Remote Monitoring of Rented Vehicles through Android Application

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Abstract
Towards supporting the vehicle owners, the authors of this paper have developed a mobile application that handles Vehicle and driver activities. The mobile application is capable of monitoring drivers through the use of special sensors and through a user-friendly interface that can be used to alert vehicle owners. The vehicle owners rely on their drivers for their transportation business needs. But vehicle drivers cheat their owners in all the aspects from fuel filling to ticketing. So, monitoring agent becomes the necessity to continuously track the records of vehicle as well as driver. This paper states the continuous monitoring of fuel filling, mileage, number of passengers travelled per trip, fare collected. And furthermore the safety of passengers, drivers and vehicle have to be considered. So drunken driving, using cell phone while driving and restless driving are to be monitored and alerted to Authority. Not only the driver cheats owner, he also gets cheated by the passengers, so ticket less travelling must be alerted to the driver.

Keywords: monitoring agent, intelligent mobile applications, vehicle informatics, support for the vehicle owners,

1. Introduction
In this new age of modernization, fraudulent are equally as high in any sector. Especially in case of transportation sector, where the vehicle owner gets cheated by the fraudulent drivers. Owners get cheated in all the aspects right from fuel filling to ticketing (they even use some fake tickets to lure money from passengers as well as from owners). So, Continuous monitoring the rented vehicle manually is not at all possible. However we can solve these issues by monitoring the vehicle remotely. By monitoring we can collect the details like number of passengers travelled every trip, the source and destination of individual passengers and we can also get the details of fare collected in each trip, thus the problem in ticketing can be greatly reduced. Fuel filling and mileage can also be monitored remotely. Another thing which the owners or authority want to check is the probability of accident. The major reason of accident in our nation is drunken driving, using mobile phone while driving, and restless driving especially during nights. So, Proper monitoring agent should be installed to continuously update the owner on driver activities. The cheating is done not only by employees but also by the passengers. They won’t purchase tickets unless and until forced to purchase. So ticketless travelling needs to be monitored.

From the above discussion it is clear that, the owners of rented vehicles or authority of public transportation needs to monitor the above details remotely any time. In this paper we are introducing a device which can install on the vehicle to monitor above key points and communicate with owners or authority by using application software in android and windows phone and also in computers. The device is integration of the all the monitoring block of above points. And the software will give good analysis to the owners and authority about the above necessary field.

2. Related Work
Though many feasible vehicle monitoring systems are existing, but this monitoring system will monitor or control only one or two above key points and that all are not satisfactory for owners or transporting authorities. In our paper we are introducing the integrated monitoring system such us monitoring of all the key points using one central device which can be installed on the vehicle and the owners and authority can communicate through a smart phone or the computer which are connected to internet and having application software. This system is the reference and advancement of some research papers. Main advantages of our system are it can monitor more than five parameters which are helpful for the owners and transporting authority. It uses single device with so many peripheral devices to assist this central device to monitor the
vehicle and these sub system will communicate with the central device. This central device will communicate with owners using application software in a smart phone or in computer which is connected to internet.

In paper presented by Howards white Toronto and Leonard Cascianto[10], A vehicle monitoring system is disclosed in which a central control station is provided for the vehicles, for example buses, in the system. Each vehicle is provided with a transit universal microprocessor unit, including a modulator-demodulator, and one or more peripheral devices and a radio communication link is provided between the vehicles and the central control station. Typical peripheral devices are odometers, passenger counters, drive switches and display devices, loud speakers, etc. This invention relates to a system for identifying objects during movement and indicating and/or recording the movements. The invention is particularly concerned with the identification of moving vehicles on a road and is especially adaptable for use in a bus monitoring and control system. In this paper they only monitoring the movement of a vehicle and communicating to a central station but advantage of our device over this is our device is not only monitoring the movement of the vehicle and also some other parameters and communicating directly to the owners or to the authority and give a good analysis.

Another paper presented by Jhono shaheen[2] he introduced a monitoring system for taxi meter. This invention relates generally to monitoring systems and more particularly is directed towards a new and improved system for monitoring fare meters in taxi cabs to prevent the improper use of cabs by drivers. Taxi operators have found that from time to time a few dishonest driver-employees will try to cheat the cab company of collected fares. Such dishonest drivers are able to pocket a fare by not turning down the meter arm to start the meter when a passenger enters the cab but instead will collect -a flat fee from the passengers at the end of the trip. As another technique, the driver may not start the meter running until a substantial portion of the trip is completed'. The driver collects a fare that is not the amount that would normally be payable for the trip but only what appears on the meter plus an extra profit for himself. This practice requires collaboration with the passengers who save money but cheats the taxi company of its usual charges beyond this we introducing some other things.

In a paper presented by Dean Stockett Edmonds[3] he introduced a concept of testing the content of alcohol in the blood using spectroscopic blood analysis such as analyzing the light emitting from the subject. And he also attached a finger print technology to protect the testing this is the technology which we are going to use in our device for alcohol consumption monitoring.

The paper which is presented by Amon Amir, Lior Zimet, Alberto Sangiovanni-vinentli, sean kao[4], they introduced an embedded system for eye detection sensor. In this paper describes hardware based eye detection with no cpu and no addressable frame buffer. They just used the image based recognition with advancing the algorithm for image processing. In our paper with the reference of this paper we using image processing for monitor restlessness of the driver.

3. General Architecture Of The System - The Central Device

This is the main device for monitoring the vehicle. In this all the other sub monitoring systems are integrated into single block. This single block has wireless connection with all other peripheral monitoring system and also with the smart phones and computer which is connected to internet in which application software is embedded.

The sub monitoring system which are connected to this are,
1. Passengers details monitoring system
2. Ticketing details monitoring system
3. Fuel and distance monitoring system
4. Alcohol consumption monitoring system
5. Restlessness monitoring system
6. Usage of mobile phone by drivers monitoring system

3.1 Passengers Details Monitoring System

The passenger’s details monitoring can be done using pair of cameras and allowing passengers to enter on the vehicle one by one. In each door pair of cameras will be installed for collecting passenger details. From the each stop that is from source to destination one camera will take the images of entering passengers and count the number of passengers.
entered in each stop, and update total number of passengers. This updating will be done on each stop from where the passengers started to enter the vehicle. Another camera will take the images of passengers who are getting out of the vehicle. And counts the number of passengers exited from the vehicle in each stop. The main criteria are that the passengers must enter or exit out of the bus one by one. And if total number of passengers exceeds the minimum number of passenger allowed traveling in the vehicle, then the alert will be given to vehicle and no further passengers are allowed to enter the vehicle. If this condition is satisfied the door will not open unless there is no passenger to exit from the vehicle.

![Central Device to be installed in Vehicle](image)

**Figure 1** Central Device to be installed in Vehicle

### 3.2 Ticketing Details Monitoring System

The ticketing monitoring system is just connecting the ticketing machine to the central device and collecting the details like number of ticket for each stop every time and this number of ticket for each stop is compared to the number of passengers went out on corresponding stops. If the number of ticket sold for a particular stop is greater than number of passengers went out from the vehicle in that stop then someone needs to go out of the vehicle. If number of ticket is less someone want to purchase the ticket.

### 3.3 Fuel and Distance Monitoring System

The fuel and distance of the vehicle monitoring can be easily done by collecting the information needed to monitor from the digital fuel gauge and digital meter to calculate the distance traveled by the vehicle. Fuel filling can be monitored using a symbol algorithm. We can collect the quantity of fuel present in the tank in particular time interval up to the vehicle stops the service and parked in the shed. By last collected quantity we can monitor the fuel consumption. If the last collected quantity of fuel is decreased greater than a particular threshold value the fuel is theft by someone then alert will be given. The threshold value is based on the efficiency of each engine.

### 3.4 Alcohol Consumption Monitoring System

The alcohol consumption of drivers can be monitor using the device like ignition interlocking. When the blood-alcohol
content of drivers is above a threshold value the ignition of the engine will be locked. The one way to do this is by using breath analyzer but this is not satisfactory and not accurate too. This can be affected by environmental factors and also by the drivers whose blood alcohol level differs from average level. So the spectroscopic blood analysis is used to measure the blood alcohol content of drivers. This method works on the chemical analysis of subject’s blood by measuring light emerging from the subject’s tissue such us finger. This idea was introduced by Dean Stockelt Edmonds[3] in his research paper. And he also introduced a figure print system for identifying individuals for prevent the fake test. In this method irradiating the subject with infrared light, and measuring the light emerging from the other side of the tissues. Other thing is a person other than the driver can pass the test and allow drunken driver to drive the vehicle. So for prevent this only the inventor Dean[3] used finger print system on his ignition interlock. This system is going to employee the alcohol consumption monitoring in our system.

3.5 Restlessness Monitoring System

The restlessness of the driver can be monitor by taking the images of face of the driver in few seconds interval. In that images we are going to find the condition of the eye- if it is closed in continues images for some time the driver is feeling sleepy. So we can alert the driver or authority.

3.6 Monitoring System for Mobile Phone Usage While Driving

This problem is also solved using the technology of object reorganization from the image. We are just taking the image of person who sitting on the driver’s seat while engine is running in interval of few seconds if any object like mobile phone or hear phone is reorganized, The alert will be thrown.

These all subsystem is integrated in the central device and analyzed in this device with the help of programs of the device. The owners or transporting authority can monitor these things by using a smart phone or computer which connected to the internet and having application software for monitoring and analysis those things.

![Figure 2 Graphical overview of the system’s architecture](image-url)
4. OVERVIEW OF MOBILE APPLICATION

In this section we give a brief overview of the resulting mobile application in use. Figure illustrates the basic screen of the mobile application. We may notice few discrete services, as well as the settings menu. The screenshots of the mobile application that is installed in the supervising vehicle owner’s mobile device is shown. As we can see, the vehicle’s location can be also viewed through an incorporated map.

5. CONCLUSIONS AND FUTURE WORK

In this paper we have presented an intelligent mobile application that can be incorporated into modern mobile smartphones in order to be used for the needs of the vehicle owners. It is in our future plans to evaluate this system in
order to test its efficiency in actually helping these vehicle owners sufficiently. It is also in our future plans to extend the system’s capabilities by incorporating new services. These services include the following:

- Integration of social networks to alert vehicle locations and seating availability
- Integrate public agency to alert vehicle locations
- Add a system administrator feature.

References

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