Micro Controlled Battery Charging For a Solar Powered Rover With Pick and Place System

Vellaturi Sreedhar
M.Tech (Embedded systems),
Aryabhata Institute of Techonology and Science.

M.Varasundar
Assistant Professor,
Department of ECE,
Aryabhata Institute of Techonology and Science.

C.Madhusudan
Assistant Professor & HOD,
Department of ECE,
Aryabhata Institute of Techonology and Science.

Abstract:

This paper focuses on the design and construction of an optimization charging system for Li–Po batteries by means of tracked solar panels. Thus, the implementation of a complete energy management system applied to a robotic exploration vehicle is put forward. The interest of this robotic system lies in the design concept, based on a smart host microcontroller. On this basis, our proposal makes a twofold significant contribution. On the one hand, it presents the construction of a solar tracking mechanism aimed at increasing the rover's power regardless of its mobility. On the other hand, pick and place also connected to the robot. The aim is completing the process of charging a battery independently while the other battery provides all the energy consumed by the robotic vehicle with pick and place robot.

Index-terms:

ARM processor, ZIGBEE module, solar panel, sensor, motors, pick and place.

I.INTRODUCTION:

Robot is an electro-mechanical machine which is guided by an electronic circuit. It can be independent, semi-independent or remotely controlled. The use of robots in military war raises moral worries. Industrial robots generally consist of a jointed arm and end effectors that is attached to fixed surface. In 2003, NASA's Mars Exploration Rovers will launch towards Mars in search of answers about the history of water on Mars.

Robotic exploiters used in manufacturing are examples of fixed robots. They cannot move their base away from the work being done. Mobile robots are comes with wheels or tracks attached it. Instead of wheels, some robots have legs in order to move about. Robots have high accuracy and toughness so they are now used in all the fields. But robots are human dependent because of their battery charging. In order to make them human independent we can use solar energy for their battery charging. Solar energy is the best renewable resource which can generate electricity. The photovoltaic cells used in calculators and satellites are used for converting sunlight directly into electricity. This cell is made up of semiconducting materials such as silicon. When light strikes the semiconductor it is absorbed and then allows the electron energy to flow freely.

The main function of PV cells is it converts the phonons to electrons. An atom of silicon has 14 electrons which arranged in three different shells. Silicon has the pure crystalline form. When energy is added to pure silicon, as in the form of heat for example, it can cause a few electrons to break the bonds and leave their atoms. This process produces electric current in p-n junction. This solar energy is used for robotic vehicle by optimizing of battery charging. This can be achieved by using tracked solar panels along with master & slave microcontrollers. The first rechargeable batteries used in Mars exploration rovers, after that many generations of exploration vehicle is inspired by the NASA designs [6] for example consider K9.This rover is for remote science exploration [7] & autonomous operation VANTER robot is solar powered robotic vehicle which was tested on the robotic platform which was unmanned, the

robotic platform known as a Cool Robot uses an algorithm for control purpose of maximum power point aimed to achieve maximum power that is to be supplied from system for five PV modules designed as a cube. At the end, there are some noteworthy projects whose main achievement is the optimal selection of solar energy and different power sources according to the operation conditions of robot.

II.RELATED WORK:
2.1.ARM PROCESSOR:

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set.
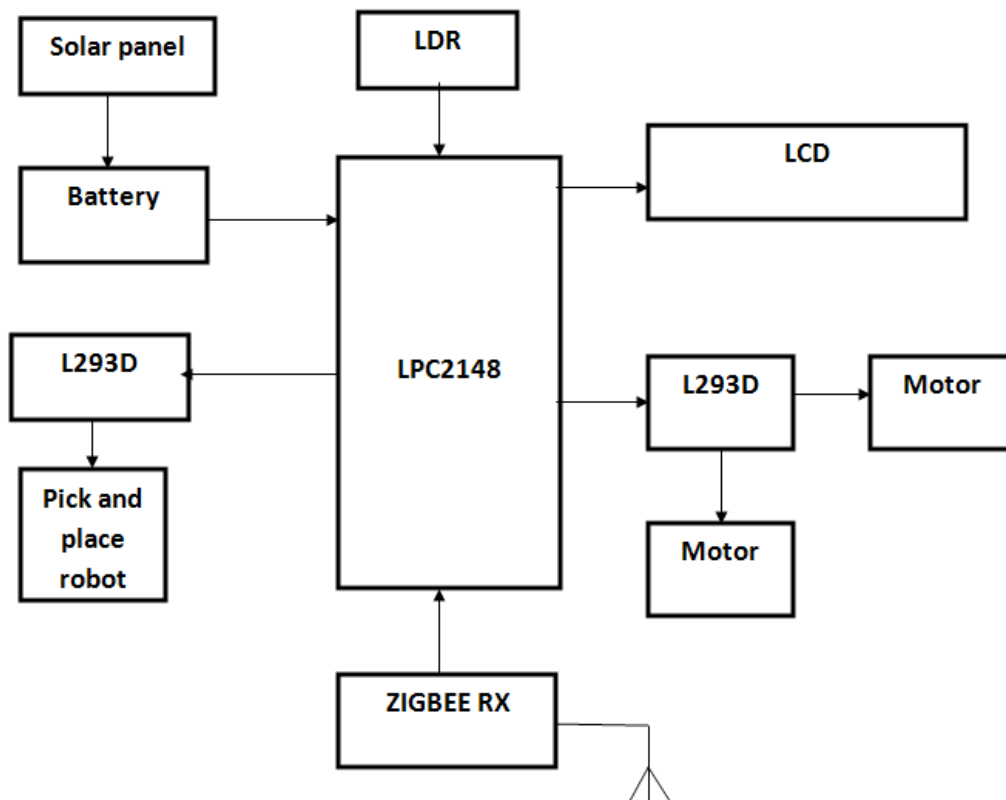
2.2 BLOCK DIAGRAM:
Receiver section:

Figure-1: block diagram of receiver
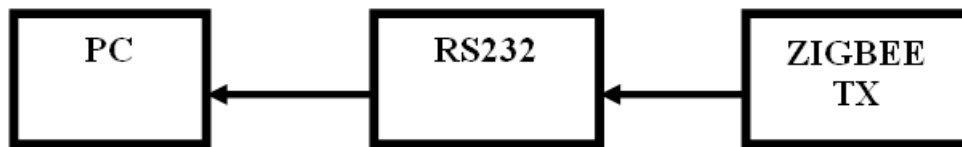
Transmitter section:

Figure-2: block diagram of transmitter

2.3.ZIGBEE MODULE:

ZigBee is a low-cost, low-power, wireless mesh networking proprietary standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range. The ZigBee Alliance, the standards body that defines ZigBee, also publishes application profiles that allow multiple OEM vendors to create interoperable products. The protocols build on recent algorithmic research (Ad-hoc On-demand Distance Vector, neuRFon) to automatically construct a low-speed ad-hoc network of nodes. In most large network instances, the network will be a cluster of clusters. It can also form a mesh or a single cluster. The current profiles derived from the ZigBee protocols support beacon and non-beacon enabled networks.

2.4 EXISTING SYSTEM:

In this project design and construction of an optimization charging system for Li–Po batteries by means of tracked solar panels. Thus, the implementation of a complete energy management system applied to a robotic exploration vehicle is put forward. The robot will controlled through PC using ZigBee communication.

2.5 PROPOSED SYSTEM:

In this project design and construction of an optimization charging system for Li–Po batteries by means of tracked solar panels. Thus, the implementation of a complete energy management system applied to a robotic exploration vehicle is put forward. The robot will controlled through PC using zigbee communication. Here we are using pick and place robot for proposed method.

III.SENSOR AND MOTORS:
3.1 LIGHT DEPENDENT RESISTOR:

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically. Thus in this project, LDR plays an important role in switching on the lights in the room based on the intensity of light i.e., if the intensity of light is more (during daytime) the lights will be in off condition. And if the intensity of light is less (during nights), the lights will be switched on.
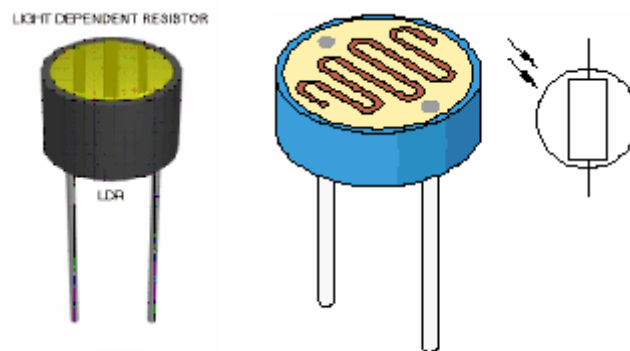

Figure-3: light dependent resistor

When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED glows. The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive.

3.2 DC MOTOR:

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa. The input of a DC motor is current/voltage and its output is torque (speed).

Figure-4: DC motor

3.3 SOLAR PANEL:

A solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel is used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications. Because a single solar panel can only produce a limited amount of power, many installations contain several panels. This is known as a photovoltaic array. A photovoltaic installation typically includes an array of solar panels, an inverter, batteries and interconnection wiring. Photovoltaic systems are used for either on- or off-grid applications, and for solar panels on spacecraft.
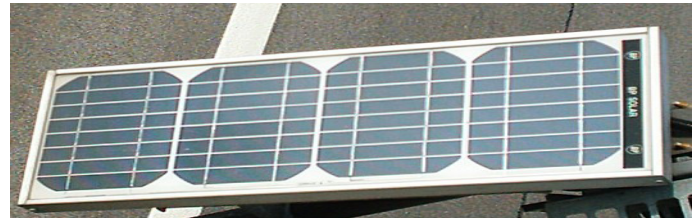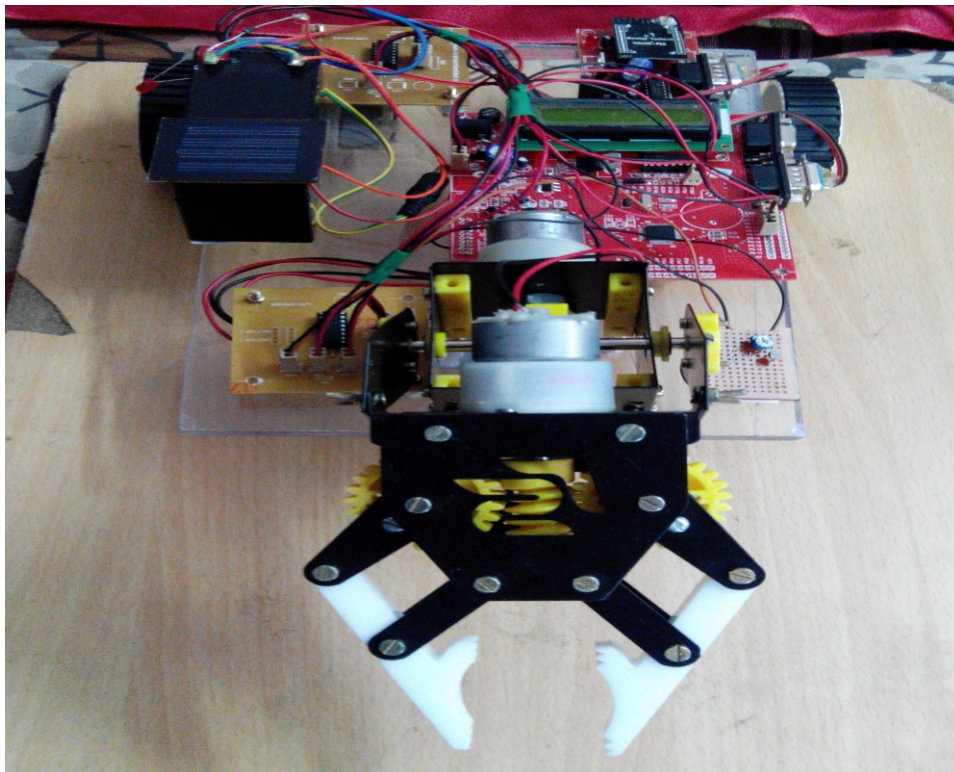

Figure-5: Solar panel

IV.RESULTS:

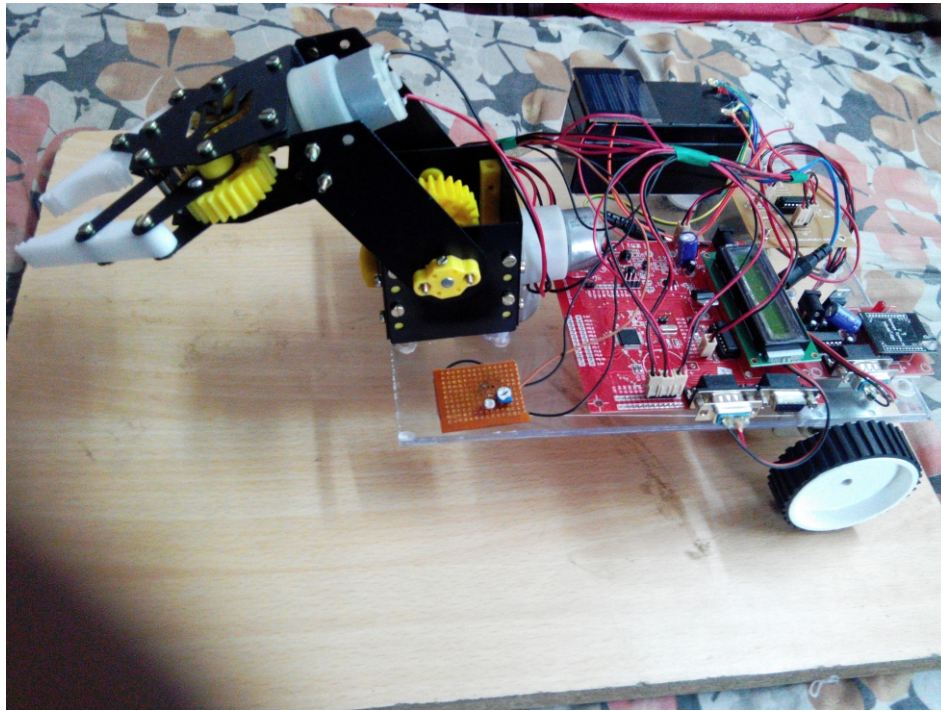**Figure-6: pick and place robot**

Figure-7: pick and place robot at receiver side

V. CONCLUSION:

The project "Micro controlled battery charging for a solar powered rover with pick and place system" has been successfully designed and tested. 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. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

VI. REFERENCES:

[1]. Anderson I A, Ieropoulos I A, McKay T, O'Brien B and Melhuish C (2011), —Power for Robotic Artificial Muscles, IEEE/ ASME Trans. Mechatronics, Vol. 16, No. 1, pp. 107-111.

[2]. Anderson K N and Carlson K (2008), —Elecrothermal Microgrippers for Pick and Place Operations.

[3]. Bajracharya M, Maimone M W and Helmick D (2008), —Autonomy for Mars Rovers: Past, Present, and Future⊐, Computer, Vol. 41, No. 12, pp. 44-50.

[4]. Bartolomeo L, Zecca M, Sessa S, LinBio Rob Arm Z (2010), —A Quiclkly Deployable and Intrinsically Safe, Light Weight Robot Arm for Service Robotics Application.

[5]. Gonz´alez Ramos J E (2010), —Battery Charging Optimization with Steerable Solar Cells, M.S. Thesis, Dept. Electron. Eng., Comput. Syst. Autom., Universidad de Huelva, Huelva, Spain. Smart Optimal Battery Charging in a Solar-Powered Powered Robotic Vehicle www.iosrjournals.org.

[6]. Lee C Y, Chou P C, Chiang C M and Lin C F (2009), —Sun Tracking Systems: A Review, Sensors, Vol. 9, pp. 3875-3890.

[7]. Takahashi Y, Matsuo S and Kawakami K (2008), —Hybrid Robotic Wheelchair with Photovoltaic Solar Cell and Fuel Cell, in Proc. Int. Conf. Control, Autom. Syst.,Seoul, Korea.

[8]. Tomas de J, Mateo Sanguino and Justo E Gonzalez Ramos (2012), Smart Host Microcontroller for Optimal Battery Charging in a Solar-Powered Robotic Vehicle, IEEE/ASME Trans Mechatronics.