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Satellite Based Vehicle Tracking And Maintenance Monitoring System

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1. Abstract

Satellite Based Vehicle Tracking And Maintenance Monitoring System is an alternative approach for the toll road collection and maintenance status indication of the vehicle to the owner of the vehicle as well as the regional authority. This system works in a way that the toll applied to individual vehicle travelling on a national highway on its complete journey from the point of arrival to the national highways as well as till the point of departures from a national highway, the applied toll can be collected without any human intervention i.e. automatically.

And also this system is able to detect the current maintenance status of the vehicle, which can be shared with the owner as well as with regional authorities. If the status of the maintenance system is unfit it will able to indicate the warning to the owner by itself on their communicating channel like email, SMS, flash notification etc.

And if the owner of the vehicle is unable to have maintenance checkup within the given time limit permissible by the regional authority and use vehicle continuously after the permissible time limit. The system should forward the notification to the Regional Data Monitoring Authority by itself.

2. Introduction

In this paper, we will discuss about the unique vehicle identification and tracking in a selected region of interest with accurate results. User Authentication is also a service crucial for many electronic devices. Without a secure User verification, it is impossible to acquire many services like vehicle identification, vehicle type, selection of route along the journey etc by both the internet and during everyday life.

At first we need authentication methods for verification of vehicle identities and access authorization by the regional data monitoring centers through a log report which represents the current maintenance status of the vehicle to them. Each time a vehicle gains access to authentication service, it releases its identity, which can be used by service providers to track the behavior, profiling the usage of vehicle. It is not only the security of the service providers

which is at stake but also the security and privacy of users that must be protected.

GPS is a service that can connect to multiple satellites to determine the location of the vehicle. It uses trilateration which have the access multiple satellites by GNSS i.e. Global Navigation Satellite System. This process has the access to the estimate the location which is determined by latitude, longitude, elevation & time. These devices are already used in cars navigation system to evaluate the most appropriate & efficient route selection with minimal traffic, current vehicle speed, Road lane assist along with arrivals & departures from national highways, estimated time of arrival for end of journey etc. But this technology can be used more than that, with the help of GPS technology we could build and implement a monitoring system which is able to collect toll collections on their on. As for the current scenario we are having a fastag section at the toll plaza in which a RFID(Radio Frequency Identification Technology) is used to make toll payments directly while the vehicle is in motion. But this system is inappropriate in several ways, it sometimes unable to catch the Identity of the vehicle because of various reasons like

- Materials like metal & liquid can impact signal.
- RFID reader can scan a tag within frequency range.
- Unknown machines can read and even modify data without owner permission.
- It takes several seconds to process the identification at toll plaza.

By having these point of failures. Sometimes a scenario of over traffic occurs at the toll plaza which results in a long traffic lane and which is to be processed through this RFID based system. This imposes an aggression in the behavior of public in the long traffic lanes as well as the pressure on the toll plaza executives in the extreme weather conditions i.e. Rain/extreme hot/cold. Sometimes leads to scrimmage between the public and toll plaza executives.

That's why we have introduced this idea of toll collection without any human intervention. And the plus point is we also want to implement an automation sensing device in the vehicle, which is able to sense the current status of the vehicle fitness and generates a report that further will be send the indication to the vehicle owner as well as update the notification to the regional data monitoring authorities after breaching the permissible time limit usage on vehicle.

This notification can be shared by any types of communication channels, which could be an email able report, SMS on the mobile phone, flash notification on the application etc.

The best part of implementing the above monitoring system is as follows:

- It will be helpful for Reducing Road Rage Situations.
- The vehicle owner is satisfied by having the real time location of its vehicle.
- It will be helpful for reducing vehicle stolen activities by having the access of the real time location.
- The device is able to detect unfit status of the vehicle. By using an unfit vehicle could leads to low vehicle efficiency, which further impacts the mileage/triggers pollution/ware and tare/ accident.

In this paper discuss about Satellite Based Vehicle Tracking And Maintenance Monitoring System, study the literature survey and the behavior of an inappropriate technology on public everyday life.

3. Literature Survey

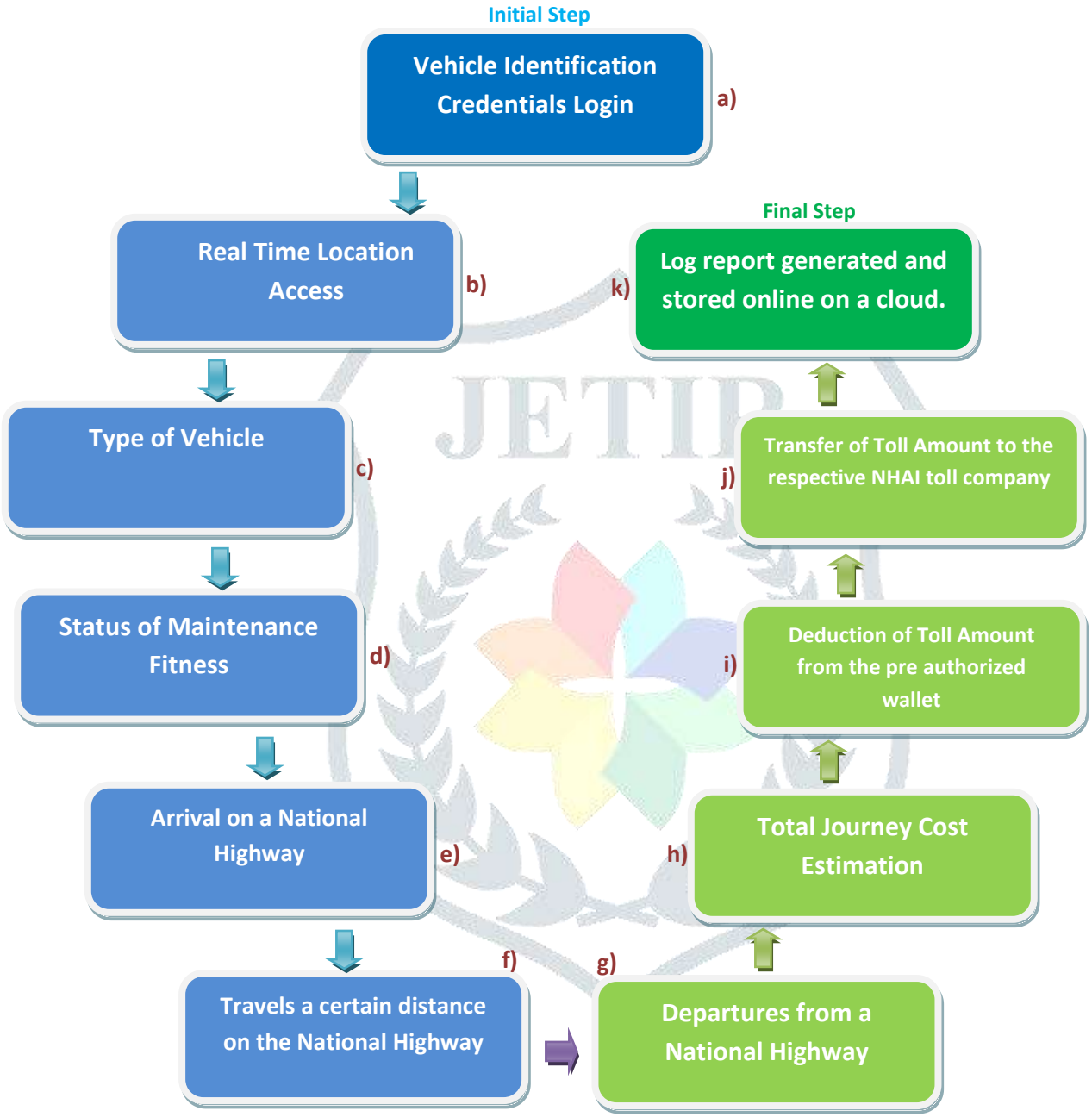
Object Visual Recognition is a process developed by some algorithms to detect many objects. We can easily classify these objects like a bicycle, vehicle, ball but this task is difficult to understand by the devices in real-time. Even if the vehicle is having partially coverage by GPS. It may be recognized accurately if the software is strong enough.

In daily life, we face many problems. Traffic jam is one of them and it becomes terrible day by day. In return the increasing vehicle congestion and various problems exists, for example, road accidents, road congestion, Road Rage etc. Various ways are there to track, identify a car on road like by installing navigation devices on them, by Image Processing, by detecting their motion etc.

The amount of traffic can be calculated and this data is important in many surveys & play an important role in vehicle and traffic management. It's one of the best concept, that countries are seeking to implement in their traffic management. If this monitoring system will be installed to the upcoming vehicles, there will be a separate Data Monitoring Authority for this automation process, which further provide opportunities to skilled manpower and drag the attentions of tech-friendly manufacturers on this project. This system could lead to the power and efficiency management for the country.

4. Concept

This diagram below shows the total working of the concept:



a) Vehicle Identification Credential Login: Automatic position detection system enhances the accuracy of locating anyone's position by using Global Positioning System and Web Tech. This system includes a mobile client, and a repository, a web client and a map service like google. The mobile client is used to search location and send an API request to user when another user comes around. This location info will be sent to server and will be optimised and accessed using the web client. With the help of this technology an automated session for login the vehicle's unique credential will be sent to server along with time stamp and appropriate information.

b) Real Time Location Access: It measures distance to each satellite by the total time it takes to receive a transmitted signal. To compute the 2-Dimension position and track movement, the Global Positioning System receiver unit will lock on the radio signal of minimum three satellites. And this process is known as trilateration. Global Positioning System doesn't need any kind of internet, but there are technologies like A-Global Positioning System that uses mobile network to shorten the time to first fix, or the initial positioning or increase the accuracy in low satellite visibility.

c) Type of vehicle: Type of vehicle can be set during the installation of the monitoring system to the vehicle. It will be a pre applied method which creates a virtual account for the vehicle with unique data credentials based on the type of that particular vehicle.

d) Status of maintenance fitness: Most of the essential parts that new-age vehicle use is the vehicle sensor. It plays an important role in notifying user for an issue within its system. It helps user narrow down to the problem by a parts, and saves time when it comes to maintenance of vehicle. It also helps in controlling every aspect, such as fuel intake and heat. To a pro in auto-engineering, it's a true fact that sensors have streamlined the overall ownership and handling of automobiles. There are various types of sensors used in vehicles, most of them are embedded in the engine, and each of them performs a specific role. With a sensor-equipped vehicle, you have the assurance of efficiency on the road.

e) Arrival on a National Highway: The national highways are already defined with a unique identification number on almost every map service. So if a vehicle is approaching towards any national highway the tracking device is already able to detect the route and current location of the vehicle. The monitoring system registers a timestamp along with location coordinates from the starting point on a national highway and updates the log status for that particular session.

f) Travels a certain distance on National Highway: When the vehicle covers a certain amount of distance on the national highway, meanwhile the monitoring system updates the log status with various real time information like speed, direction, travelling distance etc.

g) Departures from a National Highway: When the vehicle takes exit from the national highway, the system updates the log status with time stamp and location coordinates.

h) Total journey cost estimation: After the departure of vehicle from a national highway the cost of the total journey covered by the vehicle during the session will be estimated in the form of deduction format like rupees or wallet coins. And a log report is also generated for this session.

i) Deduction of Toll Amount from Pre Approved wallet: After the total cost estimation the system is enable to send the request of the total amount cost to the monitoring authorities. Then from the monitoring end an amount deduction process will be started automatically after getting this request from the client side. And that's how the transaction is initiated.

j) Transfer of toll Amount to the Respective NHAI toll company: After deducting the amount of travel estimation for a particular session from the vehicle's account. It will be transferred to the respective NHAI toll company. In this phase of the session the transaction is to be successfully completed.

k) Log report Generated and stored on a cloud: After performing the above phases a final status will be updated in the log report and this log report is completed and it has to be saved on the cloud for security and log maintenance.

5. Result

GPS Module:The position of the vehicle can be detected using a Self-tracker. It effectively detects the vehicle location.

Data Sharing Module: The authorised client can upload the data online in a server or cloud. This data can be used to monitor vehicle activities using Web Client.

Notification Module: The location of the vehicle can be notified to the user. This location includes the data such as Landmark, Street, Country etc.

Automatic vehicle detectors can be used as vehicle identifiers and vehicle tracking devices. The vehicle identifiers will work on GPS data and collect info from the entire vehicle. However, they miss out the spatial variations. Trackers are fixed inside vehicles and can collect specific info such as travel time from the vehicle. The info can also be collected from vehicles that voluntarily participate via trackers. This extends the sample size and most of the available data repositories are available to store and share this specific data.

6. Conclusion

The proposed concept uses Global Positioning Service & Web Tech in order to enhance the positioning experience. Location detectors & trackers can effectively alerts the client about the location of the vehicle. This positioning of vehicle can be shared online. To log report & the concept which is proposed here can be implemented to update the location.

With the help of this system, the collection for the tolls along the national highways will be enhanced for the government as well as public who uses this technology will be happy as they are not to be stand at the long fastag lanes. It reduces the wasting of time, fuel, energy and exploitation of humans during a scrimmage/road rage.

Also vehicle theft claims will be decreased as everyone has their vehicle's real time location.

Maintenance of the vehicle can be checked up on its routine, as their vehicle will be safe from ware and tare, efficiency of the vehicle will be increased, vehicles will be emitting less pollution than as usual. This will also help our environment, and as a human it's our need and deed to have a sustainable development along the journey of our life.

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