AUTOMATIC SWITCHING TECHNIQUE IN VEHICLE CHARGING STATION USING IoT

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Abstract: **we are currently facing many issues related to shortage of fuel. Now we have to move towards electrical vehicle. people are not ready to use electrical vehicle over present petrol and diesel vehicles because of the cost as well as lack of availability of electric charging stations . Even though there are very few charging stations available, it is requires extra time for charging the vehicle. So, by considering this issue in view the design is proposed to create and handle the Electric Vehicles (EV), charging procedures based on the intelligent process. Due to the electrical power distribution limitation, Electric Vehicles charging should be performed in effective way. This proposed Smart Electric Vehicle Charging station having many advance features like it will automatically maintain the power from different source and automatic switch the source based on availability of the source. In this implementation we are using two different source, solar system, and main supply. The controller will automatic switch the source based on its priority. User will be able to see the source connected based on availability on the LCD display. Once charging will be completed, the device will automatically stop the charging and overcharging will not happen in electrical vehicle. This process is monitored by using Internet of Things (IoT). The proposed control system and their control functions are done in Proteus 8 Professional.**

Keywords– Arduino UNO, NodeMCU, Electric Vehicle Charging, Proteus 8 Professional

I. INTRODUCTION

A photovoltaic (PV) cell assembly mounted in a framework is referred to as a solar panel. Sun panels use solar energy to generate direct current power. A cell is a single photovoltaic (PV) device. Typically, a single photovoltaic cell only generates 1 or 2 watts of power. These cells are frequently thinner than four human hairs and constructed of various semiconductor materials. To endure the elements for a very long time, cells are sandwiched between protective materials in a combination of glass and or plastics. In order to boost their power production, PV cells are connected together to form larger units known as modules or panels. Modules can be used single or linked together to form arrays. Then, as a component of the complete Photo Voltaic system .One or more arrays will be connected to the electricity grid. Due to their modular construction, Photo Voltaic system systems may be created to meet any size of the electric power requirement. Arrays, Modules are simply one part of the PV system. In addition to the components that convert the direct current (DC) electricity generated by modules into the alternating current (AC) electricity needed to power all of the appliances in your home, systems also contain mounting structures that guide panels toward the sun.

An electrically controlled switch is a relay. It consists of a number of input terminals for one or more control signals as well as a number of functioning contact terminals. Any number of connections in different contact configurations, such as making contacts, breaking contacts, or combinations of both, may be included on the switch. These are used when multiple circuits need to be controlled by a single signal or when a circuit has to be controlled by a separate low-power signal. An electromagnet is used in the typical relay design to close or open the connections

A flat-panel display known as a liquid-crystal display (LCD) uses polarizers in addition to the light-modulating capabilities of liquid crystals. Depending on the polarizer configuration, LCDs can display text with little information, often on (positive) or off (negative). It is distinguished by the ability to create images using liquid-filled crystals. The display screen contains liquid crystals illuminated by a backlight of some kind. Electric vehicles requires a charging station to charge similar to the current fuel cars that require a petrol , and charging takes some time, so it will be better to charge the vehicles when it is parked. We are using two different sources, the solar system and the main supply for the charging system, based on Internet of things technology, making the system user-friendly. One can upload the information on the cloud and simultaneously on the smartphones. The IoT is the finest monitoring tool for switching systems., providing more comprehensive

connectivity, an modified sensing, processing information, and greater flexibility. So, controlling the charging of devices is simple with the help of IoT.

II. LITERATURE REVIEW

[1] Stephen Lee, Srinivasan Iyengar, David Irwin, and Prashant Shenoy, In this paper, it is considered solar-powered charging station for an Electric Vehicle car-share service (such as ZipCar, Autolib). Usually, in the vehicle-sharing services, gasoline powered vehicles are most popular but with increase in popularity of electric cars, service providers may soon own more electric cars. In fact, some vehicle sharing services have Tesla models. The cars that run solely on electricity. Typically, vehicle sharing service leases vehicles to consumers and bill consumers using a pay per-use model.

[2] Mr. C. Chellaswamy, V. Nagaraju, and R. Muthammal, this paper describes about the solar and wind energy based charging mechanism (SWCM) to generate the power for charging the battery packs of electric vehicles (EVs). The renewable charging station consists of both a wind generator, solar photovoltaic (PV) modules and. Analytical modelling has been done for the production of wind energy, and single diode models have been used to simulate renewable energy sources like solar and wind. For the proposed SWCM, a simulation model was created in MATLAB-Simulink.

III. STATEMENT OF THE PROBLEM

Since solar energy fluctuates, EV battery users cannot rely on it as their primary energy source. As a result, grid power must be used as a backup energy source. The current solution involves manually switching between solar electricity and other power sources. So, suppose automatic switching between solar and the utility grid is possible. In that case, a solar power system may have a backup electricity supply to ensure the user has constant access.

IV. OBJECTIVE

The current study aims to create vehicle charging stations using the automatic switching technique using IoT, as explained in the following discussion. With the help of this system, the user will receive consistent power utilizing various power sources according to the Time of Use Tariff and can view all information on an LCD display.

V. METHODOLOGY

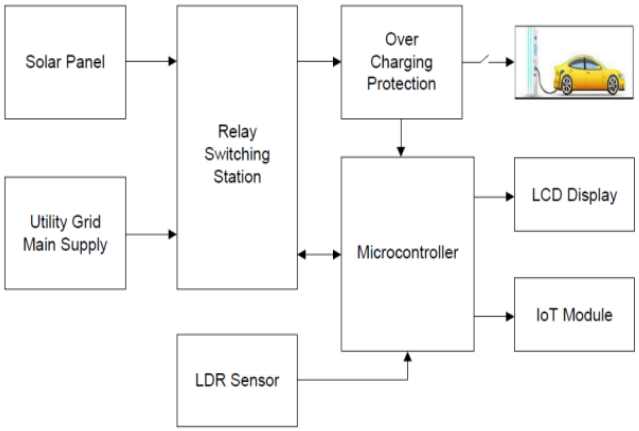

Fig 1: Main Block Diagram

Switching section and the sensors are interfaced with a microcontroller. Here, Microcontroller is main heart of the system. The switching action between different sources happen to be automatic using relay, the triggered signals are sent from microcontroller. Finally, the current consumed for charging the battery. In this method we are using a current sensor ACS712 for monitoring the charging level. This system consists of current sensor, Relay and microcontroller. ACS712 is current sensor and in our implementation It's interfaced with microcontroller. Microcontroller will read from analog pin. Once charging load will be approximate zero, at that time battery will be full charge. IoT is implemented by interfacing a Wi-Fi module (ESP8266), and connecting to internet. Amount generated based on the usage, which is updated on IoT and LCD. About information for charging slot available status related information will be update on Esp8266 Wi-Fi microcontroller

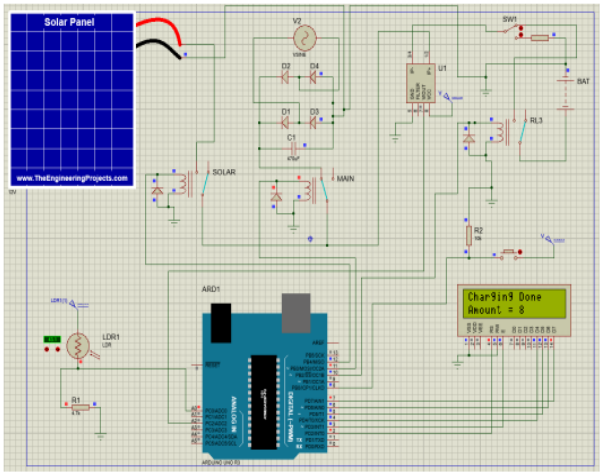

Fig2: Main Supply Switching Operating Condition After Charging

VI Simulation Description

For this project simulation the Proteus 8 Professional software tool is used to draw schematics, PCB layout, code and even simulate the schematic. Designing, testing and debug is completely embedded inside schematic capture before making a hardware prototype. A complete workflow for designing an Arduino appliances and then controlling it remotely from a mobile phone or browser. It was developed by Labcenter Electronic Ltd. The ATmega328P microprocessor, LDR sensors, bridge rectifier, pull down resistor, current sensor, LCD, and active switch were all utilised with the Arduino Uno.

Proteus 8 Professional Software Modules: A Windows programme for schematic capture, simulation, and PCB (Printed Circuit Board) layout design is called the Proteus Design Suite. Depending on the scale of the designs being generated and the needs for microcontroller simulation, it may be acquired in a variety of configurations. An autorouter and fundamental mixed mode SPICE simulation capabilities are included in all PCB Design solutions. A. Schematic Capture In the Proteus Design Suite, schematic capture is employed during both the design phase of a PCB layout project and for the simulation of designs. As a result, it is a fundamental element that comes with every product configuration. B. Microcontroller Simulation Proteus's functions by adding a hex file or by debugging the file to microcontroller portion on the schematic. The associated analog and digital electronics are then co-simulated with it. This makes it possible to utilize it for various project prototypes in fields including user interface design, temperature control, and motor control. Additionally used by general hobbyists, it is practical to use as a training or teaching tool because no hardware is needed. The following are supported by co-simulation: Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, dsPIC33 microcontrollers Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 microcontrollers ,NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 microcontrollers Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 microcontrollers Parallax Basic Stamp, Freescale HC11, 8086 microcontrollers.

VII. SYSTEM DESCRPITION

Microcontroller- Arduino Uno

Fig3: Arduino Uno

An open-source development board, Arduino Uno enables you to utilise the board to communicate with physical objects by allowing you to upload programmes to it as shown in Figure 3. It is based on the microcontroller ATMEL ATmega328p. It can interact in any way with everything that is under the influence of electricity. Additionally, it can communicate with electromagnets, sensors, and motors. In other words, by employing this board, we may create objects that respond to the outside environment. In a nutshell, Arduino serves as the brain for countless projects. It is one of the Arduino family's more affordable boards. Due to its smaller size and fewer input-output pins than Arduino Mega, the bigger brother of Arduino Uno, it is commonly utilized

IoT Module NodeMCU

Fig4: NodeMCU

Node MCU is an open source internet of things platform . It has hardware based on the ESP-12 module and an firmware that will run on Espressif Systems' ESP8266 WiFi system on chip as shown in Figure 4 Instead of the development kits, the firmware is what is typically meant by the phrase "NodeMCU." The Lua programming language is employed by the firmware

Solar Panel

Fig5: Solar Panel

Solar panels are devices that convert the sun's energy into heat or power as shown in above Figure A solar panel really consists of a number of solar (or photovoltaic) cells that may produce power thanks to the photovoltaic effect. On the surface of solar panels, these cells are organized in a gridlike configuration. As a result, it might alternatively be defined as a collection of photovoltaic modules put on a supporting framework. A 610 solar cell assembly that has been packed and linked is known as a photovoltaic (PV) module

Over Charging Circuit

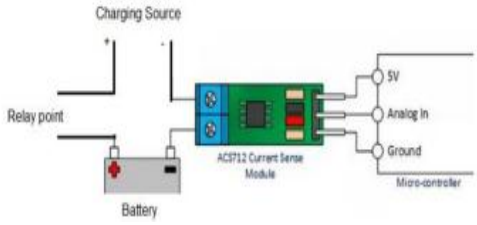

Fig6: Over Charging Circuit

Here we connect a discharged battery or less charged battery to this system, the charger voltage falls to a point where the battery is removed, and the voltage rises slowly. The battery will try to consume all the current available. The battery will consume maximum current until the terminal voltage reaches 12.4V (for a 12V battery), the voltage limited by the charger as shown in above Figure

Working Flow chart

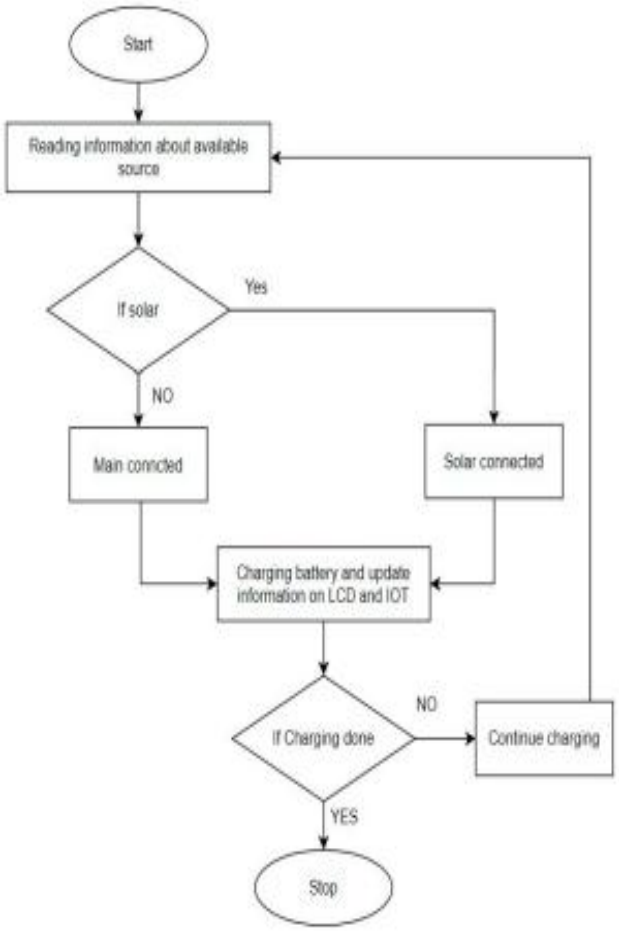

Fig7: Flow Chart

VII Results and Discussion

One of the main sources of carbon dioxide emissions and air pollution is because of the vehicles. The increase in widespread use of electric vehicles (EVs) is a potential way to tackle environmental issues and reduce carbon emissions in the transportation industry. In the project designed, we have developed a charging station for electric vehicle. We are able to successfully able to test hardware. It is working as per expected working. We are able to switch source automatically as shown in Figure 7. As we know Solar electricity is also expensive and many times variable, conventional methods of charging that ensure 100% recharge are not still possible. In the most cases full available power from the PV array will be transferred to the battery till the voltage level increases to a certain level, and indicating full charge is achieved.

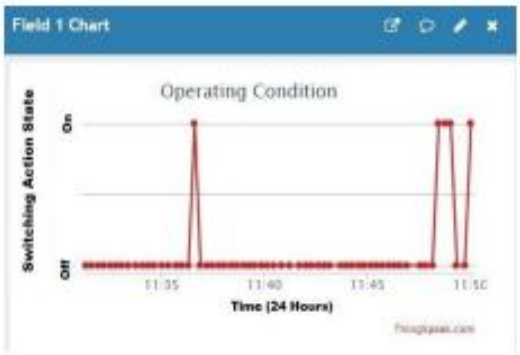

Figure 7: Switching Operating Condition

The following Figure 8 shows the consumer bill plotted against amount in rupees versus time in 24-hour clock.

Figure 8: Consumer Bill

VIII Conclusion

This project proposed using IoT, an Automatic Switching Technique in Electrical Vehicle Charging Station prototype is developed Due to the restrictions on electrical power distribution. Charging of Electric Vehicles should be performed in the effective way. The proposed Smart Electric Vehicle Charging station is having many advanced features like, automatically maintaining the power from different source and automatic switching of the source based on availability of source. In this implementation we are using two different sources, suchas solar system and the main supply. The controller used will automatically switch the source based on its priority. User will be able to see amount in LCD display. Once charging will be completed, the device can be stopped charging and overcharging will not happen in electrical vehicle. This prevents overheating, exploding lithium ion batteries, longer cycle life, and battery life. Also, using this method, dependency on utility grid can also be reduced.

XI Future Scope

Utilizing overcharging protection, the charging cable will automatically unplug from the vehicle's battery, slight overcharging will reduce a cell's discharge capacity,and will lead to over discharging, which will increase impedance and heat generation, and decreases lifetime of cell. Other renewable energy sources can also be used without using the utility grid, in addition to solar. This strategy decreases pollution while increasing electric vehicle EV usage, which results in a pollution-free environment.

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