Developed Smart Vehicle Tracking System using GPS and GSM Modem

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Abstract

Fast technological development has streamlined daily living. On the other hand, as a result of a shortage of emergency services, the growth of technology has also increased the incidence of traffic accidents, which cause enormous loss of life and property. Systems for monitoring vehicles and detecting accidents are highly dependable and secure, and they are especially useful for remotely monitoring vehicle activity. In this paper, based on the Global Positioning System (GPS) and the Global System for Mobile (GSM) Communication has been implementing, an effective system for monitoring vehicle movement and identifying any accidents that occur has been established GSM. The suggested method successfully made use of widely available hardware elements that integrate a smartphone and a vehicle unit that is mounted within the car. The proposed system would use General Packet Radio Service (GPRS) to automatically communicate and store vehicle data to the Internet of Things (IoT) every 10 seconds. In addition, the system will create an SMS Short Message Service (SMS) and send it to the user's smartphone in response to an SMS request received with the vehicle's current position information. At the user side, it has been an android smartphone for software application connected to the Thinger.io platform that has been used to view up-to-date car information. Only the authorized user who has access to the Thinger.io platform and the login and password may access this application due to its security. The suggested system's accuracy has been evaluated. The findings show that the suggested method can follow the vehicle high accurately.

Keywords- Vehicle tracking, GPS, GSM and IOT.

I. INTRODUCTION

The IoT is a framework that allows all objects to have an online presence and representation. It is the networking of computing devices built into common things through the Internet, allowing them to send and receive data. In a broad sense, the IoT describes the expansion of network connectivity and computing capabilities to objects, devices, sensors, and other items not often thought of as computers. IoT pioneer Kevin Ashton previously said IoT actually gives information as a terrific approach to decrease waste and boost efficiency [1]. These (smart devices) may create, share, and consume data with a minimum of human intervention; they frequently have access to distant data gathering, analysis, and management capabilities [2].
IoT solutions are quickly being used in almost every aspect of daily life, expanding the range of applications for these technologies to be as many as they are diverse. The vehicle tracking system is one example of an IoT application that has had an impact. The purpose, operation, and application of a vehicle tracking system [3]. The simplest answers to the solve problems that IoT has to offer are discussed in this article for monitoring vehicle movement and identifying any accidents that occur, a reliable vehicle tracking and accident detection system has been built and created using the GPS[4]–[6]

II. RESEARCH METHOD

This research endeavors to introduce a Vehicle Tracking System (VTS-based) IoT system that operates in real time. The central component of the project, or the microcontroller, is an Arduino Uno. The proposed VTS aims to acquire the location of a vehicle and send it to the IoT platform for real-time tracking of the vehicle's movements. Users can remotely access the IoT platform through a software application to monitor the vehicle's current location and speed. To achieve this, a GPS receiver is utilized to track the vehicle's location, speed, and time of the last data received. The information collected is transmitted to the IoT platform via GSM

technology. In situations where the user does not have internet access and cannot access the application, they can request the vehicle's location from the proposed system by sending an SMS request. The proposed system will then respond with the current coordinates. Additionally, if an accident occurs, an alert will be sent to the user via SMS, and the coordinates will be immediately sent to the platform. The entire system's functionality results from interactions within a system design divided into three parts:

A. Hardware

The proposed system uses Arduino Uno R3 microcontroller with 32KB memory, 1KB EEPROM, and 2KB SRAM, operating at 16 MHz. It supports I2C and SPI communication and can import data from sensors. The board has a USB port, power jack, ICSP header, reset button, and 20 digital I/O pins. The SIM800L GSM modem is used for sending/receiving SMS and making/receiving calls. The NEO-m6 GPS module provides high-performance navigation, while the KY-038 microphone sound sensor detects sound. A vibration sensor with an analog output is also used in the system. All nearby cellular towers are utilized to locate the user [3]– [5].

B. Software

Firstly, the Arduino IDE is a software program that simplifies the process of writing and uploading code to Arduino boards. Secondly, Google Maps is a widely used mapping software that provides satellite images and 360-degree street views. Thirdly, Thinger.io is a cloud-based platform used for IoT applications that offers pre-installed capabilities for device registration, storage, and communication. Lastly, Thinger.io also provides an Android application for easy navigation and vehicle tracking by linking to the GPS device and creating a Quick Response (QR) code for monitoring. Overall, these technologies have revolutionized the way people build applications, navigate, and access information in real-time.

C. Protocols

The Hyper Text Transfer Protocol (HTTP) protocol is an application-layer protocol used for transmitting data over the internet, and it can be used for a variety of purposes beyond its original design of facilitating communication between browsers and servers. It is a server-client technology where a client initiates a connection and waits for the response, and the server does not save any data state among requests since HTTP is connectionless. HTTP is commonly used in web hosting, enabling users to communicate with online resources by exchanging hypertext messages between servers and clients. By default, HTTP uses Transmission control protocol (TCP) connections on port 80, and after evaluating the request message, the HTTP server can transmit the requested resource or an error message [6].

III. RESULTS

N The proposed vehicle tracking system involves testing GPS and GSM functionalities to ensure effective communication with the satellite and network, respectively. Once the system is linked and installed in the vehicle, it can continuously fetch speed and location data while detecting any collisions and alerting the user. The system is powered by an external source, such as the vehicle's battery, and has been experimentally tested for GPS accuracy in Table 1 lists the comparison results between actual and virtual locations and Figure 1 explains the path tracking, location requests, and accident detection.

Table 1. location comparison results.

Actual location		**Virtual location**		**Error (Virsual location- Actual location)**		**Error(m)**
lat	long	lat	long	lat	long	
33.34289	44.26739	33.342882	44.267412	5.67842E-06	-2.07952E-05	2.0323
33.32599	44.28676	33.32599	44.28672	1.81641E-06	3.74827E-05	3.4884
33.34297	44.26759	33.34298	44.26758	-7.21534E-06	1.01549E-05	1.2384
33.35174	44.34502	33.35174	44.34503	6.59077E-06	-1.17058E-05	1.3112
33.33824	44.27007	33.33822	44.27007	2.40931E-05	-1.8E-09	2.679

Figure 1: Explains the path tracking with location requests and accident detection

IV. CONCLUSION

The vehicle unit and user unit are the two components of the proposed vehicle tracking and accident system in this paper. The suggested system uses active, passive, and hybrid tracking techniques to keep tabs on the vehicle. The following is an explanation of the important points: The proposed method can locate a vehicle with an MAE of 2.14986. It is appropriate for observing the movements of all sorts of vehicles using GPRS, and it may be used to find one's present position by making an SMS request to the suggested system. In addition to user notification and automated accident detection. The vehicle path is shown and location data is stored for review purposes using an IoT platform.

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