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SOLAR TRACKING BASED MOBILE CHARGER WITH BATTERY VOLTAGE ANALYZER USING ARDUINO

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Abstract: *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 panels consist of photovoltaic cells, converts the solar energy into electrical energy and this electrical energy is stored into the battery. Solar energy is a time dependent energy resource, at night or during heavy cloud cover, solar panels cannot produce energy. Hence need has aroused to develop a project, which can be used to utilize the solar energy effectively, when the sun is present. This project work is designed the system rotates the panel automatically according to the sun position, so that maximum solar power can be utilized. Two LDR's are used, where one is used to distinguish day/night and the another is used to trace out maximum intensity. One more additional controller is connected to the third LDR through trigger circuit designed using a 555 timer for detecting any shadows falling. If so, automatically the chassis will be moved by operating the DC motors until the shadow is removed. Here we using an IR sensor are used to detect the pits on the ground surface. Thus, the electrical energy generated from the solar panel is stored into a rechargeable battery through a charging control circuit that protects the battery from high voltage and over charging. In addition, the battery voltage is analyzed by the Arduino controller ad will be displayed in the LCD interfaced to it. The battery output is connected to a voltage regulator of 5V to charge the mobile phone.*

Keywords-*Light Dependent Resistor(LDR),Arduino microcontroller,Solar panel,Charge controller.*

I. INTRODUCTION

As the availability of fossil fuel declines, there is need to find alternate energy sources. Of the many sources, solar energy available in abundance and renewable is the ultimate source of all known forms of energy. It is clear, safe, and free, does not pollute the environment and thus will be an extremely viable alternative in the days to come. Power generation from sunlight is done by solar tracking method. This requires maximum sunlight in order to generate power. This is tracking for maximum intensity of light. If the intensity of light is low, panels automatically changes its direction to get maximum intensity of light. Trackers are used to increase the daily output of PV modules by keeping them faced as directly as possible towards the sun. The sun sees a wider surface and the increase reflectivity that occurs at low angles of incidence is avoided. During the long days of summer when the sun is rising north of east and setting north of west, a tracker can increase the daily output of modules by 25 to 40 percent. During winter season when the sun takes a low, short arc above the horizon, the tracker will contribute much less, perhaps 10 to 15 percent. In this project work controller is used for sensing the presence and position of the Sun, according to the received information from the sensors, controller controls the panel automatically. Microcontrollers are increasingly being used to implement control systems. It is therefore important to understand controlled system well. This project describes about the design and development of "Solar Tracking and Panel Positioning System using Microcontroller".

II. FUNCTIONAL DESCRIPTION

The module consists of Solar panel, battery, logic circuit, charging circuit, light sensors (LDR), control circuit, etc. and is designed as totally automatic to track the position of sun. DC motors with built in with reduction gear mechanism are used for the movement of the solar panel that tracks the sun automatically.

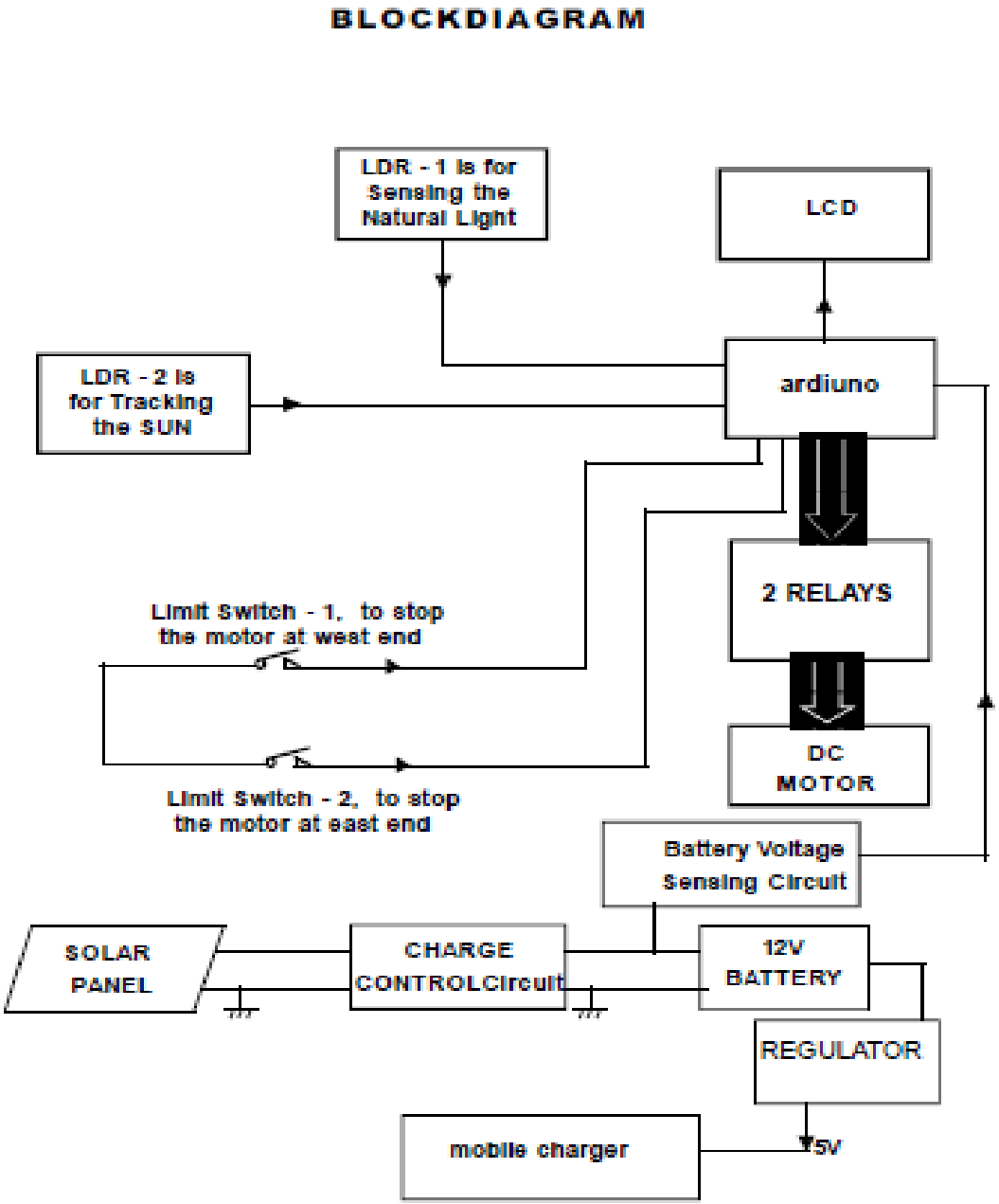

Fig1: Block diagram

In this project work two LDR's (light dependent resistors) are used as light sensing devices. The first LDR is used for detecting the intensity of sun light irrespective of its position, for energizing the system and the second LDR is used for detecting the position, to drive the panel towards the sun direction. The outputs of the both LDR's are fed to ADC(analog digital converter) for converting the analog information into digital information which is fed to the microcontroller chip. According to the digital information received from ADC, the microcontroller energizes the DC motor. The motor rotates the solar panel from west to east and again from east to west, for tracking the sun by rotating the motor in clockwise and anticlockwise direction. When the panel is positioned towards the sun, the microcontroller sets the motors automatically to move in the respective direction. The speed of the motor can be increased or decreased by increasing or decreasing the pulse rate produced by the microcontroller. This is how the sun is tracked and positioned using microcontroller.

III. OPERATION OF PROJECT

The project "SOLAR BASED MOBILE CHARGER WITH VOLTAGE ANALYZER USING ARDUINO" is explained in brief as follows:

Fig 2: Project Kit

- Initially, the battery voltage is read and it is displayed in the LCD (Liquid Crystal Display) screen.
- Now, when the battery voltage is greater than 10 volts, then the tracking will be ON (i.e.), the DC motor rotates the solar panel. Otherwise the tracking will be OFF (i.e.), the DC motor stops rotating the solar panel.
- In this project, we use two LDR`s (Light Dependent resistors) as Light Sensing Devices.
- LDR-1: It is used for detecting the environmental changes (Day/Night) irrespective of its position, for energizing the system. When the LDR-1 is less than 4 volts (Day), then the DC motor runs. If the LDR-1 is greater than 4 volts (Night), then the DC motor stops rotating.
- LDR-2: It is used for detecting the maximum intensity of sunlight, to drive the panel towards the sun direction only. When the LDR-2 is greater than 1 volt then the DC motor runs. If the LDR-2 is less than 1 volt then the DC motor stops rotating.
- The outputs of the both LDR`s are fed to ADC (Analog - Digital Converter) pins of an Arduino microcontroller (AT Mega 328) for converting the analog information to digital information which is read internally and according to the digital information, the microcontroller energizes the DC motor.
- This DC motor plays a very important role as it rotates the solar panel from WEST to EAST and again from EAST to WEST vice-versa. This method is mainly used for tracking the maximum amount of sunlight. When the panel is positioned towards the sunlight, then the microcontroller de-energizes the DC motor automatically.
- The energy produced by the solar panel is stored in a rechargeable battery. It is used for charging the electronic appliances like mobile phones.

IV. ADVANTAGES

- **Cost Effective**: Compared to other mobile chargers, the solar chargers are cost effective as it absorbs power from the sun. It does not require electric power.
- **Versatile**: It is also known to be versatile as it can be used for all types of mobile phones.
- **Uninterrupted Power Supply**:Main advantages of solar mobile phone charger is that it can be used to charge mobiles even during power outages.
- **Emergency Purposes**: Another benefit is that it hardly requires any electrical outlet. It can therefore be used during emergencies and outdoor purposes.
- **Compact Design**: Solar mobile phone chargers are compact in size and easy to carry anywhere.

V. CONCLUSION

Renewable energy is not a new concept, never the less at an exponential growing population, the development and improvement of them are essential to sustain world power hunger. In 2050 the population expectation on earth is about 9 billion people, where approximately 5 billion will use mobile phones. The application of renewable energy plays a significant role at global energy saving. Solar chargers are portable and ready to use devices which can be used by anyone especially in remote areas.

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