ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 3, Issue 11, May 2014

# Electric Vehicle Charging Method for Automobiles Using Photovoltaic Cells

Latha M, Stafford Michahail ,Apoorva K S, Pooja S K,Prafulla P S,Sharvani chandrashekar B C
(Asst.prof, Dept. of TE, GSSSIETW, Mysore, Students of TE, GSSSIETW, Mysore)

***Abstract*—an electric charging method for automobiles using photovoltaic cells is a project that aims to design and implement a reliable system to charge the vehicle using solar energy power sources. The solar energy charging and discharging controller is electrically connected between the storage batteries and the solar panel and electrically connected with a load. This utility model discloses a simple charging device with a solar PV module for charging electric vehicles, comprising a PV panel, a charging protector, and an electric storage battery. Charging model employs series connection, improves charging efficiency, and protects the storage battery by over-voltage and under-voltage. This has advantages of long service life, energy saving, environment protection.***

***Index Terms*—inter integrated circuit (IC2), over voltage, solar power tracking, under voltage.**

## I. INTRODUCTION

The system is designed to run the electric vehicle using photovoltaic cells. The vehicle mounted solar energy power source comprises a solar panel and at least two sets of storage batteries, a fixing support fixed with a vehicle roof is arranged below the solar pane which converts solar energy into electric energy during running and parking of a vehicle[1]**.** The solar energy charging and discharging controller controls at least one set of the storage batteries to be charged, and meanwhile, at least one set of the storage batteries are discharged to provide electric energy for running of the vehicle. Most of the solar panels have a fixed position at a certain angle towards the sky; thus, the power output from the photovoltaic cells (PV) is greatly decreased as the intensity of solar radiation upon the solar panels varies during the day [7].Solar panels are to be integrated with solar tracking system which will move the panels in such a way that direct sunlight is always incident with the PV cells to ensure maximum power output. This proposal is for Solar Vehicle charging system, which is basically to augment the electric power used to charge electric vehicles. A few years ago, it was decided that the educational institution must be carbon free by the end of year 2010. The objective of this project is to design and develop electric vehicle which charges from Photovoltaic cells [6].

## II. DESIGN METHODOLOGY

The block diagram shows the basic design of the project and the components involved and their respective functions and specifications. It includes microcontroller P89V51RD2, LCD 16X2, Voltage divider, ADC PCF8591, Battery, H-bridge Motor L293D, Charge Controller and DC Motors

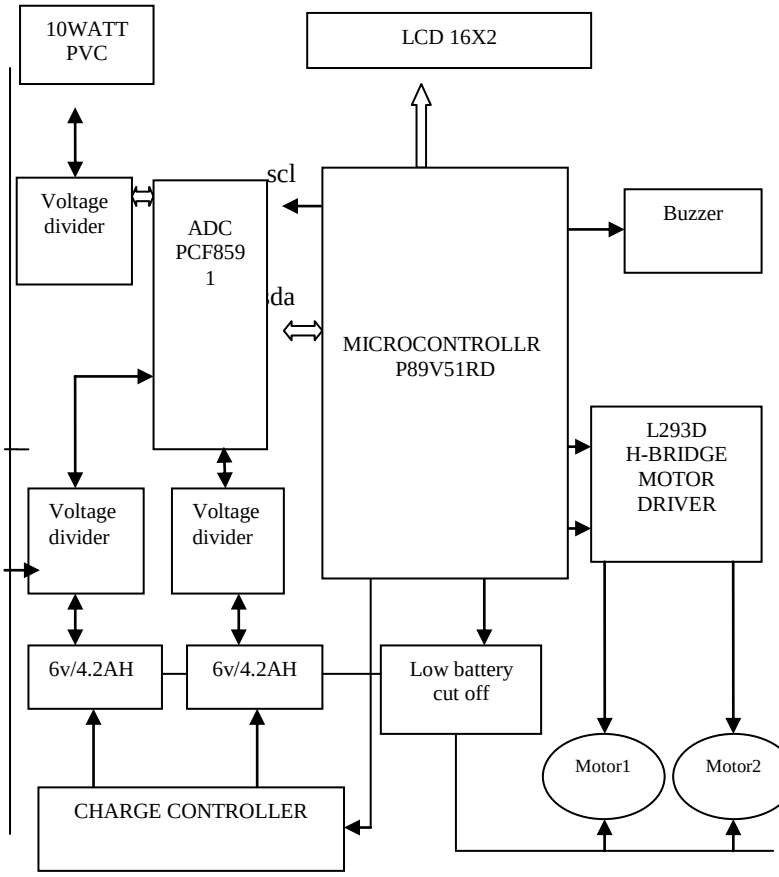


**Fig 1 Block diagram of electric vehicle charging using photovoltaic cells**

### *A. Working procedure*

This system is equipped with 8-bit microcontroller p89v51rd2 operating at 11.0592mhz.This controller monitors charging voltage and present voltage of the battery. This system consists a pair of SLA (sealed lead acid battery) of the voltage 6v, 4.2ah. When solar power been detected by the microcontroller with the help of ADC PCF 8951 which function based on I2C protocol. Rotation of the motors is controlled by H-bridge motor driver L293D because the motors operates on 12 v which not preferred to drive directly by microcontroller as it consumes more current of the ratio 200ma per motor but the microcontroller provides only 25ma per i/o which may damage the controller permanently. Charge controller controls the charging voltage of the battery if the battery voltage is charged to 7.1 volts then it will be considered as fully charged if we charge more than that voltage it may lead to degradation of the battery life [5] so this system controls the over charge of the

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 3, Issue 11, May 2014

battery a electromagnetic relay is used as switch which connects the battery to solar panel when charge needed by the command of microcontroller when microcontroller considers battery is fully charged it disconnects the relay from battery for preventing it from over charge [9]. LCD 16x2 is used to display the current voltage of the battery and the voltage provided by the solar panel and also provides the visual information to the user which battery is used and the voltage of the battery. Microcontroller can accept of maximum of 5v if we provide more than 5v than controller will get damaged so we are using a pair of resistors which function as a voltage divider and avoid the damage to controller.

### *B. P89V51RD2 MICROCONTROLLER*

The P89V51RD2 is an 80C51 microcontroller with 64 kb Flash and 1024 bytes of data RAM.A key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI. The Flash program memory supports both parallel programming and in serial In System Programming (ISP). Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The P89V51RD2 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running.

### *C. LCD 16X2*

An LCD is a small low cost display. It is easy to interface with a micro-controller because of an embedded controller (the black blob on the back of the board). This controller is standard across many displays (HD 44780) which means many micro-controllers (including the Arduino) have libraries that make displaying messages as easy as a single line of code.

### *D. Voltage divider*

A voltage divider (also known as a potential divider) is a linear circuit that produces a output voltage ($V_{out}$) that is a fraction of its input voltage ($V_{in}$). Voltage division refers to the partitioning of a voltage among the components of the divider.

### *E. ADC PCF8591*

The PCF8591 is a single-chip, single-supply low-power 8-bit CMOS data acquisition device with four analog inputs, one analog output and three address pins A0, A1 and A2 are used for programming the hardware address. The functions of the device include analog input multiplexing, on-chip track and hold function, 8-bit analog-to-digital conversion and an 8-bit digital-to-analog conversion.

### *F. Battery 6v/4.2AH*

The rechargeable batteries are lead-lead dioxide systems. The dilute sulphuric acid electrolyte is absorbed by separators and plates and thus immobilized. Should the battery be accidentally overcharged producing hydrogen and oxygen, special one-way valves allow the gases to escape thus avoiding excessive pressure build-up. Otherwise, the battery is completely sealed and is therefore maintenance-free, leaking proof and usable in any position.

### *G. H-bridge Motor L293D*

The most common method to drive DC motors in two directions under control of a computer is with an H-bridge motor driver. H-bridges can be built from scratch with bi-polar junction transistors (BJT) or with field effect transistors (FET), or can be purchased as an integrated unit in a single integrated circuit package such as the L293. The L293 is simplest and inexpensive for low current motors, for high current motors, it is less expensive to build your own H-bridge from scratch.

### *H. Charge controller*

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may prevent against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life. The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery recharger.

### *I. DC motors*

These are very commonly used in Electric Vehicles. DC motors can rotate in both directions depending upon the polarity of current through the motor. These motors have free running torque and current ideally zero. These motors have high speed which can be reduced with the help of gears and traded off for torque. Speed Control of DC motors is done through Pulse Width Modulation techniques, i.e. sending the current in intermittent bursts. PWM can be generated by 555 timer IC with adjusted duty cycle. Varying current through the motor varies the torque.

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 3, Issue 11, May 2014

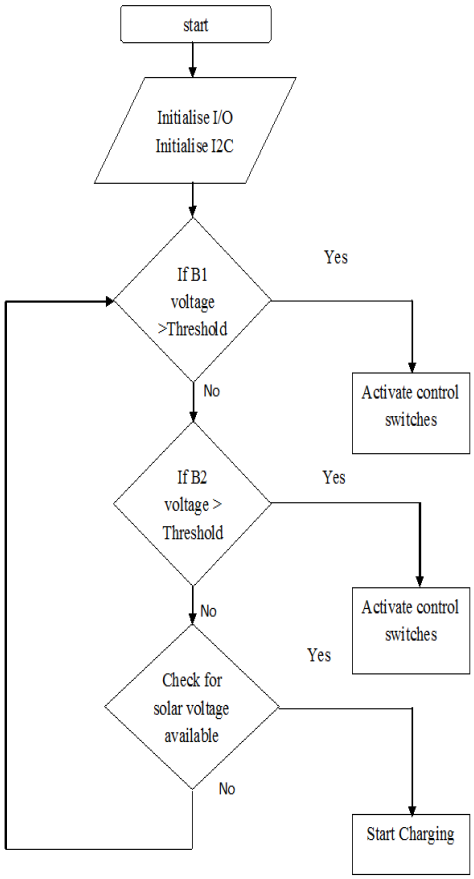


Fig 2. Flowchart of battery monitoring and charging

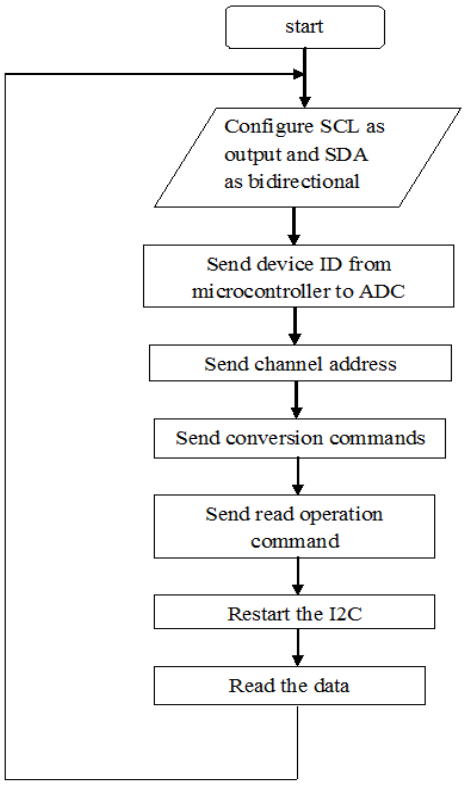


Fig 3. Flowchart of Inter integrated circuit

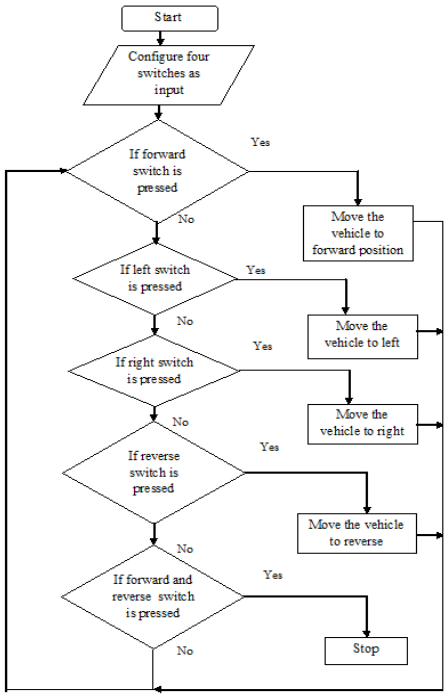


Fig 4. Flowchart of vehicle control

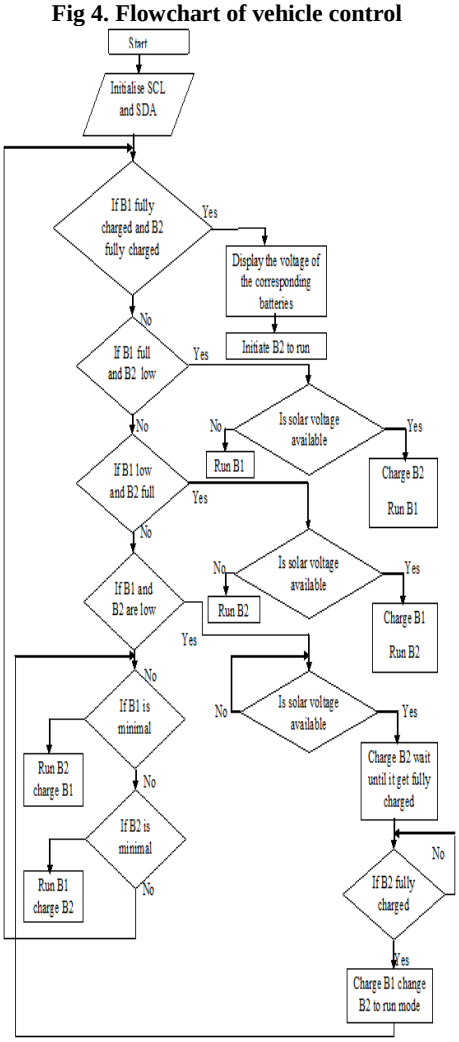


Fig 5. Flowchart of battery change over and monitoring

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 3, Issue 11, May 2014

## III. APPLICATIONS

1. Used in automobiles where carbon emission is avoided
2. EV charging scheduling algorithm for smart homes/buildings and implementation of prototype application for home/building EMS.

## IV. CONCLUSION

As the world is facing climate change and global warming due to human activities, more innovation and research has been done into unconventional energy sources to reduce the environmental impact of human activities such as using/burning fossil fuel. As part of this "Green" movement is making strong and effective steps towards sustainability Solar Vehicle is a small part of this large movement. Vehicles are being charged by mains electricity (110V), which is generated by burning fossil fuels and electric vehicles dependency on mains electricity and use solar panels to charge them.

## REFERENCES

[1] Wencong Su, Wente Zeng and Mo-Yuen Chow, "Computational intelligence-based energy management for a large-scale PHEV/PEV enabled municipal parking deck", Applied Energy, vol. 96, Aug. 2012, pp. 171–182.

[2] TulpulePinak, "Energy economic analysis of PV based charging station at workplace parking garage", in IEEE conference proceedings of Energytech, 2011, pp.1-5.

[3] Shane Hutchinson, MesutBaran and SrdjanLukic, "Power Supply foran Electric Vehicle Charging System for a Large Parking Deck", IEEE Annual Meeting report of Industry Applications Society, 2009. IAS2009.

[4] Wencong Su and Mo-Yuen Chow, "Investigating a Large-scale PHEV/PEV Parking Deck in a Smart Grid Environment", in conference proceedings of North American Power Symposium (NAPS), 2011

[5] Murat Yilmaz, "Review of Battery Charger Topologies, Charging Power Levels and Infrastructure for Plug-in Electric and Hybrid Vehicles", IEEE Transactions on Power Electronics, vol. , no. 99, pp. 23-27.

[6] HabiballahRahimi-Eichi, WenteZeng, "A Survey on the Electrification of Transportation in a Smart Grid Environment," IEEE Transactions on Industrial Informatics, vol. 8, no. 1, Feb 2012.

[7] E. K. Stefanakos "Driving With the Sun; PV EV Recharging Station", Solar Today, 1993

[8] H. A. Kiehne Battery Technology Handbook, 1989: Marcel Dekker, Inc.

[9] B Mathew PV Energy Systems: Design and [Installation, 1983: McGraw-Hill, Inc.

## AUTHOR'S BIOGRAPHY

Mrs Latha M joined as faculty in Telecommunication Department at GSSSIETW, Mysore in 2007. She completed her M.Tech in Computer Network Engineering at NIE, Mysore. Her recent work besides Secured data collection in Wireless Sensor Networks with Mobile Sinks to provide security in sensor network.

Mr Stafford Michahial did his M.Tech in 2012 and pursuing Ph.D. in the area of Medical Image processing from VTU.at present, he is working as Asst.Professor in the department of Telecommunication Engineering of GSSS Institute of Engineering and Technology for Women, Mysore. He has published several papers in international conferences and journals. His areas of interest include signal and image Processing and AI Robotics.

Apoorva K S is pursuing her bachelor's program in Telecommunication Engineering at GSSS Institute of Engineering and Technology for Women (GSSSIETW), Mysore.

Pooja S K is pursuing her bachelor's program in Telecommunication Engineering at GSSSIETW, Mysore.

Prafulla P S is pursuing her bachelor's program in Telecommunication Engineering at GSSSIETW, Mysore.

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 3, Issue 11, May 2014

Sharvani Chandrashekar B C is pursuing her bachelor's program in Telecommunication Engineering at GSSSIETW, Mysore.