Study and Analysis of IOT based Electric Vehicle

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Abstract: The Internet of Things is an advance technology for the communication between the human and machine as well as machine and machine. As IOT consist of various features like collecting information, communication and response control so, it can be used in various applications. Electrical vehicle is one of the examples, in electrical vehicles the various parameters of battery and motor can be achieved or displayed with help of IOT. It becomes possible to know about information very easily. Instead of SOC we can also get other parameters like speed , current and voltage of electric vehicle , only it require various sensors according to need and some internet related devices. In this paper we had collected the data from electric vehicle with help of IOT.

***Index Terms* – Arduino Nano, Internet of Things, Voltage, Current, Speed.**

I. INTRODUCTION

Now a days the cost of fuel is increasing and the storage is decreasing also the use of fuel is dangerous for the environment and living being. To avoid these effects Electrical Vehicle is best option because it is environment friendly and produces zero emission. And to make this option smarter IOT (Internet of Things) concept is combined with it. Internet of Things is very simple concept, it means taking all the things in the world and connecting them to the internet. When something is connected to the internet that means it can send the information and receive makes the things smart. Such vehicles will necessarily be battery operated and will need to be recharged after certain hours of driving.

Internet of Things comes into the picture because through IOT all the devices would be connected to each other consequently the monitoring of devices, maintain the data and several similar factor can be regulated more efficiently. According to the requirement different types of sensors are used and these sensors provide the information to the Arduino Nano, simultaneously nano model provide that information to Wi-Fi model and with help of internet it becomes possible to see this information on mobile application.

II. LITERATURE SURVEY

On conduction of an experiment on IoT and development of electrical car to illustrate an implementation of electric vehicle technology on a small scale, we observed how to implement automation and IoT in an electric car with less cost and have studied about various components that is required to acquire various parameters of an electric car. It shows that electrical battery operated vehicle is more suitable than other vehicle because the cost of the electricity is low and also maintenance cost is less. Also we got an idea about how to measure various parameters such as voltage, current, speed with their respective sensors in vehicle. In this study we understand the basic principles of data acquisition, IoT implementation, controllers used for such operation and performance battery management system of the vehicle.

Here we analyzed how to design a controller to collect data regarding battery voltage, battery charging in percentage and speed of vehicle. This paper also gives idea about, how to modify the design for the required features of vehicle.

III. PROPOSED TECHNIQUE

The overall block diagram is combination of various sensors connected to the Arduinonano whose output can be seen on LCD as well as on mobile application with the help of Wi-Fi module which is also connected to the Arduino nano. The selection of sensors is carried out according to output requirement. As the vehicle is on the basis of electricity it means the electrical parameters are the important to be displayed on output system hence to detect the current the current sensor is used that is WCS1800 which is very efficient and compact . Similarly for the speed detection the A3144 is an integrated Hall effect speed sensor is used .No doubt the working of vehicle is totally depends upon the charging of the battery hence to maintain the continuous operation of vehicle state of charge of battery should be proper and hence to get aware about the battery capacity there should be proper display of battery percentage according to which we can detect the working capacity of the vehicle and hence for it the voltage of battery is required so the series combination of the 1K resistor, 10K resistor and variable trimpot is carried out which is connected to the A1 of Arduino and current sensor is connected to the A0 where the speed sensor is connected to D2.

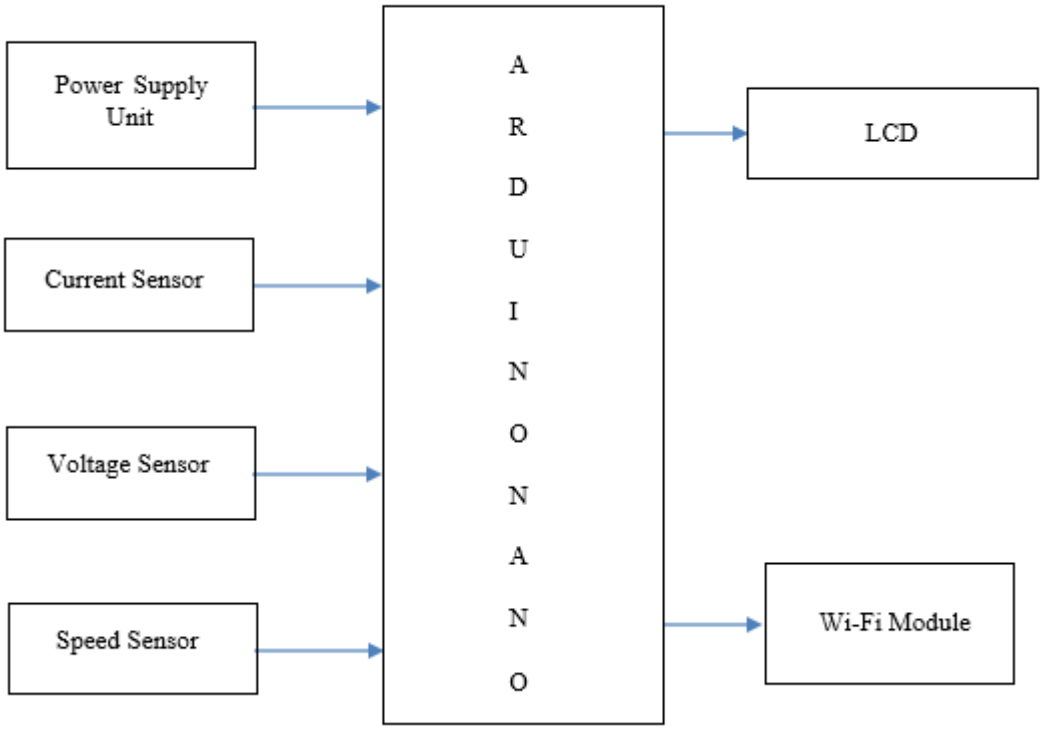

Fig. (1)block diagram proposed system

The overall equipment's used helps to display all required parameters as per our need and it become possible to see on mobile application only because of Wi-Fi module that is ESP8266X . In this, voltage sensor and speed sensor is connected to A1 and D2 pins of arduino nano respectively which provides acquired data to controller. Then this data is displayed on 16x2 LCD as well as sent to Things peak cloud platform.

IV. SYSTEM ELEMENTS

Arduino nano v3

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.0). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech. With operating voltage of 5V AND Consist 14 digital input output pins.

LCD display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. They come in many sizes 8x1 , 8x2 , 10x2 , 16x1 , 16x2 , 16x4 , 20x2 , 20x4 ,24x2 , 30x2 , 32x2 , 40x2 etc . Many multinational companies like Philips Hitachi Panasonic make their own special kind of lcd's to be used in their products. All the lcd's performs the same functions (display characters).Their programming is also same and they all have same 14 pins (0-13) or 16 pins (0 to 15).

Current sensor wcs1800

The Winson WCS1800 current sensor provides economical and precise solution for both DC and AC current sensing in industrial, commercial and communications systems. The unique package provides easy implementation without breaking original system and makes current sensing possible. Typical applications include motor control, load detection and management, over-current fault detection and any intelligent power management system

Trimpot

A trimpot or trimmer potentiometer is a small potentiometer which is used for adjustment, tuning and calibration in circuits. When they are used as a variable resistance they are called preset resistors. Trim pots or presets are normally mounted on printed circuit boards and adjusted by using a screwdriver. The material they use as a resistive track is varying, but the most common is either carbon composition or cermet. Trim pots are designed for occasional adjustment and can often achieve a high resolution when using multi-turn setting screws. When trimmer potentiometers are used as a replacement for normal potentiometers, care should be taken as their designed lifespan is often only 200 cycles.

Speed sensor

The A3144 is an integrated Hall Effect non latching sensor. That's nice but what does it do? Holding a magnet near the sensor will cause the output pin to toggle. This makes for a robust presence sensor. A reed sensor also works nicely, but can be limited by the glass encapsulation and size. A Hall Effect sensor is much smaller, but can handle less current than a reed switch. The device includes an on-chip Hall voltage generator for magnetic sensing, a comparator that amplifies the Hall voltage, and a Schmitt trigger to provide switching hysteresis for noise rejection, and open-collector output.

Wi-Fi module

The ESP8266EX microcontroller integrates a Ten silica L106 32-bit RISC processor, which achieves extra- low power consumption and reaches a maximum clock speed of 160 MHz The Real-Time Operating System (RTOS) and Wi-Fi stack allow about 80% of the processing power to be available for user application programming and development. ESP8266EX is integrated with a 32-bit Ten silica processor, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. All of them are included in one small package, our ESP8266EX.

V. RESULTS

As per designed circuitry vehicle was tested on flat road under different conditions the following results were obtained for discharging cycle of vehicle battery:

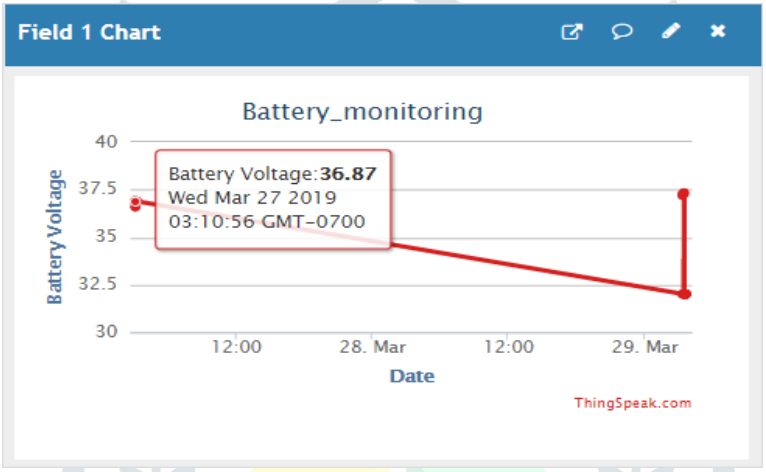

Fig. 2. Battery voltage monitoring

Above graph represents battery voltage with respect to time for discharging cycle of battery. On X axis time is shown and on Y axis battery voltage is shown .The voltage values will be displayed on this graph. At starting battery voltage is 36.87v as shown in above graph and it will get decreasing as vehicle uses its supply.

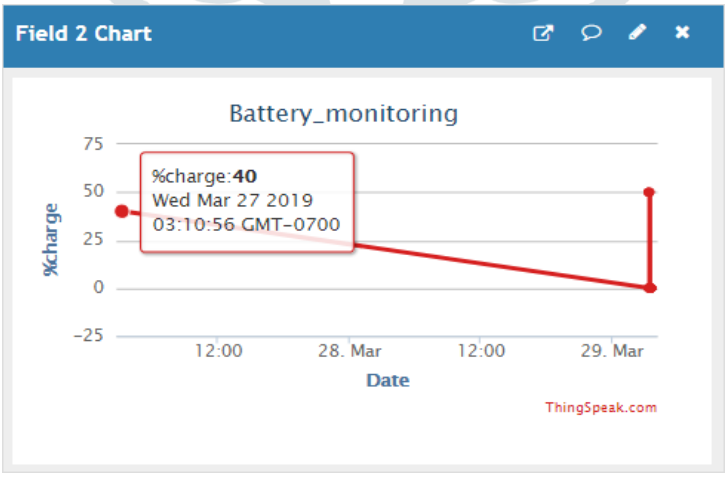

Fig. 3. Battery charge of percentage monitoring

Above graph represents battery charging in percentage with respect to time. On x axis time is shown and on Y axis battery charging is shown. Here all the battery charging values will be displayed. At starting 36.87v battery percentage is 40% as shown in above graph. As the vehicle runs and uses battery energy the charging percentage of battery gets decreasing as shown in fig.3

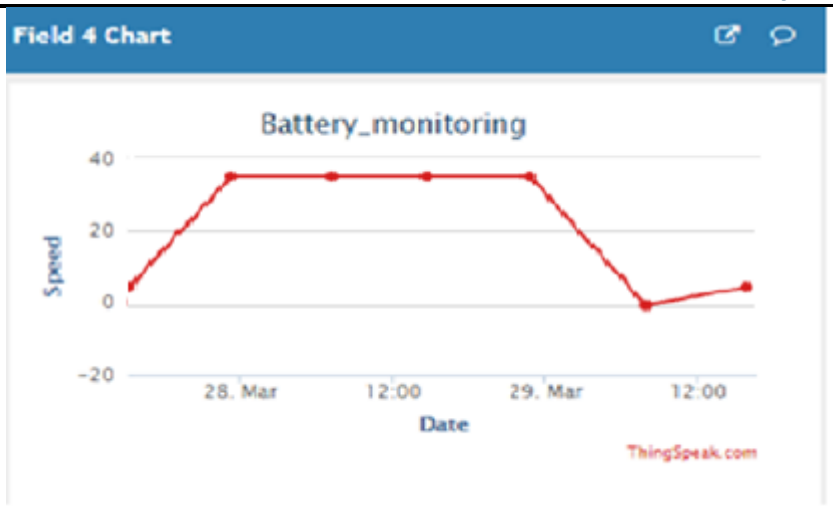

Fig. 3. Vehicle speed monitoring

Above graph represents vehicle speed and time for discharging cycle of battery. On x axis time is shown and on Y axis speed is shown. Here all the speed values will be displayed. When vehicle starts its speed increases from zero. Then kept constant by driver at flat surface of road and to stop vehicle brakes are applied with reducing speed of vehicle.

FUTURE SCOPE

As our vehicle is based on IoT, it is possible to improve performance by adding more features like GPS which help us to identify vehicle's real time location also can indicates the directions for where we want to go. By adding a feature of ABS i.e. Automatic Braking System vehicle and driver can be provided with more protection facility that also prevents an accidents on roads also. Like that there are many more opportunities in IoT based Electric Vehicle to add more features only with the help of IoT and more advanced controllers. We can convert the idea of multipurpose vehicle similar to existing, so that we can develop the electric car to the next level.

VI. CONCLUSION

This project can run for lower time of period as the batteries used for vehicle are of low ampere-hour rating. So, as results are shown by controller on things peak IoT platform it is concluded that by increasing the size and ampere-hour rating of batteries as well as by using more efficient batteries like lithium-ion we can increase the running time of vehicle. Also by using more accurate sensors performance of vehicle would be possible to improve. This project provides flexibility in operation and noiseless operation. The scope of this project lies in fully determining and understanding the opportunities for automation in car.

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