Iot Based Charging Station For E-Vehicles

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Abstract- *The Internet of Things (IoT) technology has immense potential for application in improvement and development of Smart Grid. The rising number of distributed generation, aging of present grid infrastructure and appeal for the transformation of networks have sparked the interest in smart grid. The need for energy storage system primarily the electrical energy storage systems is growing as the prospects for their usage is becoming more compelling. Dynamic electrical energy storage system viz., Electric Vehicles (EVs) are relatively standard due to their excellent electrical properties and flexibility but the possibility of damage to their batteries is there in case of overcharging or deep discharging and their mass penetration profoundly impacts the grid. To circumvent the possibility of damage, EVs' batteries need a precise state of charge estimation to increase their lifespan and to protect the equipment they power. Based on ease of implementation and less overall complexity, this paper proposes a real-time Battery Monitoring System (BMS) using coulomb counting method for SoC estimation and messaging based MQTT as the communication protocol.*

I. INTRODUCTION

Batteries have become the popular form of electrical energy storage in EVs. The evolution in city transportation has boosted over the last few decades which in turn increased the growth of societies and industry. Since battery is a commonly used device for storage of energy,calculation of Status of Charge plays a vital role in the future. Nowadays, vehicles are essential in the day to day life and for industrial use as well. Sufficient effort is being done to withdraw the combustion engines by electric motors. Due to the increase in carbon dioxide (CO2) caused by the industries and transportation, the Kyoto treaty was signed. This treaty was aimed to reduce the level of CO2 and has boosted the findings for new cleaner energy solutions. As a finding, Electrical Vehicles (EVs) appeared as a solution to reduce CO2 emissions. Electric Vehicles are increasing day by day across the globe. When the number of Electric vehicles is increasing, there is a need to implement Electric Vehicles Charging system in parking systems or grid. In this wide range of array of ideas, these EVs can definitely assure some gains to the energy management, eminently to supply major and important loads like manufacturing shops during power failures and any emergencies. EVs bring benefits to city services and provide indemnity for the viable energy sources intermittency. This new method is effective and more relevant owing to the fact that most of the electric vehicles are halted on an average of 91-95 percentage of their usage period, and most of the Electric vehicles are parked at home amid 9 pm and 6 am. When the EVs are plugged to the power grid, the power can discharge to or from the EV batteries (G2V and V2G). In the truancy of power grid or Electric disruption, the EV can operate as voltage parent to supply the necessary loads. This work describes the measurement and performance of EV battery in a smartgrid. IoT makes smart grid to contribute the information between multiple users and thus amplifies connectivity by the help of infrastructures. Cloud storage is used for the data storage where the data is send through Internet gateway.

II. LITERATURE SURVEY

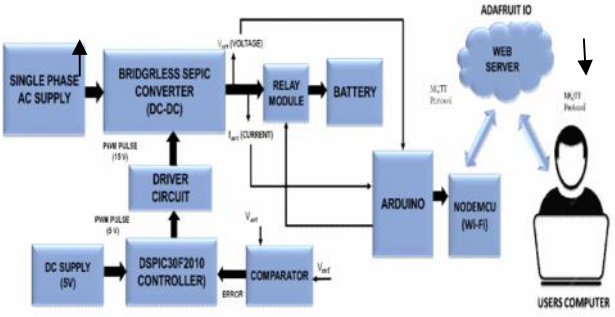
Putta Sindhuja and Balamurugan has projected a home automation system in which the user can be able to control and monitor appliances with the help of the IoT to minimize the energy usage. The appliances are connected via an Ethernet to a router and uses m-bed microcontroller and sensor-actuator units to control the power utilization. The designed system enables client to monitor and control the appliances at home from anywhere availing the IoT features of the designed system thereby reducing the wastage of energy.The interesting part of the hardware for this system comprises of the Hall effect sensor, Ethernet break outboard, Appliances such as 10W bulb 12V fan, two channel relay, m-bed microcontroller – LPC 1768 and Ethernet modem. The Relay needs 12v power supply, groove Electricity Sensor is employed to measure the energy consumption in each appliance. Xively is software which enables the cloud data storage and its used to analyse the usage.This work gives the direction to be followed while designing systems that analyse the power consumption of devices.

Krupal Kachhia Patel et. al proposes a system that implements MQTT (Message Queuing Telemetry Transport) and TCP in ESP8266 Wi-Fi module to control appliances and interfaces them with proximity, PIR sensors. In his paper, they have described the architecture and implementation of home automation system. To reduce the development cost, this system utilizes the electronic boards. Apart from the low cost, the smartness of the automation system can be justified with the automation scripts that can be customized by the user, even at runtime. The complete system efficiently utilizes the

existing network infrastructure with the help of MQTT protocol and TCP protocol. This work helps understanding how the ESP8266 can be interfaces with appliances, and automation of appliances.

M. Mazhar Rathore et. al proposed The four-tier architecture in this system applied using smart parking, votlDB, vehicle data sets, spark and storm for real time processing which has the Hadoop framework to make it more scalable and efficient . The execution of architecture has the process of decision making, filtration, preprocessing, aggregation, computing, collection and classification. In this proposed research,the implementation is carried out by means of Hadoop with Storm or S4, Spark, voltDB to process the real-time IoT data and produce results. The analysis with Hadoop with MapReduce programming is done for future developments and further enhancements. This work gives an overview on creating scalable power monitoring systems.

III. BLOCK DIAGRAM



IV. HARDWARE DESCRIPTION

4.1 POWER SUPPLY

There are many types of power supply. Most are designed to convert the Voltage AC Mains electricity to a suitable low voltage supply for electronic Circuits and other Devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. Here the AC supply main is given to the step down transformer. The transformer having the different voltages.

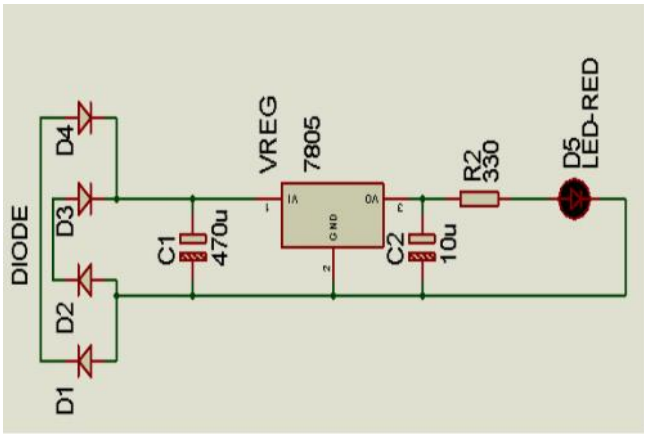
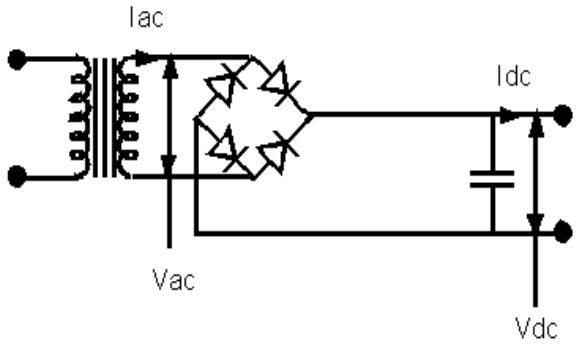


Figure 4.1: Circuit Diagram of Regulated Power Supply

The output from the transformer is given to the rectifier circuit. In this rectifier circuit the AC voltage is converted to DC voltages. The rectified DC voltage is given to the regulator circuit. The output of the regulator is depends upon the regulator IC chosen in the circuit.

4.1.1 BRIDGE RECTIFIER

A bridge rectifier can be made using four individual diodes, but it is also available in special packages containing the four diodes required. It is called a full-wave rectifier. Smoothing is performed by a large value electrolytic capacitor connected across the DC Supply to act as a reservoir, supplying current to the output when the varying DC Voltage from the rectifier is falling



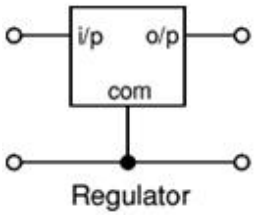
The fig 4.2 shows the unsmoothed DC, smoothed DC by the filter capacitors. The capacitor charges quickly near the Peak of the varying DC, and then discharges as it supplies current to the output.

Note that smoothing significantly increases the average DC voltage to almost the peak Value (1.4-× RMS value). For example, 6V RMS AC is rectified to full wave DC of about 4.6V RMS (1.4V is lost in the bridge rectifier), with smoothing this increases to almost The peak value giving 1.4

× 4.6 = 6.4V smooth DC. Smoothing is not perfect due to the capacitor voltage falling a little as it discharges, giving a small ripple voltage. For many circuits a ripple which is 10% of the supply Voltage is satisfactory and the equation below gives the required value for the Smoothing capacitor. A larger capacitor will give less ripple. The capacitor value must Be doubled when smoothing half-wave DC.

4.1.2 REGULATOR

Voltage regulators ICs are available with fixed (typically 5, 12 and 15V) or variable Output voltages. They are also rated by the maximum current they can pass. Negative Voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and Overheating ('thermal protection').



Many of the fixed voltage regulator ICs has 4 leads and look like power transistors, Such as the 7805 +5V 1A regulator shown on the right. They include a hole for attaching a heat sink if necessary.

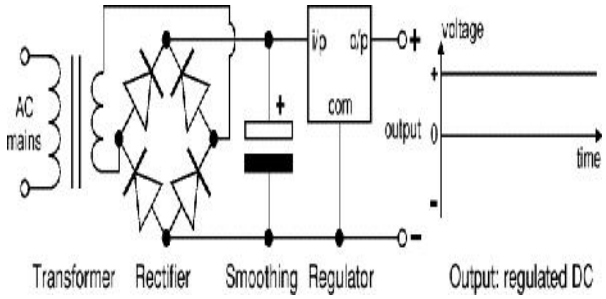


Figure 4.4: Rectifier Circuit Diagram and Waveform

The above fig 4.4 shows the rectifier circuit diagram and the regulated output voltage. The regulated DC output is very smooth with no ripple. In generally there are two types of regulators are used. Namely the positive and negative type regulators. For positive type regulators 78** series of regulators are used. For negative type regulators 79** series of regulators are used. Depends upon the voltage and type of the voltage the regulator IC is selected

4.2 MOSFET

The MOSFET (Metal Oxide Semiconductor Field Effect Transistor) transistor is a semiconductor device which is widely used for switching and amplifying electronic signals in the electronic devices. The MOSFET is a core of integrated circuit and it can be designed and fabricated in a single chip because of these very small sizes. The MOSFET is a four terminal device with source(S), gate (G), drain (D) and body (B) terminals. The body of the MOSFET is frequently connected to the source terminal so making it a three terminal device like field effect transistor. The MOSFET is very far the most common transistor and can be used in both analog and digital circuits. he MOSFET works by electronically varying the width of a channel along which charge carriers flow (electrons or holes). The charge carriers enter the channel at source and exit via the drain. The width of the channel is controlled by the voltage on an electrode is called gate which is located between source and drain. It is insulated from the channel near an extremely thin layer of metal oxide. The MOS capacity present in the device is the main part

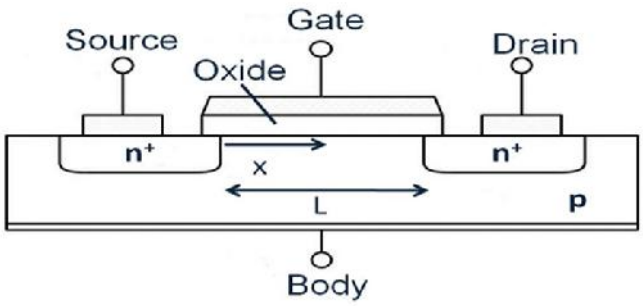


Figure 4.14 structure of MOSFET

VI. NODEMCU12E Wi-Fi Module

The Nodemcu is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines.

Figure.4.7 Nodemcu

Description:

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box).The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming this module into an IoT.

V. DSPIC30F2010PIN CONFIGURATION

The architecture of dspic30f2010 is shown in fig.4.4 and pin diagram in shown in fig.4.4

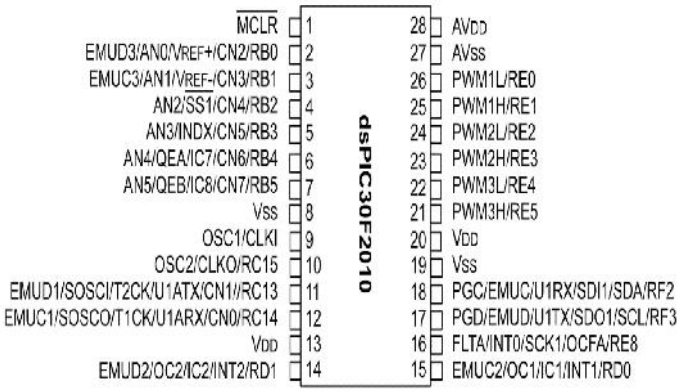


Fig 4.4 DSPIC 30F2010pin Configuration

VI. DSPIC MICRO CONTROLLER FEATURES

High Performance Modified RISC CPU

- Modified Harvard architecture
- C compiler optimized instruction set architecture with flexible addressing modes
- 24-bit wide instructions, 16-bit wide data path
- 48 Kbytes on-chip Flash program space (16K Instruction words)
- 2 Kbytes of on-chip data RAM
- 1 Kbytes of non-volatile data EEPROM

VII. CONCLUSION

This project presents the prototype of a smart platform that was developed to perform batteries analysis. It was developed a power electronics system and a control system related with Information and Communication Technologies. As presented, through this platform it is possible to configure different tests to the batteries according to charging or discharging profiles. These profiles can be configured through a local or a remote application, contributing to strengthening the Internet-of-Things.

VIII. RESULT

We have used a free IOT web platform from Adafruit industries for the proposed system names as Adafruit IO.Adafruit IO is a system that makes data useful. Our focus is on ease of use, and allowing simple data connections with little programming required.

IO includes client libraries that wrap our REST and MQTT APIs. IO is built on Ruby on Rails, and Node.js.

The web dashboard which we have created for the proposed system is shown in figure

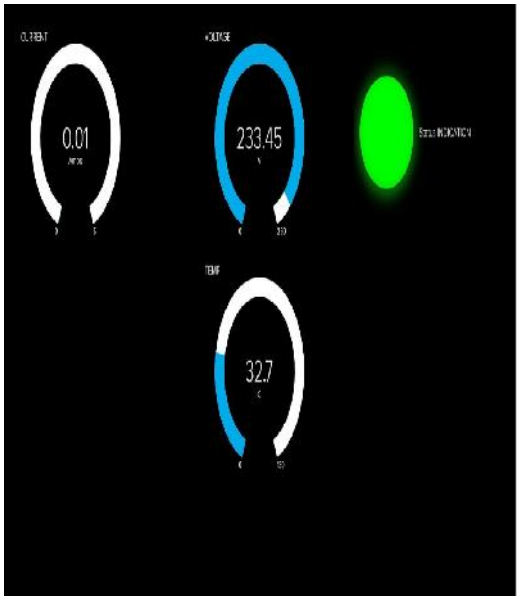


Figure 6.2 Web dashboard of the proposed work

A manual control was created were user can turn on/off the light through /button provided on dashboard.

Thus user can monitor and control the aquarium using the Adafruit IO dashboard from any modern web browser using a computer/laptop. We have also created a web mobile app for quick access to Adafruit Io dashboard using mobile.

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