farmer phases difficulty in farming. To reduce their difficulty and make their farming easy, here we will generate the electricity with the help of solar energy and the solar energy is the one of the renewable energy source. Our domain is to generate electricity with the help of solar energy. In this with the help of sun rays we generate electricity. Here first of all we should know how the solar panel works? Here in solar panels there are many blocks which are equally implemented in their entire area of solar panels. We can also call as solar cell. The solar cell has a nonlinear relationship between its output voltage and current. [1] The values of these parameters depend upon solar irradiance and cell temperature.

These solar cells are also known as photovoltaic cell. The conversation of the energy into electricity (one form of energy into another form of energy). [6] The photovoltaic cell work on the principle of photo electric effect in this the sun rays falls on the solar panel in that the ray will emit the electron. The silicon is also known as semiconductor material it is used in manufacturing or designing of the solar panels. The sun light in the form of photons which radiates from the sun rays and the rays will heat the silicon atoms of solar cell. So, the "n-type" silicon pare jumps over to fill the gap in the "p-type" silicon that means the "n-type" silicon becomes (+ve) charged & "p-type" silicon becomes (-ve) charged by creating electric filed across the cell so the electric field will generate the power. Here we will make tracking system which will track the sun ray for generation of the electricity. [2] Various methods have been implemented and used to track the position of the sun. The principle of operation of a PV cell is the simplest of all uses an LDR – a Light Dependent Resistor to detect light intensity changes on the surface of the resistor. To store the voltage there will be a battery. Our system will also operate, when there will be cutoff.

II.   SCENARIO OF OUR PROJECT

A solar tracker is an electro-mechanical system used on behalf of orienting a solar photovoltaic panel in the direction of the sun. It is used in many applications such as the transportation signaling, lighthouses, emergency phones installed in the highways, etc… Its main objective is to find the maximum sun radiations in order to get maximum charge for the batteries. Electricity can be generated from the sun in several ways. Photovoltaic's (PV) has been mainly developed for small and medium-sized applications, from the calculator powered by a single solar cell to the PV power plant. For large -scale generation, concentrating solar thermal power plants have been more common, however new multi-megawatt PV plants have been built recently. A photovoltaic cell (PV cell) is a specialized semiconductor that converts visible light into direct current (DC). Some PV cells can produce DC electricity from infrared (IR) or ultraviolet (UV) radiation. Photovoltaic cells are an integral part of solar-electric energy systems, which are becoming increasingly important as alternative sources of power utility. Solar cells generate DC electricity from light, which in turn can be used in many applications such as: charging batteries, powering equipment, etc. They produce currents as long as light shine.

The detection of the position of the sun undergoes. A digital system (LPC2148) is used to calculate the maximum sun radiation [4]. It is connected to a stepper motor and to light dependent resistors to redirect the panel to the

sun. It sends the received data (position of the sun) to the stepper motors in order to position it toward the sun. The position angles are stored in the processor registers and can be displayed on an LCD or can be transmitted to a remote system.

Here we are using Arduino Uno R3 board in that board the microcontroller is ATmega328. Secondly, we are using maximum light sensing circuit, in that it will sense the light which is falling on the LDR. We will use light sensing circuits in both directions. Here in the Arduino board as per the coding the controller will check the resistance value of both sensing circuits, then it will consider only high value which is occupied by any one of the light sensing circuit. Now the servo motor will get command through Arduino Uno board to rotate the solar panel according to the movement of sun direction. We are using three solar panels which will be connected in series.

The solar panels will be mounted on the solar tracking structure. The servo motor will be attached at its required position. The light sensing circuits will be also mounted on the solar tracking circuit and this scenario is called as the mechanism of the solar tracking system. The solar panels will rotate 180^0. The solar panel generates 7 volts each and it will be in DC.

In the structure of solar panel there are many solar cells which are connected with each other after observing the ray it converts solar energy into electrical energy. To store the generated voltage, we will use battery. This generated voltage will be store in the battery. The battery storing capacity will be 12 V. With the help of pump driver circuit the pump will run. To make easy for farmer to operate the pump we will use GSM (Global Switching for Mobile). With help of GSM the farmer can easily operate the ON and OFF operation at anytime and anywhere. The pump will get supply from the battery, which will be charging continuously from the solar panels.

When we give 230v AC power supply at input terminal of the step-down transformer and at output terminal side which is connected with a bridge rectifier and at the output of the bridge rectifier we get 12v DC supply. The output of rectifier is given to the voltage regulator which is IC LM7805 which provides 5v at the output. We are using two batteries which will work simultaneously. One battery is for the pump and another battery is for the system. If the main supply get cutoff, then to make system working continuously another battery which is already charged and is in standby mode the relay will directly switch the battery supply to the system to make it run continuously and generate electricity. Also, the battery which is used to make system continuous, that battery will be charged parallel when the AC supply will be ON.

III. BLOCK DIAGRAM
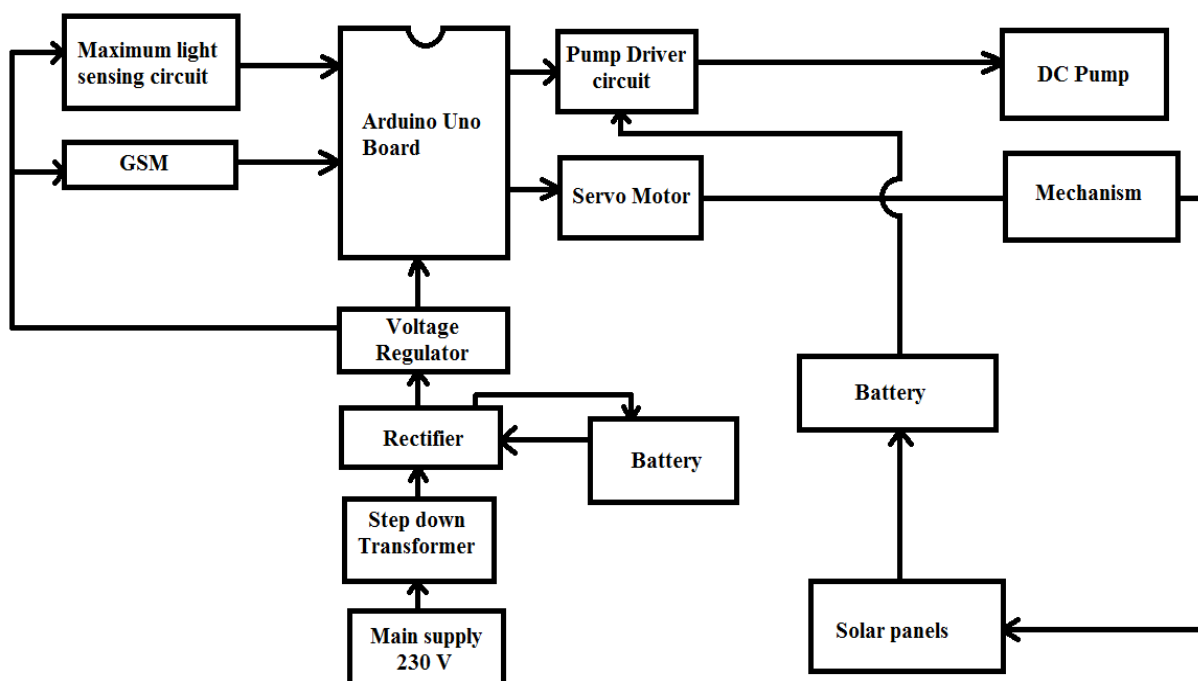
Figure 1. Block Diagram

IV. SOFTWARE

Here we will use Arduino IDE software to write the program. We will right two programs, one will be for tracking purpose and second one will be for operating the pump. The IDE stands for Integrated Development

Environment. The Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload the programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension. ion. Arduino Software (IDE) pre-1.0 saved sketches with the extension .pde.The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

V. ADVANTAGES

A. It is easy to install.
B. Easy to operate the system.
C. System works efficiently.
D. Use of the renewable energy.
E. Generate the voltage efficiently.
F. It does not generate pollution.
G. Fast response time.
H. Maintenance cost is less.

VI. APPLICATION

A. Useful in village.
B. Useful in hospital and industries.
C. Useful in collages and school.
D. Useful in satellite.
E. Useful for house- hold purpose.
F. We can use in electric car also.
G. Used in street light system.

VIII. CONCLUSION

Here we are implementing a tracking system in which we can grasp the maximum power from the sun rays by continuous tracking as peer the direction of the sun and generate more electricity efficiently without any pollution.

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