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Internet of Things Based Advanced Telematics System For Electric Vehicles

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***Abstract*—** The Internet of Things (IoT) will break newfangled ground for automobile manufacturers by introducing entirely new layers to the traditional concept of a car. Traditional LCD/LED dashboard displays have a constraint of space i.e. the data display is restricted exclusively to the drivers which make it infeasible for other concerned people to view and know about the various parameters of the vehicle. IoT along with cloud computing will help to store the sensor values and other crucial data on encrypted cloud servers which can help set up a telematics solution along with a data acquisition system accessible from anywhere in the world.

***Keywords* —** Blynk cloud,data-analytics,connectivity,NodeMCU,

I. INTRODUCTION

The Internet of Things has led to a wave of connectivity that left no industry in the world untouched. The automotive industry is going through a disruptive change, moving into the era of all-encompassing connectivity, mobility, integration, and immersive experience. When devices get connected to each other through smartphones, our world will get smarter than ever. The purpose of setting up an advanced telematics solution in vehicles is to monitor the status and parameters of one's vehicle by completely eradicating the constraint of space and inaccessibility [1].

Solutions Provided in IoT (Internet of Things):

- Connected systems
- Real time monitoring
- Predictive maintenance
- Security & surveillance
- Dashboard reporting
- Data Analytics
- Cognitive insights for management

This paper covers the approach, methodology and the implementation sections of the IoT based advanced telematics system with scope for further improvement. Section I contains the introduction of IOT based data telematics system, Section II contain the related work in this field, Section III contain the methodology and the approach used for this project, Section IV contains the various features implemented under the project. Section V contains the future scope and application of this IoT based telematics solution.

II. RELATED WORKS

A Bluetooth based data telematics system was set up by many car manufacturers, but they came with a main drawback of range and accessibility. Wi-Fi offers much more flexibility than most of the communication technologies available [2].

Nexa has come up with a similar efficient telematics solution which is based on cellular IoT.

III. METHODOLOGY

This research aimed at setting up a data acquisition system where sensor values and different information like location, battery level, speed, distance covered, geofencing etc. were collected from the hardware mounted on the vehicle and transmitted to a cloud server through the internet with the help of a Wi-Fi hotspot also mounted on the vehicle. Hardware and software requirements:

A. .Blynk app

Blynk is an IoT platform which allows us to integrate and connect any non-living thing to the internet by using Cloud computing. Blynk cloud server is used for providing remote access to the vehicle.To store the data on cloud server, virtual pins on Blynk app were used.

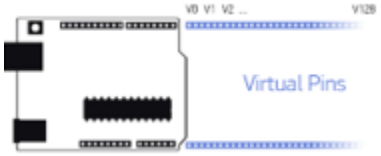

Figure 1: Virtual pins in Blynk

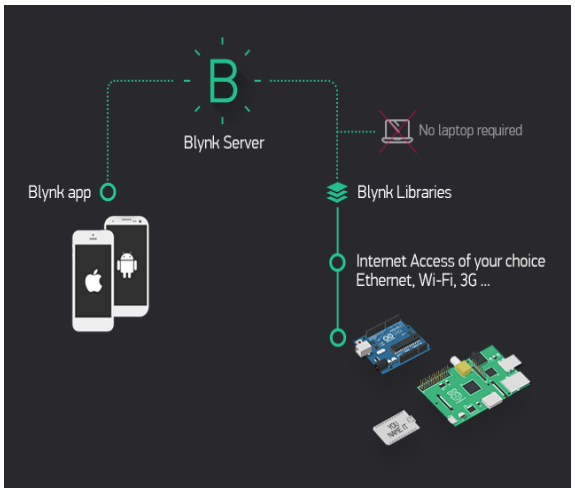

Figure 2: Basic overview of the working of Blynk

B. Nodemcu

The NodeMCU (Node Microcontroller Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266.

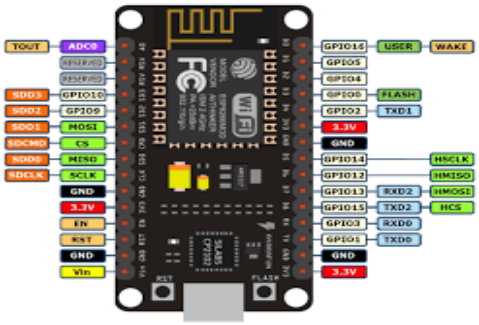

Figure 3: The NodeMCU pinout

C. GPS module (Ublox Neo 6M)

This module when integrated with Nodemcu & Blynk displayed GPS co-ordinates of the vehicle on the app.

D. Reed switch and magnet

They were mounted on the rear wheel to count the frequency of revolutions that is rpm. From rpm instantaneous speed was efficiently calculated by knowing the radius of the rear wheel.

E. Relay,Resistors(1 and 15 kilo-ohms),Arduino UNO,9 V battery,PCB sheet

F. Jio-Fi

Jio-Fi was used to provide internet access in order to transmit the collected data to the Blynk cloud server.

All the above-mentioned hardware was set-up on a PCB sheet and enclosed inside a box. This box was mounted on the rear side of the vehicle.

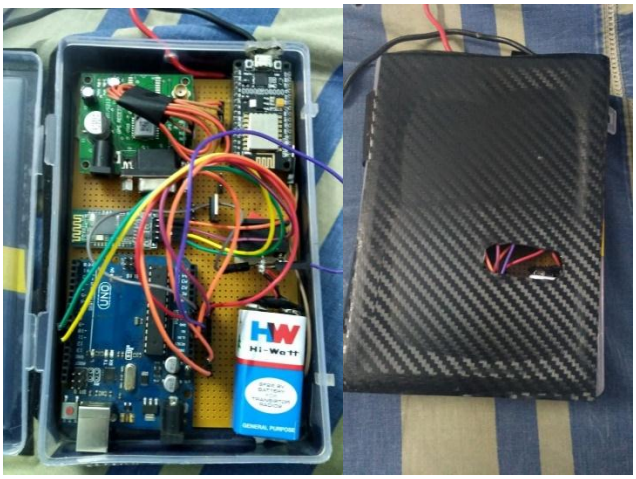

Figure 4: The hardware involved in this research

IV. RESULTS AND DISCUSSION

Different features of the IoT based telematics system were implemented on the vehicle. They are as follows:

A. Geo-tracker and Geo-fencing system

Through this GPS tracker, it is possible to know the real time location of the vehicle on the Google maps feature integrated with Blynk app. Further this tracker is also integrated with a history feature which keeps a record of the vehicle's latitude and longitude and astonishingly it can keep track of data up to 1 year old. Further, the Geo-fencing feature allows the users to set a radius of area. Whenever the vehicle ventures out of the set radius, an alert is popped up on all the phones which are connected to this project. This ensures vehicle proximity security.

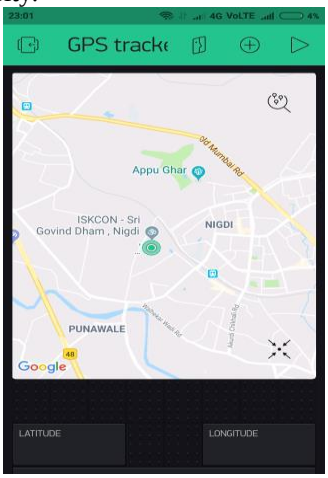

Figure 5: The GPS tracker snapshot on BlynkBattery voltage level indicator

The battery level indicator helps in indicating the instantaneous voltage of the battery. This indicator is integrated with a history function which will keep a track of

the voltage up to 1 year old. This feature helps in estimating the life span by knowing the discharge cycle of the Lithium ion battery.

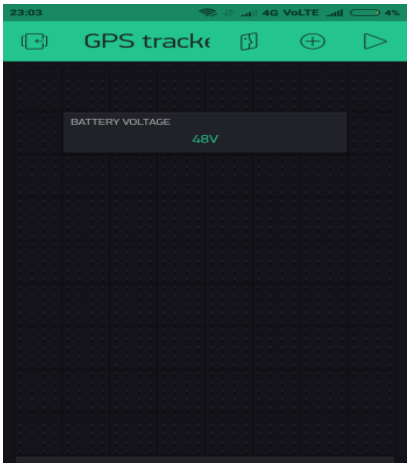

Figure 6: The battery voltage indicator

B. Speedometer and odometer

This IoT based speedometer measures the speed of the vehicle by using the interrupts of reed switch sensor connected on the back tire of the vehicle. The RPM is efficiently calculated. This feature will help the drivers to get the estimate of the speed to accordingly slow down on turns and speed away on plain roads.

Further, if the speed crosses a limit, an alert is popped up on all the phones connected to this project using the shared access key. This will prevent the driver from over speeding

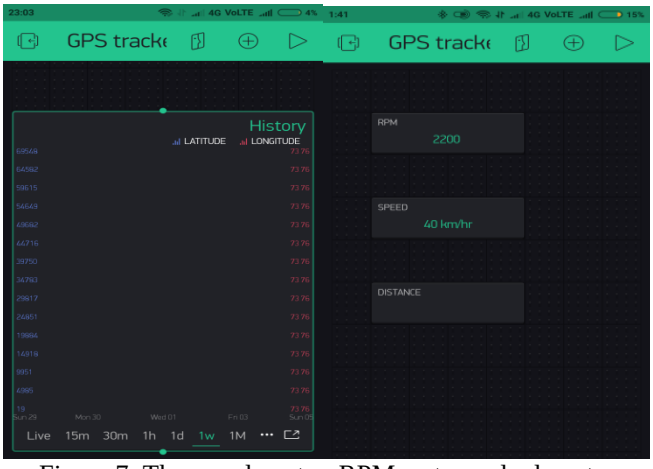

Figure 7: The speedometer, RPM meter and odometer

C. Electronic kill switch

This switch provides an electronic solution for switching on/off the vehicle. It can act as an electrical lock wherein the drivers can ensure that the vehicle can't be operated electrically by anyone if the switch is off. This is achieved by creating a button on the Blynk app with the appropriate virtual pin.

Further, the drivers can turn the motor of the electric vehicle on and off using voice commands of Google assistant using IFTTT by saying simple commands like 'Turn off the motor. This feature is useful when the driver doesn't wish to use his hands to turn ON/OFF the motor.

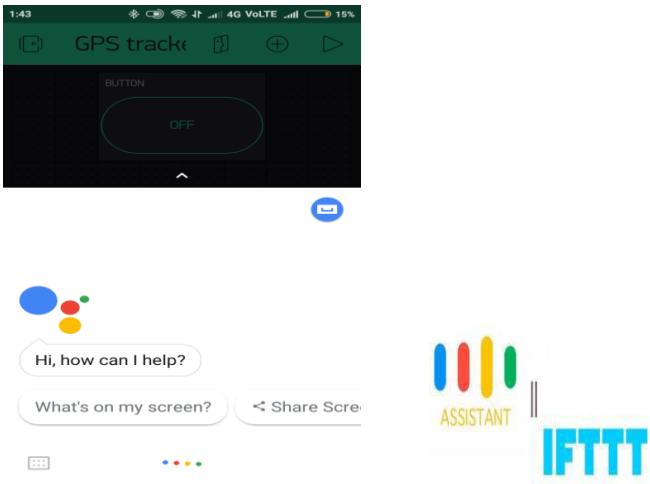

Figure 8: Creating voice applets with IFTTT

V. CONCLUSION AND FUTURE SCOPE

This paper focused on how IoT plays an important role in offering flexibility and various fresh features in the world of electric vehicles.

This IoT based dashboard cum telematics system provides more flexibility than traditional dashboards in vehicles. Concerned people with the right login credentials can view the different parameters of the vehicle from anywhere in the world over the internet. This also encourages data analytics. A centralized data acquisition system can be set up to monitor the status of the vehicles. The data stream received on Blynk can also be configured for the reading rate with a feature available on the app. This offers flexibility to scale up/down the computational power and processing requirements based on this reading rate. Also, a deep sleep mode in the NodeMCU helps lower down the power consumption when the system is idle.

The total cost of a single IoT box which contained all the hardware came to be around INR 2100.With mass production, this cost can be drastically lowered down.

Further, many more features can be added to set up a larger database like temperature and smoke sensors near the battery. A faster microcontroller with more computational power can be used for advanced applications.

VI. REFERENCES

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Mr Arvindsingh Rathore is currently a third-year undergraduate student pursuing Bachelor of Technology in electronics and telecommunications engineering at College of engineering, Pune.He is a member of IEEE and SAE since 2018.His research interests include Internet of things, VLSI design with FPGA technology and Cloud computing. He also has research experience in the field of piezoelectric energy harvesting.

