

# SOLAR WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM

Bugatha Ram Vara Prasad<sup>1</sup>, M. Geethanjali<sup>2</sup>, M. Sonia<sup>3</sup>, S. Ganeesh<sup>4</sup>, P. Sai Krishna<sup>5</sup>

<sup>1</sup> Assistant Professor, Department of Electrical and electronics Engineering

<sup>2,3,4,5</sup> U.G students, Department of Electrical and electronics Engineering

Lendi institute of Engineering and Technology, Vizianagaram, Andhra Pradesh, India

**Abstract:** This paper describes the design of solar powered charging station for charging of electric vehicle describes design of solar powered charging station for charging of electric vehicle that solves the key downside of fuel and pollution. Electric vehicles have now hit the road worldwide and are slowly growing in numbers. Apart from environmental benefits electric vehicles have also proven helpful in reducing cost of travel by replacing fuel by electricity which is way cheaper. Well here we develop an EV charging system that solves with a unique innovative solution. This EV charging of vehicles without any wires, No need of stop for charging, vehicle charges while moving, Solar power for keeping the charging system going, No external power supply needed. The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, atmega controller and LCD display to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging. Thus the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road.

**Keywords:** *Battery; Micro Controller; Embedded System; Transformer; Microprocessor; Electric Vehicle;*

## I. INTRODUCTION

Electric Vehicles (EVs), represents a new concept in the transport sector around the world. It is expected that the market share of EVs will exponentially grow, comprising 24% of the U.S. light vehicle fleet in 2030, representing 64% light vehicle sales in this year. In this context, the EVs battery charging process must be regulated to preserve the power quality in the power grids. Nevertheless, with the proliferation of Evs a considerable amount of energy will be stored in the batteries, raising the opportunity of the energy flow in the opposite sense. In the future smart grids, the interactivity with the EVs will be one of the key technologies, contributing to the power grid autonomous operation. The concept of the on-board bidirectional charger with V2G and V2H technologies is introduced [1].

The electric vehicle has become more competitive when compared to the conventional internal combustion engine vehicle

due to lower carbon dioxide emission and raising fossil fuels. However, the EV was not widely adopted into the market due to some limitations such as high vehicle cost[2]. limited charging infrastructure and limited all electric drive. EVs are vehicles that are either partially or fully powered on electric power. Electric vehicles have low running costs as they have fewer moving parts for maintenance and are also very environmentally friendly as they use little or no fossil[3].

## II. Electric Vehicle

An electric vehicle (EV) is a vehicle that uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources, or may be self-contained with a battery, solar panels, fuel cells or an electric generator to convert fuel to electricity[4]. EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft. EVs first

came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Modern internal combustion engines have been the dominant propulsion method for motor vehicles for almost 100 years, but electric power has remained commonplace in other vehicle types, such as trains and smaller vehicles of all types[5].



### III. Introduction To Embedded System

#### 3.1: What Is An Embedded System

An embedded system is a microprocessor- or microcontroller-based system of hardware and software designed to perform dedicated functions within a larger mechanical or electrical system. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost-conscious market[6]. Its purpose is to control the device and to allow a user to interact with it[7].

An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a

traditional business or specific application[8].

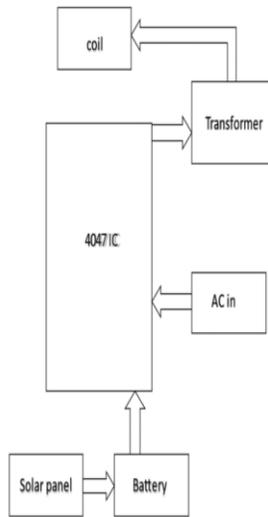


#### 3.2: Applications Of Embedded Systems

Embedded systems are used in different applications like automobiles, telecommunications, smart cards, missiles, satellites, computer networking and digital consumer electronics..



### 3.3: Block Diagram



5. LED

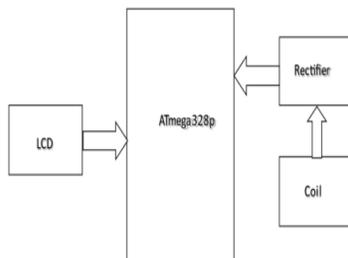
6. 16\*2 LCD display

#### 4.1.1: Atmega 328p

The Atmel ATmega328P is a 32K 8-bit microcontroller based on the AVR architecture. Many instructions are executed in a single clock cycle providing a throughput of almost 20 MIPS at 20MHz[9]. The ATMEGA328-PU comes in an PDIP 28 pin package and is suitable for use on our 28 pin AVR Development Board. The computer on one hand is designed to perform all the general purpose tasks on a single machine like you can use a computer to run a software to perform calculations or you can use a computer to store some multimedia file or to access internet through the browser, whereas the microcontrollers are meant to perform only the specific tasks, for e.g., switching the AC off automatically when room temperature drops to a certain defined limit and again turning it ON when temperature rises above the defined limit[10].

#### 4.1.2 : 4047 IC

The CD 4047 IC is one kind of multivibrator including a high voltage. The operation of this IC can be done in two modes like Monostable & Astable. This IC requires an exterior resistor & capacitor to decide the output pulse width within the monostable mode & the o/p frequency within the astable mode[11]. This IC operates at 5 Volts, 10 Volts, 15Volts & 20Volts. The 4047 IC is a CMOS multivibrator that works in two modes like monostable & astable[12]. The 4047 IC applications include a wide range like generation of the pulse wave, sine wave, and DC signal to AC signal conversion, etc.



## IV. Hardware Requirements

### 4.1 Hardware Components

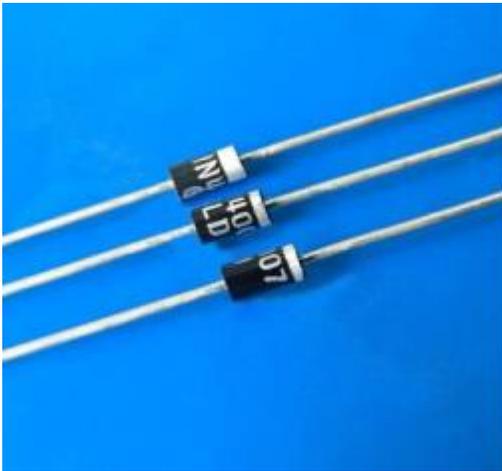
1. Atmega 328p
2. 4047 IC
3. 1N4007
4. Coil



#### 4.1.3: IN4007

Diodes are used to convert AC into DC these are used as half wave rectifiers or full wave rectifier. Three points must be kept in mind while using any type of diode.

1. Maximum forward current capacity
2. Maximum reverse voltage capacity
3. Maximum forward voltage capacity



#### 4.1.5: LED

LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride[13]. When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until its white hot. Because LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.



#### 4.1.4: Coil

A circle, a series of circles, or a spiral made by coiling. 2 : a long thin piece of material that is wound into circles.

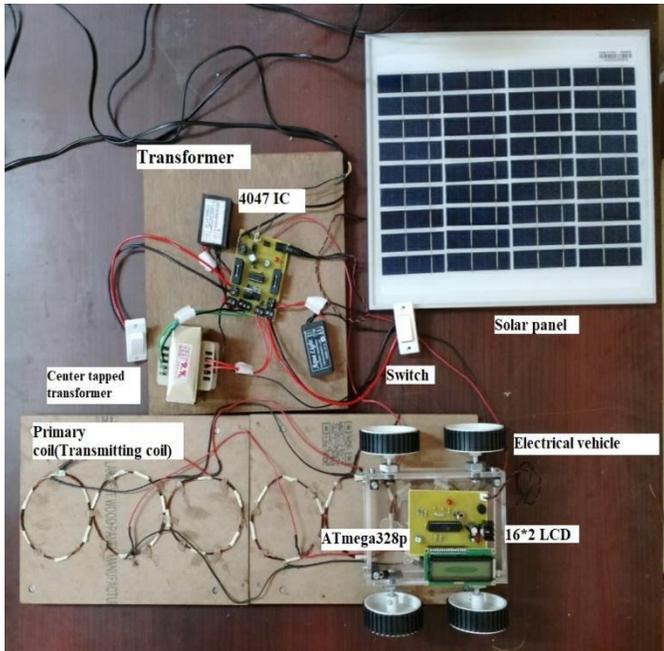


#### 4.1.6: 16\*2 LCD

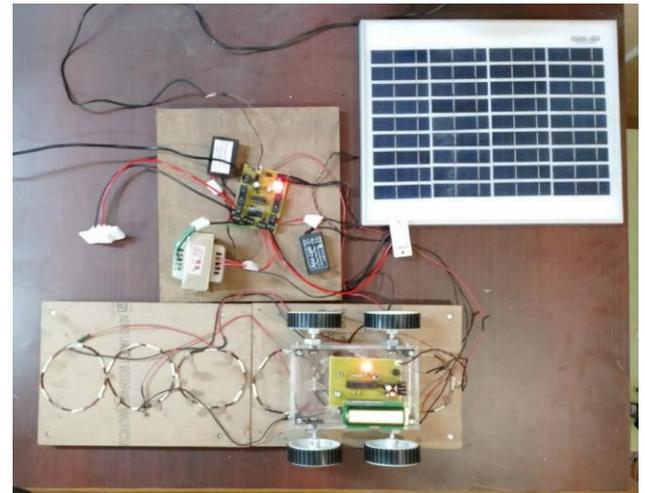
This is the example for the Parallel Port. This example doesn't use the Bi-directional feature found on newer ports, thus it should work with most, if not all Parallel Ports. It however doesn't show the use of the Status Port as an input for a 16 Character x 2 Line LCD Module to the Parallel Port[14]. These LCD Modules are very common these days, and are quite simple to work with, as all the logic required running them is on board.



### V. HARDWARE OUTPUTS:



The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, atmega controller and LCD display to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging[15]. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The DC power now needs to be converted to AC for transmission. For this purpose we here use a transformer.



The power is converted to AC using a transformer and regulated using regulator circuitry. This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle.

When the vehicle is driven over the coils energy is transmitted from the transmitter coil to ev coil. Please note the energy is still DC current that is induced into this coil[16]. Now we convert this to DC again so that it can be used to charge the EV battery.

We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input voltage using an atmega microcontroller and display this on an LCD display[17]. Thus the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road.

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#### AUTHOR PROFILES



<sup>1</sup> **Bugatha Ram Vara Prasad** received UG degree in Electrical and Electronics Engineering from JNTU-Kakinada. He received PG degree in the stream of Power & industrial drives (PID) from JNTU-Kakinada. His area of interest includes Electric vehicles, Power electronic converters and Renewable energy, IOT. He is currently working as Assistant Professor in department of electrical and electronics engineering at Lendi institute of engineering and technology, Vizianagaram and has more than 5 years of teaching experience. He had published papers in international conferences and journals and having one patent.