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Vehicle Speed Detection and over speed control system based on IoT

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Abstract:

These days, automatic car monitoring has shown to be an extremely important situation. By putting the following technologies into practice, it might become possible. The goal of this project is to suggest a system that can identify vehicles exceeding a set speed restriction and notify the appropriate authorities right away.The number of traffic accidents has increased recently, making the development of a system to identify overspeeding vehicles necessary. The current Smart Vehicle Overspeeding Detector uses the Internet of Things to automatically and intelligently determine all traffic information on the roads. Smart cars are appropriate for use with overspeeding detectors that can record, store, and share data regarding the speed of the vehicle. The system has an IoT module, Google Maps, radar, and GPS modules. IoT and GPS technologies are used to automatically identify the safe zones.With a GPS sensing network and Internet of Things implementation, the electronic tracking device is powered by 12 V lithium batteries.This device has a battery life of five to ten hours.To reduce the vehicle's speed in specific areas, such as accident-prone zones, an IoT-enabled smart vehicle overspeeding sensor is used. Accident avoidance may be achieved if the safety guidelines are applied using this smart sensor technology. The data is sent wirelessly by the system. The sensor sounds an alert to warn if it detects an overspeeding vehicle. The intended sensor's goal is to lower high death rates caused by accidents in Oman and other Middle Eastern countries.

Keywords: Internet of Things, smart car overspeed sensor, Omani accident prevention system, car-to-vehicle interface.

Introduction

The primary concern with auto accidents is because they can happen anywhere, at any time, and are listed as continuing disasters. The Association for Safe International Road Travel Report states that 1.24 million people die and 50 million people are wounded on the world's roadways each year. Based on statistical analysis, they are believed to be the second most important causes of death.As a remedy to these problems, numerous manufacturers and the automotive device sector have tried to recommend speed control techniques to maintain a vehicle safe distance. This method involves employing recently created IoT-oriented technology to create a secure driving application for cars in order to create a more effective solution [1].The Internet of Things, or IoT, refers to the connections between readily identifiable embedded computing devices within the existing infrastructure. Beyond machine-to-machine (M2M) interactions, the Internet of Things (IoT) provides advanced system, service, and device connectivity across a range of domains and applications. By establishing this connection between embedded appliances, or smart things, all automation makes modern applications like Smart Grid possible [2]. The purpose of this project is to design and develop a brand-new internet of things-based smart car overspeed detector that alerts people when a car goes over the speed limit. Since there are so many accidents on the roads every day, advanced automobile overspeed detectors are essential to save lives. This article gives a general description of a smart automobile overspeed detector and focuses on using Internet of Things technology to enhance the overspeed detector's performance. Additionally, through a review of the literature, the current study focuses on the various strategies for handling speeding radars. The benefits of the speeding detector and its technological operation are explained by more

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research. Consequently, the proposed analysis would provide academicians and researchers with new insights into the topic and open their eyes to new avenues for research.

LITERATURE REVIEW

The EBM (Eye Blink Monitoring) technology, which alerts the focus during drowsiness, has been presented by the authors. An embedded system uses head and eye motions to detect the psychological state of focus, which is useful in warning drivers when they are drowsy during the sleep cycle. The outcomes of the system are unaffected by an average eye blink [1]. Researchers created the Automated Speed Detection System in [2], which can measure a car's speed and, if it is found to be over the posted speed limit, remove the licence plate from the vehicle and submit it to Toll Plaza for a fine. Here, the speed is determined using the visible Doppler Effect. When overspeeding is detected, a camera immediately takes a picture of the car and uses DIP (Digital Image Processing) techniques to take the number plate number off. The results show that the proposed system can successfully identify overspeeding vehicles, mines the licence plate, performs well, and can be used to test out overspeeding vehicles on public roads. A unique system that may effectively detect speeding offences on roadways and assist drivers in adhering to speed limits has been created and developed by the researchers in reference [3].

GSM (Global System for Mobile), PIC (18F45K22), and RFID (Radio Frequency Identification) are all included in the created system. This method has offered real-time notification, dependable, affordable, and efficient outcomes. The authors of [4] suggested a brand-new vibration sensor device that was installed on the car. The position of the car has been determined using a GPS locator in the event of an accident, which triggers vibration. The incident has been reported right away to Patrol and Life Support so that they can recover from the accident and track the suspect using a GPS locate software. By combining the accelerometer readings across time, the researchers were able to estimate the speed of the vehicles and identify any acceleration issues. Extensive studies were conducted to ensure that the sensor's speed is robust and accurate in actual driving environments. The authors [5] have proposed a system to detect reckless driving on highways and notify the relevant traffic authorities of any infractions. Numerous strategies require human concentration and involve numerous difficult-to-execute steps. The researchers' goal in this work is to suggest a tool for the early identification and notification of potentially dangerous vehicles during patterns associated with reckless driving. A control circuit, a buzzer, and an IR transmitter and receiver are required for the entire implementation.A buzzer signal alerts the authorities if the car goes faster than the posted speed limit.

S. No	Author and Year	Techniques	Benefits
1	Aishwarya et al. (2015)	Eye Blink Monitoring using IoT technology	Fast response to take fast action User friendly interface Easily implementable
2	Malik et al. (2014)	Automated Speed Detection System with DIP	Involves manpower with a gun to inform a Toll Plaza
3	Shabibi, Jayaraman and Vrindavanam (2014)	Automobile Speed Violation Detector using GSM and RFID technologies	Reliable, low cost and efficient results It provides real time notification
4	Prasanth and Karthikeyan (2016)	Vibration Sensor Devise	find out acceleration faults Estimated speed is accurate and vigorous on driving atmosphere
5	Rangan (2017)	MQ 9 Gas sensor device using IoT, GSM and GPS	Green city concept Reduce speed and control air pollution

Table: 1 Different Vehicle Overspeeding detectiontechniques

Methodology

The suggested new Smart Vehicle OverspeedingDetector uses Internet of Things technology to alert users when a vehicle exceeds its speed limit. This device wirelessly notifies overspeeding detecting authorities and records vehicle speed information without the need for labour.

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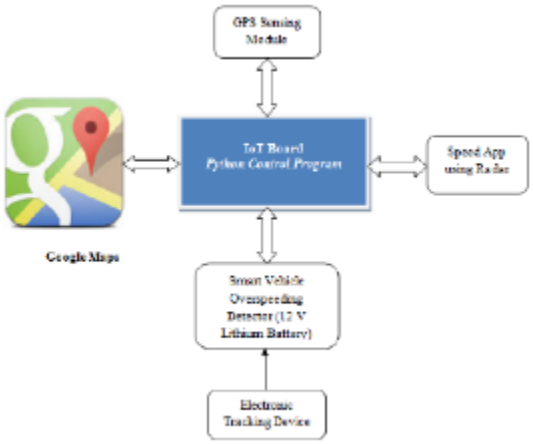

The system architecture for the vehicle speed detection technique is shown in the accompanying figure. The accuracy of the speed tracking in this suggested system can be determined using the Speed App and Radar. This device captures the vehicle speed in real-time and has an accuracy of road recognition based on the road names entered into Google Maps. Additionally, it cross-validates against the designated speed restrictions for that road's specific route. The electronic tracking device is powered by a network of GPS sensors and Internet of Things implementation, and it uses 12 V lithium batteries. This device's battery life is between five and ten hours long.For a period of six months, the server details will be hosted on a Windows server and thereafter uploaded for future usage. The speed limits can be fed into an internet application with a separate login on that website. The tracking app tracks the car with an Android application and sends a message to the specified number. The vehicle's speed and the server time when the overspeeding happens are displayed during login.

A. The Internet of Things (IoT) is the networking of physical objects, cars, and other things including actuators, software, electronics, network connectivity, and sensors that enable these things to collect and share data. Through the use of the Internet of Things, items can be remotely controlled and/or sensed via the network infrastructure. This opens up possibilities for more direct integration of the physical world into computer-oriented systems, improving accuracy, efficacy, and financial gain. It goes without saying that a massive number of devices connected to the Internet will be part of the Internet of Things. The capacity to network embedded tools with constrained CPU, memory, and power resources shows that the Internet of Things can identify applications in nearly any industry. Applications in the domains of urban planning and environmental sensing may result from the employment of these kinds of systems for information collecting in a variety of situations, including factories, buildings, and natural surroundings.

B. GPS Unit: For car navigation, a GPS (Global Positioning System) navigation gadget or GPS receiver is utilised. It is capable of accurately estimating its geographic position by first receiving data from GPS satellites and then sending it. This gadget has the ability to retrieve GPS time information and system locations in any weather condition, close to or anyplace on Earth. An open line of sight (LOS) to four or more GPS satellites is required for AGPS response.

These days, a lot of detachable GPS receivers are used in automobiles. When GPS signals are weak or unavailable, smart phones with GPS capabilities can use A-GPS (Assisted GPS) technology, which uses base stations or cell towers to provide the device with position tracking capability. However, when the smartphone is outside of the range of the mobile reception system, A-GPS won't be available.
C. Maps on Google: Plotting GPS coordinates to the geometry of the road and identifying the vehicle's speed limit on the various road segments are made possible by the Google Maps Road Apps. The services available for Google Maps Apps are as follows:

Snap to Roads: This function gives the road's best-fit geometry given a collection of GPS coordinates.
ii. Nearest Roads: Given a set of GPS coordinates, it gives the specific road subdivisions.iii. Speed Limits: It provides the road segment's positioned speed restriction.

The system first calculates the amount of time a specific vehicle will require to go from a starting point to a destination. The Smart Vehicle Overspeeding Detector uses radar and a speed app to estimate the vehicle's speed based on this data. This information is gathered and then wirelessly sent to the relevant authorities at a distance via IoT technology. The gadget has a GPS sensing module with a transmitter and receiver that work in tandem with an electronic tracking device to detect the speed of the vehicle.The name of the roads that are added to Google maps determines the accuracy of road identification, and this system tracks vehicle speed in real time. The speed of the vehicle is calculated by the system and shown on an LCD display. The suggested device alerts authorities to the presence of

an overspeeding vehicle by means of a buzzer signal. The accuracy of speed tracking is estimated by the Speed App using Radar and ranges from 40% to 80% depending on connectivity and internet speed.

CONCLUSION

This study addresses the challenge of accurately detecting vehicle overspeed in an urban environment utilising Internet of Things technology in order to facilitate the development of automotive applications. The purpose of the smart vehicle overspeeding detector is to sense the driving environment in order to achieve high detection accuracy. In order to prevent frequent accidents, the suggested method is specifically utilised to identify overspeeding vehicles and notify them to the appropriate authorities.Future improvements that could be made to the suggested system by creating hardware implants, integrating sensors, and creating software algorithms are as follows: i. Clarification of situations involving drunk driving; ii. Fix for emergency vehicle speed control; iii. Fix for wheel grab by gravity detector; iv. Fix for accident identification using impact detectors; and v. Fix for reckless driving by impeding spark plug.

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