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Internet of Things Based vehicle Speed Monitoring and complaint Registering system

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ABSTRACT: Advances in technologies and the availability of economical open-source hardware systems are setting a new trend in system designing. The use of upcoming technologies like the Internet of Things (IoT) can ease the process of data collection and analysis. The main objective of this paper is to describe a system that can monitor, track the vehicle location, parameters of different test vehicles from a centralized host system and store data obtained from the testing results on a database for further analysis and records. The system will be designed for monitoring different parameters like the location of the vehicle, vehicle speed, engine compartment temperature, fuel consumption, and many more. The proposed system uses Node MCU ESP8266 and GPS/GSM/GPRS module for obtaining the latitude and longitudes of the vehicle.

KEYWORDS: IOT, vehicle Speed detection, complaint Registering, GPS tracking.

I. INTRODUCTION

The idea of IoT has been existing for a long time. The recent advances in various other technologies such as Reduction in the price of the sensors, greater connectivity, increase in the efficiency of the cloud computing platforms, analysis, and machine learning have made the Internet of things possible.

The internet is like the air for the IoT system to breathe. With the internet and the ability to connect with various devices increasing at a faster rate, the scope and the applications of IoT are increasing at a greater rate. Few applications of the internet of things can be showered in the following sectors, Manufacturing, Automotive, Transportation and Logistics, Retail, Public Sector, Healthcare, Modern security systems.

The paper is organized as follows. Section II describes the research work that was published about vehicle speed monitoring. Section III describes the Methodology and The flow diagram gives a detailed description of how the system was designed. Section IV presents snapshot of the circuit, Database, and android app. Finally, Section V presents the conclusion.

II. RELATED WORK

Jaun Zambada, Ricardo Quintero, Ramon Isijara, Ricardo Galeana, and Luis Santillan[1], in their paper "An IoT based scholar bus monitoring system", IEEE, 2015. Had proposed the development of an IoT based scholar bus monitoring system. The development of new telematics technologies has enabled the development of various Intelligent Transport Systems. However, these are not presented as ITS services to end-users. This paper presents the development of an IoT based school bus monitoring system that through localization and speed sensors will allow many stakeholders such as parents, the government, the school, and many other authorities to keep real-time track of the scholar bus behavior, resulting in a better-controlled scholar bus.

P. Fleischer, A. Nelson, R. Sowah and A. Bremang[3], in their paper "Design and development of GPS/GSM based vehicle tracking and alert system for commercial inter-city buses", IEEE 4th International Conference on Adaptive Science & Technology (ICAST), October 2012. Had proposed the design, development, and deployment of GPS (Global Positioning System)/GSM (Global System for Mobile Communications) based Vehicle Tracking and Alert The system which allows inter-city transport companies to track their vehicles in real-time and provides an alert system for reporting armed robbery and accident occurrences.



III. METHODOLOGY

Micro controller Used:

The NodeMCU is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif Non-OS SDK for ESP82. The coding environment used for the project is Arduino IDE by importing Node MCU boards into it.

GPS Coordinates and speed Measurement:

GPS coordinates and speed of the vehicle is obtained from NEO-6M GPS module. The NEO-6M module includes one configurable UART interface for serial communication, but the default UART (TTL) baud rate here is 9,600. This is because, the GPS signal is right-hand circular-polarized (RHCP), the style of the GPS antenna will be different from the common whip antennas used for linear polarized signals. Antenna used in this module is patch antenna. Patch antennas are flat, generally have a ceramic and metal body, and are mounted on a metal base plate. The patch antenna should be oriented parallel to the geographic horizon.

GPS module has 4 pins.

- VCC
- TX (Transmitter)
- RX (Receiver)
- GND (Ground)

The pin connection of NEO-6M GPS module and Node MCU ESP8266 are shown in table below.

NEO-6M GPS Module	NodeMCU ESP8266
TX	D4
RX	D3
GND	GND
VCC	3.3 V

The data delivered by the NEO-6 GPS module follows the standard 0183 from the National Marine Electronics Association (NMEA). “TinyGPS++” is the library used in code for Parsing NMEA data streams provided by the NEO-6M GPS module. Using the TinyGPS++ library in the code latitude, longitude, and speed of the vehicle can be got.

Creating Database:

We are using phpMyAdmin which is a free and open-source administration tool for MySQL Database.

A table is created in the database with attributes like id, latitude, longitude, speed, date, and time. (Note: Here the ID is auto-incremented).

id	latitude	longitude	speed	date	time
1	12.891702	74.855523	50	2020-08-21	12:57:41

Figure 3(a): Database Table

The Figure 3(a) represents database table. The table is updated each time the request is sent and PHP code is executed.

The latitude, longitude, speed, date, and time will be updated in the database.

Sending GPS and Speed data from NodeMCU ESP8266 to SQL database:

Node MCU ESP8266 has fully implemented TCP/IP stack and is capable of sending the request and handling responses from a server using the HTTP protocol. NodeMCU ESP8266 has a library known as “ESP8266HTTPClient.h” for making HTTP requests. A URL is generated in the format

“*http://domain_name/Folder_name/insert_data.php?latitude=latitude&longitude=longitude&speed=speed*” Once the URL is sent PHP script present in the hosting server executes and updates the data in the SQL database. This procedure will be repeated every time the driver of the car ignores the alert message and crosses the speed limit.

16X2 LCD Display:

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCOs or calculators. The appearance and the pinouts have already been visualized above now let us get a bit technical.

Android Studio:

Android app was made using Java Android studio. Android Studio is the official Integrated Development Environment (IDE) for Android app development, based on IntelliJ IDEA .

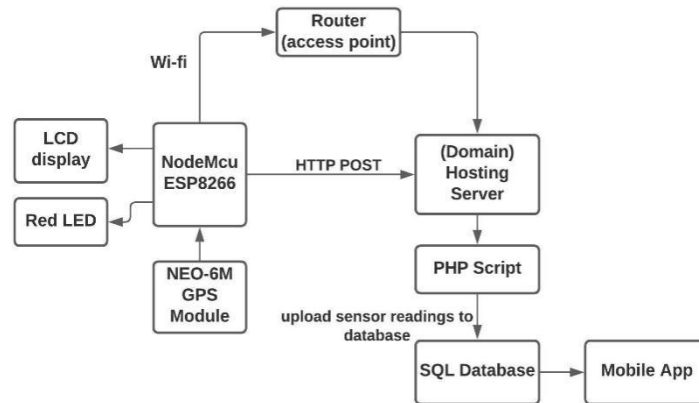


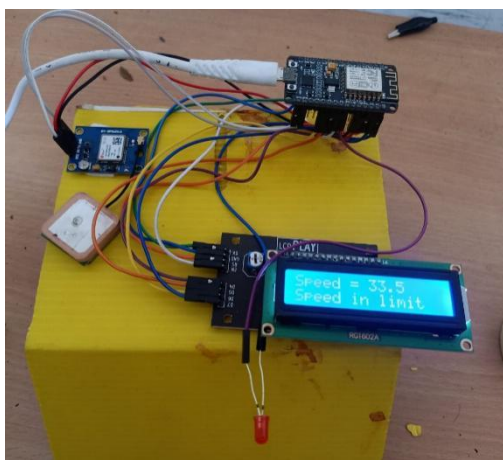
Figure 3(b): Block diagram

Working:

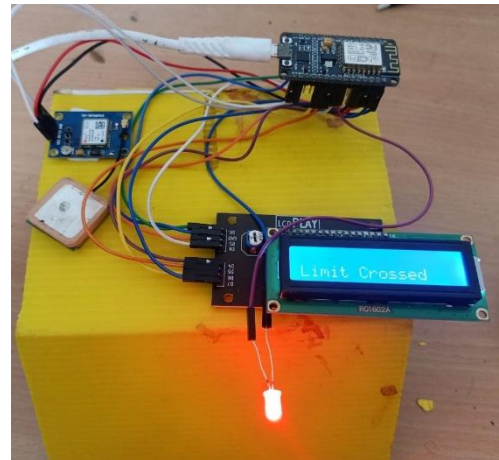
Node MCU, NEO-6M GPS module, LCD Display, and Red LED are installed in the vehicle. The GPS module NEO-6M used to obtain latitude, longitude, and speed of the vehicle. Within the city limits, if the driver tries to cross the city speed limit, which is assumed to be 40kmph, the driver will be alerted by glowing a red LED installed in the system, the LCD will show a message that the speed limit exceeded. On average, the driver will be alerted five times. If the five alerts are ignored, then a warning is issued. Node MCU has internet connectivity that generates a URL that will have latitude, longitude, and speed of the vehicle, and Node MCU does an HTTP post which runs on a PHP script in the hosting server and thus the script uploads the data in the SQL Database. This data can be further used by the traffic police. The data can be displayed using the android app. The app shows the places in which the car crossed the speed limit.

IV. EXPERIMENTAL RESULTS

Following are the snapshots of the project, Android App, Database of Internet of Things based car speed monitoring and complaint registering system.



(a)



(b)

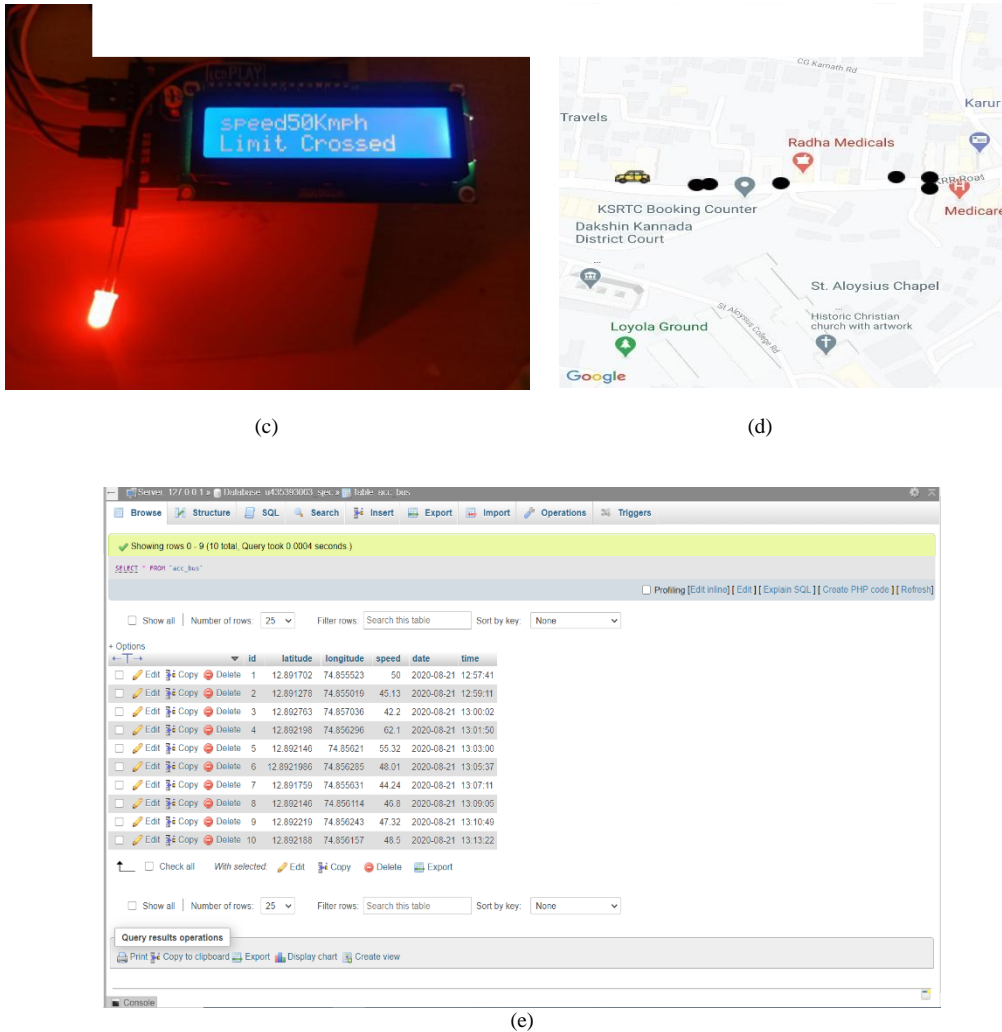


Fig. 1. (a) final circuit (b) circuit warning when speed limit crossed (c) circuit registering complaint (d) android app screenshot (e) Database Screenshot.

V. CONCLUSION

We have successfully implemented an Internet of Things Based vehicle Speed Monitoring and complaint Registering system. Our project successfully gets the speed of the vehicle, alerts the driver if he crosses the speed limit, then if the driver still ignores the alert, the location of the driver along time and date will be updated in the database so that he can be fined later. We have checked the project on the different speed limits and found that it is successful in all the test cases.

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