

Intelligent Traffic Management System for India

Abhijit Premji¹, Amarjjit Premji², Premjith P.³ and Preetha P.S.⁴

¹Department of Electronics, Bishop Jerome Institute, Kollam 691 001, Kerala, India

²Department of Computer Science, Bishop Jerome Institute, Kollam 691 001, Kerala, India

³Government Polytechnic College, Attingal, Thiruvananthapuram 695 001, Kerala, India

⁴Department of Botany, Sree Narayana College, Kollam 691 001, Kerala, India

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ABSTRACT

Today, we face a lot of threats towards our national security and most of them are involved with unknown vehicles and unidentified drivers. According to Transport Research Wing, Ministry of Surface Transport of India, there were a total of more than 326 million registered vehicles as on 2020. These vehicles generate huge on-time (real-time) data. But, authorities have very less in connection with their operation. It is high time to think of tracking real-time data of the vehicles running across India. Crimes against women, drug trafficking, illegal ethanol transporting, sand mining, and every form of crime involves vehicles. So, a smarter India needs a smarter 'National Traffic Management System'. This will definitely help to reduce pollution thereby saving our environment.

Key words: National Traffic Management system, Trafficking, Crime, Pollution

Introduction

India is constantly facing threats, both from outside as well as inside. Crime rates are increasing alarmingly and most crimes include a vehicle. At least 20% of the road accidents in India are well-planned murders. Crimes against women, drug trafficking, illegal ethanol transporting, sand mining, and every form of crime involves vehicles. So, a smarter India needs a smarter 'National Traffic Management System'.

The Need for a National Traffic Management System

- Reducing congestion and enhancing mobility on Indian roads
- Enhancing transport safety and security with technology
- Providing high quality and reliable transport services.

- Establishing an effective and efficient freight transport sector that responds to the rapid growth of India's economy.
- Building a collaborative and result-oriented organization to achieve the set goals, following world-class standards.

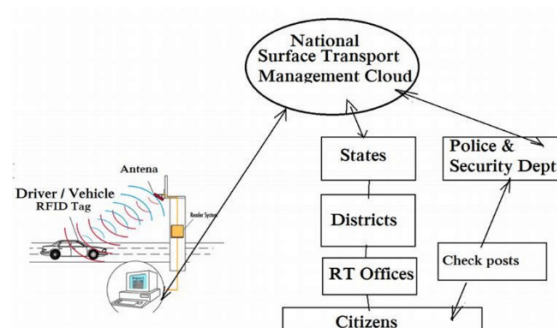


Fig. 1. Block diagram for National Traffic Management System

- Enhancing accountability in a transparent regulatory environment.
- Reduce manual checking of documents.

Materials and Methods

Radio-frequency identification (RFID) is a key technology today that drives developments in the area of the Internet of Things. RFID is a wireless communication technology. It uses radio-frequency waves to transfer identifying information between tagged objects and readers without requiring line of sight, providing a means of automatic identification (Ting *et al.*, 2009). RFID is an ADC (Automated Data Collection) technology that uses radio-frequency waves to transfer data between a reader and amovable item to identify, categorize, track. It is fast and does not require physical sight or contact between reader/scanner and the tagged item. It performs the operation using low-cost components. Again, it attempts to provide unique identification and backend integration that allows for wide range of applications. A vehicle can easily be identified along with the driver!

For radio frequency identification, RFID technology is an IT system that transmits signals without the presence of physical gadgets. It is categorized under automatic identification technologies that have well established protocols. (Want, 2004, 2006). The system utilizes tags that are attached to cars and driving license. The tags store data and information regarding the details of the product of things to be traced. The reader read the radio frequency and recognizes tags. The antenna delivers the means for the integrated circuit to transmit its data to the reader. From the reader, the data can be uploaded to central server

Basic requirements

- Smart driving licenses with RFID technology for 'Automatic driver identification'
- Smart vehicles with RFID technology
- Smart roads with RFID receivers fitted in regular intervals to gather and transmit data to the cloud computing servers
- Cloud computing facility to manage all 'internet of things' connected to vehicles and driving licenses.

Smart Driving License with RFID

At least a minimum of 20% of Indians driving ve-

hicles do not own a valid driving license. It is a grave situation. Smart driving license is the answer. A smart driving license is a card with a card with built-in security features like RFID tag embedded in it. It can be made of using durable PVC, PET, Polycarbonate, and composite blends. The RFID tag carries vital information concerning the driver identity and location that is transferred to the wireless reader. We can use a passive "write once" tag for security. Passive tag does not need power as it draws the same from interrogator field.

Results and Discussion

- Highly tamper resistant Enhanced Driver's License (EDL) that comprises vicinity radio frequency identification (RFID) capability
- A machine-readable zone – optical character read (MRZ-OCR) and contains multiple layers of overt, covert and forensic security¹ features.
- Vicinity RFID means that an RFID-enabled document can be steadily and precisely read by authorized readers from up to 20 to 30 feet away.
- No Personally Identifiable Information (PII) is transmitted from the card. The chip sends a number that has meaning only to the secure CBP database, where the issuing information is held.
- The first layer is that no personally identifiable information is stored on the card's RFID tag or transmitted by the card. The card uses a unique identification number which links to information confined in a secure database

Advantages of Smart License

- Whenever the driver causes a traffic violation (eg: over-speeding), the data picked up by the RFID receiver can be utilized for calculating drivers' penalty points.
- When the information from the receiver is uploaded to the server of Surface Transport Management system, his PENALTY POINT will be automatically updated. So drivers will be forced to drive carefully.
- It will reduce rash riding of two-wheelers
- It will reduce drug trafficking as driving license tracking data can be produced as solid proof in every court of India.
- It will lead India to a disciplined nation
- When the license expires, the radio signal also expires.

Smart Vehicles

Major share of vehicles in our Country does not have proper documents. Most of the vehicles getting involved in crimes are generally stolen, and certainly they are untraceable. Such vehicles are real threats to common people as well as our nation.

RFID enabled registration plates should be made mandatory. RFID tags fixed on the number plates help the authorities to identify the vehicle at any point of time, along with the driver! RFID tags used in smart vehicles can be programmed once. Overwriting is not permitted for national safety. Another RFID, with same frequency as that of the number plate, hidden somewhere in the vehicle can help the police to identify the vehicle in case of any theft happens. In this way, we can convert every vehicle smart! Every vehicle entering into our roads must be driven by someone having a valid license. This can be easily assured by our Intelligent Transportation System.

- Intelligent Transportation Systems, or ITS, can be defined as the application of computing, information, and communications technologies to the real-time management of vehicles and networks involving the movement of people, goods, and services.
- When integrated into the transportation system's infrastructure, and into vehicles themselves, these technologies release congestion, improve safety, and boost productivity.
- Intelligent transportation system encompasses a broad range of wireless and wire line commu-

nications-based information and electronics technologies.

- The versatile features and benefits of RFID technology have recognized that RFID can be extensively applied in the field of intelligent transportation to improve driving safety, decrease vehicle collisions, and even help reduce vehicle emissions.
- The RFID technology has over 16 subcategories in the ITS used in the electronic payment and pricing subcategories among others and the results will be magnificent.
- Check-ins and check-outs of the parking-lots will be under control with RFID readers, labels and barriers.
- Vehicles parked in the no parking areas can be simply identified and punished. Naturally, drivers will be more careful with parking and creating traffic congestion.
- RFID powered secure TAXI management system can lessen atrocities against women since it guarantees secured travel. The vehicle can be tracked at any point of travel.
- Car-pooling is the best option to decrease traffic volume in cities. Govt can ensure safe car-pooling partners through this system.
- Better public transport system can attract more people to opt for public transport.
- Fleet operation of state-owned buses can be easily managed efficiently. Traffic volume data can easily be collected.

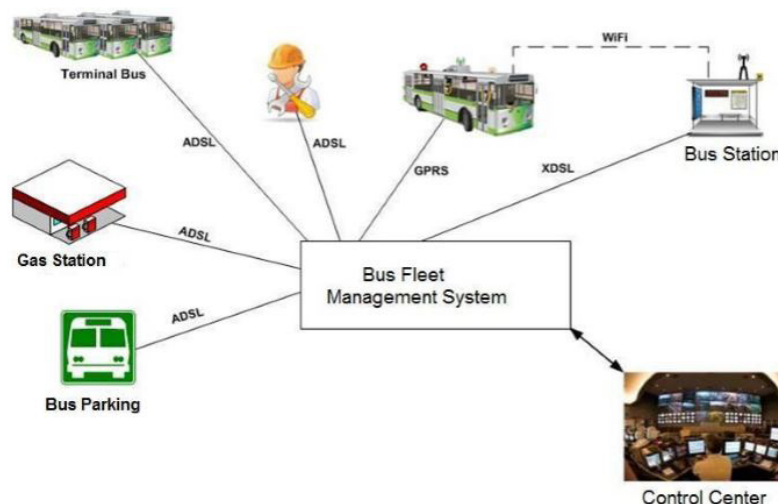


Fig. 2. State public transport fleet operations

RFID powered intelligent transport management system can do wonders in

- remote traveler support
- personal information access
- traffic management
- emergency management
- toll administration
- commercial vehicle administration
- maintenance and construction management
- information service providing
- emission management
- transit management
- fleet and freight management
- archived data management
- emergency vehicle management
- roadway management
- security monitoring
- parking management and many others.

State public transport fleet operations are worst, why?

- State public transport systems haven't adopted new technologies.
- They have to avoid RFID technology for efficient operation, proper routing and scheduling.
- Every bus operation will become accountable.
- Fuel management can be done properly
- Driver tracking reduces the habit of rash driving
- The bus operations can be centrally controlled and planned accordingly
- Bus maintenance as well as procurement details can be made accountable every day.
- On time details of Buses can be made available through mobile apps.

Secure check posts and interstate travel options

- The RFID chip is read as the vehicle queues for inspection at the border check post.
- It signals the database so that biographic information, a photo, and the results of terrorist/criminal checks are displayed to the Check post Officer as the vehicle pulls up to the inspection booth.
- The Officer can look at the results quickly and focus on the individuals in the vehicle – better for officer safety and faster processing.
- It can drastically reduce corruption in check-posts.
- Interstate travels can be made accountable in case of both vehicles as well as drivers.

Future advantages for our nation

- Roads will become smart and safer as all are forced to obey traffic rules. If there is any traffic violation done, penalty follows. Rash and care-less driving can simply be reduced. Twelve-point penalty system can be packed along with driving license. After twelve noted violations, the driving license turns to be invalid for the next three years.
- Crimes will reduce drastically.
- Vehicle theft can be reduced. Every vehicle owner can assign his vehicle to five drivers only. The receiver senses signal other than these assigned radio frequencies along with the vehicle, it simply means theft has happened.
- If a vehicle enters into the road, without proper documents, can easily be identified. On-road checking and other time elapsing measures can be avoided, thereby reducing public expenditures.
- Outdated vehicles will vanish from roads, which in turn give opportunities to vehicle manufactures. It will definitely help for public safety.
- Vehicles involving in crimes can be easily recognized.
- Parents can easily track their children using vehicles, especially two-wheelers.
- Terrorist activities can be tracked.

Brickbats

Activists supporting 'privacy' of individuals may raise problems like 'big brother is watching.' According to statistics, one in every six people owns a vehicle in India. But, in actual practice, it is not so. Rich people own more than one vehicle. The majority of Indian do not own a vehicle and security to their life is most important. Those who operate their vehicles lawfully need not worry about intelligent traffic management system.

Conclusion

India needs more vehicles running with electric power, to reduce global warming, which may require more charging points. Sustainable models of power-packs / batteries are to be developed. Secure modes for car-pooling and car-sharing have to be introduced all over India. This can be done with the help of digital vigilance portal of India. Secure taxi management is another important issue. Space for

safe car parking is important. Collaborative traffic apps have to be implemented in every state of India maintained through the data support by the commuters. Through intelligent smart traffic management, we can decrease the number of vehicles hitting the road, without disturbing the transportation requirement of commuters.

Newer technologies that we have to adopt

National portal for Taxi management with mobile app with online payment options

We need a better national version of Uber Taxi, which should be controlled by Government. Again, it has to be connected directly with Crime and Criminal Tracking Network System (CCTNS) network of India. Those drivers who sign in this application have to be carefully analysed so that safe service can be offered to commuters, especially women.

We can collect data on the smoothness of ride also through the mobile phone which sits passively in user's hands / pockets. These inputs can help authorities to find accident prone areas with potholes and road irregularities. Mobile phones as well as Taxi cars can work as roaming sensors across the nation.

Vehicle-to-vehicle and vehicle-to-infrastructure connections

Concepts of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) technology are realities now and India cannot stay away from accepting them as a mainstream application.

The idea is to connect cars to each other through computers, allowing them to know where other cars are and augment driver decisions. We can connect vehicles to infrastructure like traffic lights to produce improved pictures of congestion and to let cars know ahead of time when a light will change. In this

way, India can reduce the number accidents significantly and such systems should be made mandatory as part of new vehicles.

Passive-Sensor Tech to Cut Drunken Driving

Alcohol-detection sensors that could be available for new cars could virtually eliminate drunken driving. The breath-based system, allows drivers to enter a vehicle and breathe as they normally would. The driver's breath is pulled into sensors located in the driver's-side door or steering column. If it detects alcohol content, ignition shuts off automatically.

Smart transport management across India can be achieved through the network convergence using Internet of things. Rail, Connected Roadways and Connected Mass Transit etc., can make massive changes in the economy of India. This is the only way to create an accident-free, terror free Nation.

Conflict of interest

The authors declare that there is no conflict of interest.

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