Optimal Battery Charging in a Solar-Powered Robotic Vehicle

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Abstract— This project focuses on the working of a robot with the help of servomechanism solar panel and the ATMEL16L microcontroller .It has on chip memory used for storing the program (set of instructions). Based on the program execution the robot will take the decision in order to performing particular operation. Our proposed system is not only used to controlling the robot but also used for charging the battery completely in day time. It is also used for charging a mobile phone throughout the day. The aim is completing the process of charging a battery independently while the other battery provides all the energy consumes by the robot.

Key words: Servo Mechanism Solar Panel, Mobile Charger, Battery, Robot, Microcontroller

I. INTRODUCTION

In order to operate robot in which the decision is taken by robot itself. Here the robot is operated based on instructions stored in ATMEL16L microcontroller. The main Moto of this project is the decision is taken by the robot itself with help of solar energy and the servomechanism. Here the importance of servomechanism is used for getting solar energy from the sun entire day time, that is a solar plate is moved with respect to the direction of sun. The batteries are used in this project in order to storing the charge in daytime and that stored charge is used by robot during night time. Here the entire operation of robot is under the supervision of microcontroller. In this project we are using three LDR's at different positions in order to get the solar energy in daytime. The operation of servomotor mechanism is depending up on the instructions executed in microcontroller, that is in microcontroller depending up on the voltage drop in LDR's a particular group of instructions are executed. Due to this the servomotor mechanism works.

II. EXISTING SYSTEM:

In existing system there is the presence of fixed solar plates. In order to get the voltage from the solar energy. Due to this at particular time of day only we are getting the voltage from the solar panel. Why because the sun rises in east and sun sets in west

III. MODIFIED MEMS SYSTEM DESIGN

Depending on the voltage drop across the LDR'S the servo motor mechanism will be well controlled and served. By connecting the LDR'S in three different positions to ease the servomotor to move in the multiple directions such that the solar panel all the time under continuous storage of the charge due to sunlight. This further utilized and independent voltage source for battery charging in the mobile phone and as well as to keep the robot in continuous monitor state and movement.

A. MEMS Design:

The resulting architecture is more close efficient while achieving throughputs up to 10times faster than conventional CISC microcontroller the Atmega16 provides the following features,16Kbytes of in system programmable flash program memory with Read-while-Write capabilities 512bytes EEPROM,1kbytes SRAM,32 General purpose I/O Lines ,32general purpose working registers a JJAG interface for boundary-silicon chip debugging the Atmega16 achieves throughputs approaching 1MBPS per MHZ allowing the system designed to optimize the power consumption versus processing speed .in extended standby mode, both the main oscillator and the asynchronous timer continue to run. This has been manufactured by using Atmel's high non volatile memory technology. the on chip ISP flash allows the program memory to be reprogrammed in system through an SPI serial interface by a conventional non volatile memory programmer or by an on chip boot program running on the AVR core ,the boot program can use any interface to download the application program in the application flash memory. The Atmega 16 AVR is supported with full suite of program and system development tools include c compilers, macro assembly, program debugger or simulators in circuit emulators and evaluation kits.

B. LDRs:

It's an light controlling varying resistance, the resistance of a LDR decreases with increase in incident light intensity, In other words it exhibits photo conductivity .LDR is made of a high resistance semiconductor , with dark it has few mega ohms(MΩ).The resistance range and sensitivity of LDR can substantially differ among dissimilar devices. Moreover unique LDR may react substantially difficulty to photons within certain wavelength bands.

C. Li-Po Batteries:

Unlike cylindrical and prismatic cells, Ii-pos come in a soft package or pouch, which makes them lighter but also lack rigidity, Lithium-ion polymer battery is a rechargeable battery of lithium-ion technology in a pouch format , the more general term lithium ion is used almost everywhere else including consumer electronics such as mobile phones and note book computers and batteries the name "lithium polymer (Li-po)"is more wide spread among users of radio-controlled models, although the name "lithium polymer", is mostly applied to lithium ion cells in pouch format which still contain a liquid electrolyte. However attempts to design a polymer electrolyte cell include the use of inorganic ionic liquids such as 1-butyl3-mehtylimidazoli tetra flour borate as a plasticizer a microspores' polymer matrix.

IV. IMPLEMENTATION DETAILS:

The cell consists of the semiconductors of the P-N junctions. It will convert light-weight into electrical energy. thus we

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will assume that electricity made victimization daylight shining on the cell are often used like common electricity. The equivalent circuit of the cell is shown in Fig. 1. the present offer I pH represents the electrical current generated from the sun beaming on the cell. Rj is that the non-linear ohmic resistance of the contact. Dj could be a contact diode, Rsh and Rs represent the equivalent lineup with the inside of the materials and connecting resistances asynchronous. Sometimes generally analysis, Rsh is giant, and also the worth of Rs is tiny. thus so as to modify the method of research, one will ignore Rsh and Rs . The image artificial language represents the external load. I and V represent the output current and also the voltage of the cell, severally. From the equivalent circuit, and supported the characteristics of the contact, (1) presents the association between the output current I and also the output voltage V : Where np represents the parallel whole number of the star cell; ns represents the series connected whole number of the star cell; alphabetic character represents the contained electricity in associate electro (1.6×10−19 Columbic); k is that the Ludwig Boltzmann constant (1.38×10−23 J / °K); T is that the temperature of the cell (absolute temperature °K); and A is that the ideal issue of the cell (A = one ~ five). the present Sat I in (1) represents the reversion saturation current of the alternative energy. Further, Sat I are often determined by victimization the subsequent formula: Where Tr represents the reference temperature of the cell; Irr is that the reversion saturation current at the time once the star cell reaches its temperature Tr ; and EGap is that the energy required for crossing the energy band gap for the semiconductor materials. (the crystalline EGap ≅ one.1eV). From the study we tend to square measure able to recognize that once the temperature is fastened, the stronger the daylight is, and also the higher the open-circuit voltage and short-circuit current square measure. Here we will see the apparent effects of illumination on the short-circuit current, instead of the open-circuit current. thus the cell will offer higher output rate because the daylight becomes stronger, i.e. cell facing the sun.

Fig. 1: Robot based mobile charger

V. RESULTS

The main abstract of the project is to get done with the mobile Charging and the independent voltage or power source to automate the performance of the Robot. With this the Robot will be under continuous charge supply to do any kind of work without any elapsed gap. one way we can even reduce the complexity of the hardware unit since the replacing of entire battery with only servomechanism solar panels possibly. Artificial intelligence has offered so much in this that it has incorporated the application with program in the microcontroller. This has clearly showed in the below figure.

Fig. 2: Solar panel

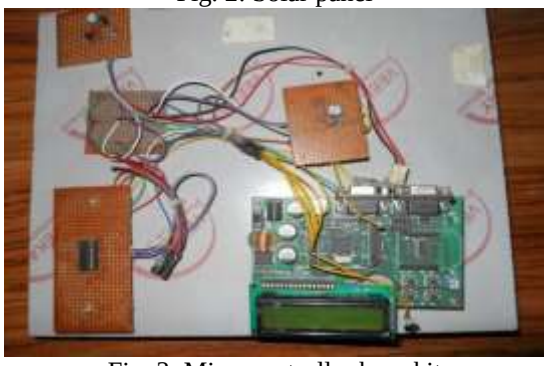

Fig. 3: Microcontroller base kit

VI. FUTURE SCOPE

This automation of battery charging and making it use for robot movement and task completion still can further extend to not only charging the mobile phone but also electronic gadgets such as laptops and high power consuming gadgets also. This application is relevant in the real time applications and Robot will be under continuous monitoring process without any gap of supply.

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