DIGITAL VEHICLE KEY BASED ON VERIFICATION OF AUTOMOBILE DOCUMENTS

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Abstract
The proposed solution focuses on verifying the accuracy of the vehicle documentation whenever a person enters the car and only permits that person to start the engine when all necessary documentation is current. By installing an actuator in the vehicle that is managed by the software that verifies the legitimacy of all the documents, we intend to achieve this. The car will not operate if any of these documents are expired and must be renewed or replaced. The program will offer an emergency alternative that can be utilized in urgent situations, but it will only work a certain number of times to prevent it from being used as a backdoor to renew the necessary documents.

Keywords: Vehicle, Tax, Insurance, Identity, Digital key, Safety, License, Arduino, Android

Introduction
In India, when an individual buys a vehicle, there are a lot of attributes attached to it that range from the registration certificate of the vehicle, and the license of the driver to the PUC certificate and motor insurance. There is a steep increase in the number of drivers who drive their vehicles with incorrect/forged/expired documents. This gives rise to illegal activities and creates a hazard for legitimate drivers on the road. Eventually, these activities lead to major road safety concerns. There is no existing hardware/platform/idea that enforces the users to have genuine documents before driving any type of vehicle. This creates an additional burden on government entities who regulate transportation as well as traffic police have a hard time verifying millions of vehicles on the road as there is some human error involved. 1 in 4 people neglect to renew their auto insurance. Despite being required by law, many people do not have a policy. We have proposed an innovative design comprising both hardware and software to compel the users to have authentic metadata required to drive that vehicle.

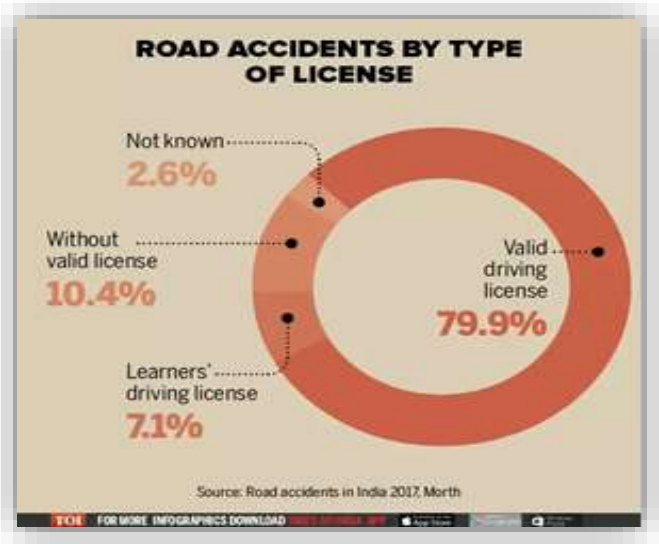

Fig 1: Statistics of road accidents based on driver license

Statement of the Problem
To ensure the safety of the vehicle owner with the help of technology and to keep a check on the automobile documents without any manual check.

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Objectives

- To make a device that ensures only authorized vehicles and drivers to be on the road.
- To make the collection of vehicle taxes easier.
- To reduce accidents by unauthorized drivers and eradicate the human errors.
- To create a centralized digital system available at the fingertips of citizens.
- To create hardware which could be attached to existing and new vehicles.

Review of Literature

L. Jamjoom et al. [1] infer that the right implementation of IoT technology with a smart combination of an Androidbased smartphone, Bluetooth wireless interface, front-end controller, and a server would allow monitoring certain parameters of intended cars like tracking, remote engine break, petrol consumption, CO2 emission rate, etc. which will eventually reduce the pollution, increase safety as well as create a new smart system for transportation. The frontend module, the server, and the smartphone all had wireless interfaces that were sent delta-based and eventdriven, which increased the system's efficiency in terms of resource use and power consumption. The system's operation was successfully tested for a distance between the smartphone and the front-end electronics of up to 20 meters. Periodically recording the system status on the cloud gave authorized users access to it anywhere in the world via cell phones whenever needed.

Girish Revadigar et al. [2] described a procedure for analyzing RSSI and determining user activity. Moreover, they have designed a secure digital key system with secondfactor authentication based on BLE channel properties. Using readily available Android smartphones, they put the suggested approach into practice and carried out numerous tests to confirm its effectiveness. They have described a method to process the channel features to recognize various user behaviors and improve the correlation of channel characteristics on two authorized devices. They have also recognized the difficulties in using BLE channel features for security. The findings demonstrate that the suggested technique, which employs BLE RSSI-based authentication, can prevent relay attacks on keyless entry systems in contemporary vehicles. The solution has been tested on passive attackers, active man-in-the-middle attacks, relay attacks, and denial-of-service attacks and thus such attacks can be successfully stopped by the suggested BLE channel features-based authentication approach, which can also support the development of secure KES.

Sanjoy Banerjee et al. [3] proposed a design to tackle several issues like improper use of helmets, increased blood alcohol concentration (BAC) during drunk driving, theft of vehicles, etc. A Wi-Fi module on an Arduino is used to represent the system. Wi-Fi is used to maintain the pairing between the helmet and the two-wheeler. The TW's GSM/GPS integration enables tracking via an Android or iOS app because Wi-Fi allows for the transmission of data. This communication suggests an Internet of Things (IoT)- based two-wheeler ignition that considers a number of factors both before and during the trip by continuously polling the sensors. Only when the rider and any passengers, if any, are wearing helmets, sober, and registered users of the two-wheeler will the ignition start and continue. The plan also considers the rider's security and that of the twowheeler.

Shravya, K. et al. [4] describes the usage of a smart helmet, a sort of protective headgear, which increases the rider's level of safety when operating a motorcycle. This helmet's primary function is to keep the rider safe. Advanced features like fall detection, accident identification, location monitoring, and alcohol detection can be used to accomplish this. As a result, it doubles as a smart bike feature in addition to being a smart helmet. The ignition switch cannot turn ON without the helmet being worn, hence it is required. An RF Module can be used as a wireless link for transmission and reception. When a rider is intoxicated, the ignition locks itself and sends a message with his location to the registered phone number. Determine whether the helmet is being worn as the first step. If a helmet is on, the ignition will turn on; otherwise, it won't. The Force Sensing Sensor (FSR) sensor is utilized for this. Alcohol detection is done in the second step. Alcohol sensors are used as breath analyzers to identify the presence of alcohol in the rider's breath and prevent the ignition from starting if it exceeds the allowed limit. "Rider is drunk and is trying to ride the bike," it

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would state in the message sent to the phone number. This is accomplished using the MQ-3 sensor. Only when these two requirements are met does the ignition start. Installation of an accelerometer in the bike unit to detect falls. This method makes it possible to find accidents.

Khaleefa Al Hammadi et al. [5] describe an effort that has been made to build a car safety system that will prevent the vehicle from starting unless the driver is wearing a seatbelt and will alert the driver if drowsiness is detected. The NeuroSky Mind-wave headset is utilized in the proposed system to record various EEG levels. In order to control the engine start, a limit Switch electrical circuit is also created and connected between the seat belt and the ignition system. To control the car's safety system, the Arduino microcontroller and its software are used as signal processing units. The outcomes of the experiment demonstrate that the technology can effectively improve drivers' sense of safety. The system features three outputs (Car Engine, Alarm, and Lighting Devices), two inputs (Seatbelt Limit Switch, NeuroSky Headset), and a data processing unit (Arduino). First off, the engine won't start until the driver buckles their seatbelt, which the limit switch can detect. Second, the NeuroSky Headset is used to identify sleepy driving in order to trigger the alarm and the vehicle's lighting, alerting the driver and the drivers of other vehicles in order to prevent an accident. The seatbelt limit switch and the NeuroSky headset inputs are processed by the Arduino microcontroller, which then turns on the car's ignition and alarm system. Last but not least, the BlueSMiRF is a peripheral add-on for Arduino that enables Bluetooth connectivity with the NeuroSky Headset.

Chougule, A.R. et al. [6] proposed an IoT-based smart vehicle monitor system. The IoT-based system was used to monitor the car parameters such as alcohol content, smoke content, object distance for black spot identification, rain intensity, and light intensity through Wi-Fi. In electronics, automation was used to convert a manual system into an automated one, allowing the parameters to be controlled in accordance with the inputs. This system's automation makes advantage of the Internet of Things to automatically monitor vehicles. The proposed system helps the owner at a reasonable cost because the actual automobiles could not have the features of pricey sedan cars. The suggested method is supposed to be inexpensive for the driver's safety and simplex monitoring. It will adapt to all real vehicles, including pricey sedans. This auto-transmission technology, which will be used in some affordable, authentic sedan cars in India, helps to prevent accidents.

Kulsresth, K. et al. [7] describes an Android application that will be useful in presenting all the information about Covid19 (including the number of total cases globally, the number of active cases, Covid19 hospitals nearby the victims, medical facilities close by, and many other things) has been developed. As we are showing the data for covid19, users may readily learn about their current location's status for the corona, i.e., the total number of covid19 instances in their country or city, without having to leave the site. As the users won't have any direct interaction with someone and won't be harmed, this method of data collection will be beneficial.

Research Summary

From the above literature survey, it can be summarized that it is possible that it is feasible to use Arduino as the microcontroller along with Wi-Fi/Bluetooth as the connectivity medium between the mobile application and the hardware which is to be installed inside the car/vehicle. A switch/relay can be used between the hardware and the engine circuit to control the start of the car. There are various drawbacks like the connectivity medium as Wi-Fi between the mobile application and the hardware where the internet is not available and the control of the start and stop of the engine.

Research Methodology

PROPOSED SYSTEM DESCRIPTION

The system comprises of hardware as well as software. The hardware consists of Arduino Uno R3, Bluetooth HC-05 module, Ignition Switch, LM2596 Voltage regulator, L298N DC motor driver, DC Motor, LED. The Arduino Uno board along with all its peripherals, depicts the prototype inhibitor for the engine (here the engine is depicted by the DC motor). The circuit diagram can be referred from the Figure 2.

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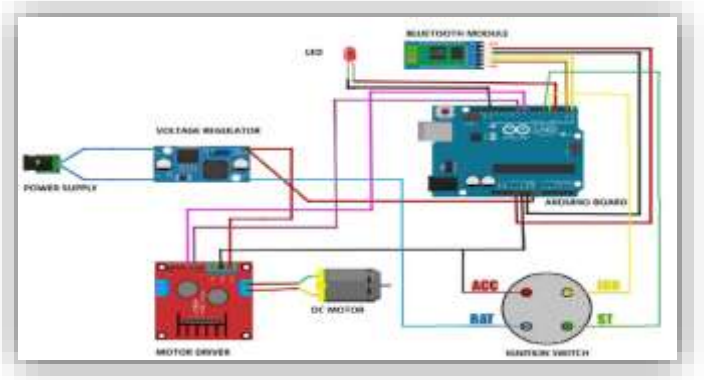

Fig 2: Circuit diagram of proposed system.

REGISTRATION

To connect the vehicle with the driver's device and successfully allow the engine to start, the driver needs to register on the mobile application with all the necessary legitimate data. The registration on the application takes place in the following steps:

i. The driver needs to install the application on his smartphone. To successfully login, the driver needs to register using mobile number and OTP verification.

ii. The driver needs to upload all the mandatory automobile documents as well as the personal driving license when prompted by the application. After verifying the legitimacy of these documents by using the database of DigiLocker, these documents will be saved on this application.

iii. There will be an expiry date linked to each document uploaded and the user can even update the records once the expiry date is passed or if the document is invalidated.

Once the registration is completed, the app will display the various login profiles available as shown in Figure 3.1.

Fig. 3.1 Application screens for successful registration and verification.

On the contrary, if any of the user's documents have expired then user would be prompted to the official payment gateway of the website where the documents could be renewed (Refer Figure 3.2).

Fig. 3.2 Application screen for expired documents.

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BLUETOOTH CONNECTION & VERIFICATION PROCESS

Once the driver has successfully registered, the driver would be eligible to connect their personal device to the hardware connected to the engine via Bluetooth. The vehicle will be operable once it passes the two phases mentioned below:

i. Successful Bluetooth connection: -

In this phase, the Bluetooth of the smartphone should be switched on. Then the Bluetooth connection would be initiated through a trigger (button) in the application which will eventually connect to the hardware's Bluetooth module.

ii. Checking the document's expiry date: -

Once both the devices are connected, the driver will be allowed to send another trigger to the hardware based on the expiry of the document. If all the documents are valid, then a value of "1" equivalent to a Boolean true would be sent to the hardware which will allow the engine to start when the driver starts the engine. Similarly, if any document has expired, a value of "0" equivalent to a Boolean false will be sent to the hardware which would not allow the driver to start the engine.

Conclusion

After implementing the proposed architecture for the vehicle inhibition, the number of licensed drivers driving would increase exponentially. The system would support and encourage time to time updating/renewal of the official required documents. Eventually, the platform would act as a boon and assist the required government authorities to curb the illegal acts of non-legit drivers. We can add an emergency SOS system or feature to aid genuine situations where drivers could bypass the system for a couple of hours. There is a scope to create prototypes for different types of on-road vehicles like two-wheelers, three-wheelers and heavy-duty vehicles. The application could also have a guest mode where the owner of the vehicle could permit other individuals to drive their vehicle for a stipulated amount of time.

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