

Intelligent Transportation System in India

Pankaj Pathak*, Akhil Singhal**, Shreya Bhutani***

*Assistant Professor, Symbiosis Institute of Telecom Management, Constituent of Symbiosis International (Deemed University), Maharashtra, India. Email: pankajpathak@sitm.ac.in

**Student, Symbiosis Institute of Telecom Management, Constituent of Symbiosis International (Deemed University), Maharashtra, India. Email: akhil.singhal@sitm.ac.in

***Student, Symbiosis Institute of Telecom Management, Constituent of Symbiosis International (Deemed University), Maharashtra, India. Email: shreya.bhutani@sitm.ac.in

ABSTRACT

Intelligent Transportation System is the amalgamation of applications of electronics, communication, analytical and decision-making tools in an integrated manner to facilitate traveller information accurately, to increase safety and optimal utilisation of transport infrastructure. This system involves vehicles, drivers, passengers, sensors, decision tools, and communication technologies, which are interacting with each other to link the infrastructure and provide improved safety and experience to users. This paper gives an insight of the current trends and applications of Intelligent Transport System on vehicles and infrastructure in India. Furthermore, this paper also talks about immediate use suggestions for applicability of ITS technology in India and the current trends in wireless and vehicle navigation system, while also exposing the existing challenges of ITS solutions.

Keywords: ITS, Transportation, Traffic, Infrastructure, Vehicle

1. INTRODUCTION

The automotive sector has been a major contributor to India's Gross Domestic Product (GDP). Initiatives have increased by Government of India and State Governments, and also various automobile related entities towards the most required trend in the transportation sector - smart technology or Intelligent Transportation Systems, which include: smart cards, incident response, advanced driving assistance, real time parking management, etc. This sector is going to witness boom by the policy reforms and reforms which has enabled an investor-friendly taxation system. ITS is an amalgamation of electronic devices, communication technologies, and analytical management strategies. This helps to achieve higher safety, and efficiency of the surface transportation system. Though, considering India's current scenario, there are a few challenges –inadequate and inefficient infrastructure, air quality and inadequately implemented intelligent transport systems. The slow pace of development will definitely result in time lag to keep pace with other countries on technological advancements and other developments for smart transportation (TIE, 2016). Although, make in India initiatives have aligned towards providing better

opportunities to manufacture items necessary for the future transportation systems.

2. CURRENT STATE OF TRANSPORTATION IN INDIA

The transport sector in India is one of the major contributors to the GDP of India, and it is one of the most important auxiliaries to all kinds of businesses and industries. It is expected to contribute around 12% of GDP by 2026 from the current 6.7%, which also means that it will be one of the biggest employment providing sector. India currently carries around 65% freight and around 80% of passenger traffic on its 47lakh km long road network. But still, attention to the quality of road infrastructure and safety is a matter of concern (Grant Thornton, 2016)

Also, there is a constant rise in urban population and per capita income, which is now leading to increase in traffic congestion times which leads to loss of valuable man-hours to the nation, also affects the environment by using fuel and hence leads to increased carbon emission. So, it is very much necessary to address these issues immediately, and the increased use of technology can help to overcome

or at least reduce such issues. In September 2017, Government of India (NITI Aayog) and International Road Federation, Geneva have joined hands to cooperate in the field of ITS in India. This will develop, Fleet Management & Monitoring, Electronic Enforcement of Traffic rules, Traffic management, Parking Management and innovation & education in the field of ITS in India.

3. CHALLENGES

The deployment of Intelligent Transportation system in the developing world faces some significant obstacles that must be overcome if ITS is to be widely applicable in developing countries (Behruz, 2013). The challenges are:

I. Economic Forces

Most of the transportation projects, either infrastructural or technological, are quite sensitive because of the huge investments involved. Such projects are mostly undertaken by Government of India under PPP programme, issues of slow rate of returns in long span of time.

II. Government Regulations

Government authorities are strongly involved in transportation development for several reasons including the need for to reserve resources for future development and taking care of various factors such as protection of the environment (calculation number of trees being cut), the huge financial investment and the consideration of negative external effects. Sometimes, these factors are also impacted by political agendas.

III. Inadequate Public Transport Infrastructure

Indian cities face a major problem with the public transport system which is inefficient or redundant. No major steps to improve them were taken, which has led to a sharp rise in private vehicles, which leads to the demand for more infrastructure. In 2007, Government had forecasted that vehicular growth would be 3%, but it turned out to be 7% due to the same (World Bank, 2017).

IV. Different Terrains and Variable Weather in Our Country

Different and vast varieties of terrain and soil quality serve as a challenge to the Indian transport sector.

Planning, execution and maintenance gets difficult to maintain the road and other road infrastructure because of the same. Width and road type has to change according to the weather conditions and soil type, which sometimes results to “choking” of traffic flow at some sites. Also, other infrastructure on road should be such, which can withstand different weather conditions.

V. Business Problem for Infrastructure

By and large, ITS is possible with the presence of large data. This data has to be collected from sensors or small devices in large number, which will send small data collections to a central server. These sensors require infrastructure available to operate on. Now the business problem in India comes up here. Manufacturers (OEMs) of sensors hesitates in investments because of lack of infrastructure on which these devices will work on, and on the other hand infrastructure providers pull out their hands as they fear how will they realise the benefits on their investments.

4. INTELLIGENT TRANSPORTATION AND THE CONNECTED VEHICLE

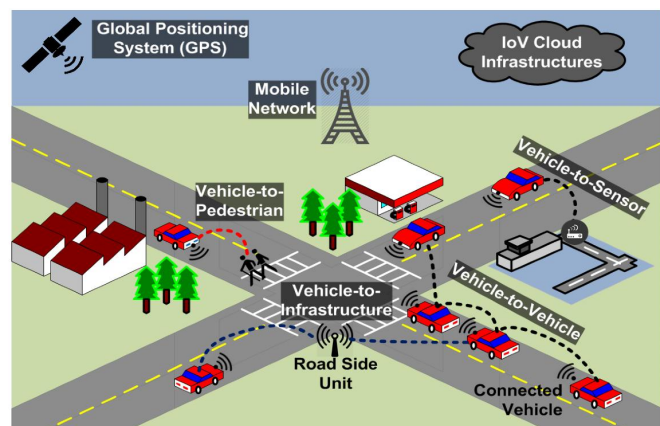


Fig. 1: Smart-Internet Based Intelligent Connected Transportation Assistance

The tremendous growth in mobile data infrastructure (fig 1) has built a strong base for intelligent transport systems. Connecting the objects on the roads in a reliable and secure way is the next target of implementation of ITS applications in India (Bonomi, 2013). Its success demands most of the things on road to be connected to obtain and analyse maximum data to improve the experience and

safety of users. A large quantity of data is generated by human triggered activities, which is recorded by sensors or small devices which are connected to the internet. These devices may be travelling with the users or installed at road sites wherever necessary (Mc Kinsey & Co, 2017). This large amount of sensor data is carried over

to the backend through communication channels which are available, robust, ensure QoS and secure, to extract useful information from analysis of current data such as traffic, weather, important activities of the time, etc. along with learning from historical data too. The components to develop an intelligent transportation system are shown in fig 2.

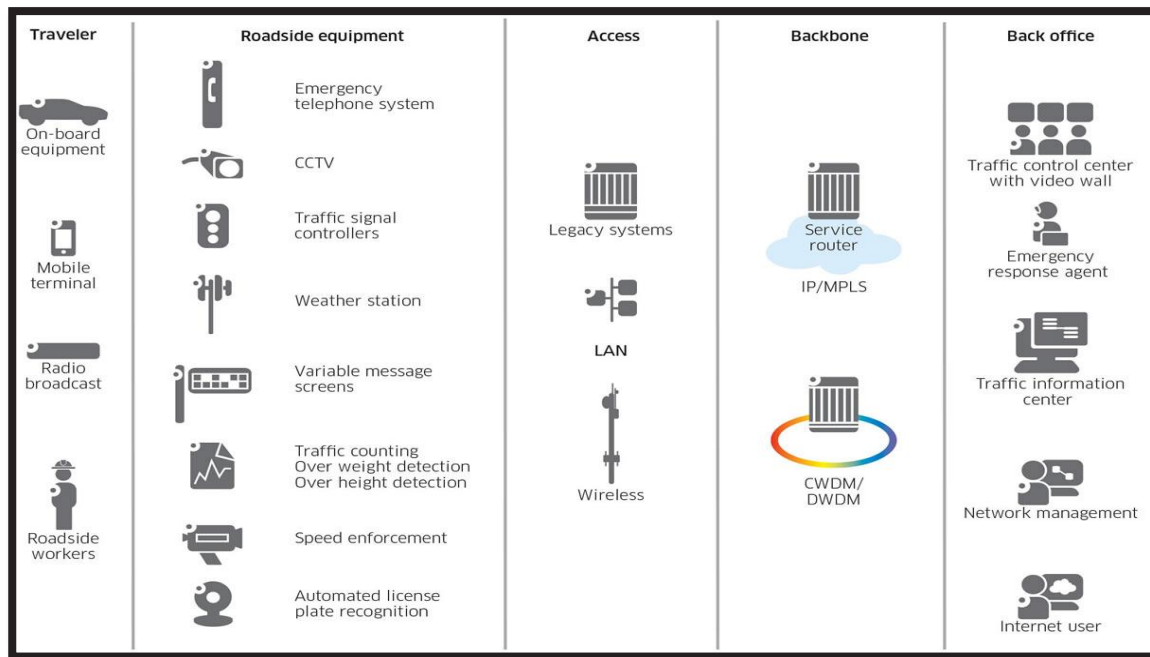


Fig. 2: Components for Smart-Internet Based Connected Transportation System

5. EXISTING SMART TRANSPORT SYSTEM IN INDIA

• Modern Age Vehicles

Today, all the vehicle manufacturers are using many technological advanced features which are useful. Essential features for the time, such as safety features for vehicle users and external users, designing better engines for better performance and consuming less of fuel or using better fuels, cars with Internet connectivity/IoT which will help in better transportation, and finally conforming to standards laid by Government of Bharat Stage and Euro standards. Other safety features which are now being added up are: Crash testing confirmations, Use of high-quality metal for the body of the car, ABS, and Airbags.

• Use of electric cars in India

Right now in India, the trend of vehicles running on petrol and CNG is booming, but Mahindra, Toyota,

and a few manufacturers have already introduced electricity driven cars on the market. But still, the road for use of electric car seems far because it is a huge challenge to bring in charging infrastructure in big cities immediately to promote migration to electric vehicles. To uplift the use of such vehicles, the government of India has introduced a National Electric Mobility Mission Plan 2020 which incentivises adoption of green vehicles and promote domestic manufacturing capability in automobile sector by linking Make in India scheme to it (MoRTH, 2016).

• Internet of Things in cars

India is soon going to see a rise in popularity of On-Board Diagnostic port devices in the automobile sector. It requires the installation of a small device in the car which is connected to cellular networks for internet connectivity. This would help users provide with entertainment, location data services, automotive telematics, and help cars with such devices talk

to each other. This would help in better traffic management by creating a real-time traffic data. Reliance Jio is working to bring such devices in the market for car users very soon, which would be connected to its LTE network all the time. Apart from the above stated features, it would also provide users with an application on their phone which would help them have all vital information like oil stats, water levels, fuel info, battery change alerts, etc. Also, remote commands can be pushed to a car, such as AC can be switched ON from your mobile phone itself when you start walking towards the parking lot, so that the cabin is already cool by the time you sit in your car.

6. INITIATIVES TOWARDS ITS IN INDIA

Indian Government is working to set up National Intelligent Transport systems (ITS) standards, ITS clearinghouse to design and adopt best ITS practices and Advanced Traffic Management System (ATMS).

- *ETC in India*: Electric toll collection system which was started as a pilot project on Ahmedabad-Mumbai highway has now been expanded to pan India basis on major toll collection centres present on National Highways.
- *BRT Corridors*: Pimpri-Chinchwad has planned BRT system comprising systems which tell its users, ETAs, vehicle tracking and automatic fare deduction, signal priority, etc.
- *APMS*: Advanced Parking Management System, implemented by NDMC in Lutyen's Delhi for efficient parking management. Now palika bazar in Delhi's Connaught place can easily handle parking of 1050 four wheelers and 500 two-wheelers. And vacancy information can be accessed by users in real time on their smartphones apart from LED displays at various locations.

7. FUTURE DIRECTION TOWARDS ITS IN INDIA

Intelligent Transportation System uses Information and Communication Technology (ICT) interventions used for efficiently managing transportation. The system has a backend and a hardware component to provide a solution for the driver dashboard, an electronic ticketing machine, passenger information system, vehicle tracking system,

etc. Some major areas where India is now witnessing the birth of ITS, are:

- *Boom in Communications and Analytics Infrastructure*

India can leverage on high proliferation of smart-phones which are now greatly powered by LTE network infrastructure which is now cover 99% of Indian Population areas. Applications which can help collect data based on specific location will help to analyse the real time data, which can be combined with services such as weather, and shopping/work hours, etc. to provide efficient transportation information to users. This will take leverage from already increasing Data Virtualisation and its allied analytical tools which are on cloud based systems, and hence, have ubiquitous access.

- *Radio Frequency Identification (RFID) in Freight Transportation*

RFID is not new to India but has not explored this technology in the freight transportation sector, whereas it is widely used in the other global counterparts, even when logistics sector is on a steep rise in India. Currently, India ranks 46th among 155 countries in the world bank international logistics performance index. Recently, Indian Railways has decided to use RFID technology in its freight coaches. These devices will help for freight maintenance management, locomotive management and coach maintenance management so as to ensure more effective and transparent functioning, and their real time tracking.

- *Electronic Toll Payments*

Electronic toll collection systems are RFID based systems that read the data from an RFID tag on car from a distance and automatically deduct the toll and opens up the barrier at each entry. This technology saves precious man hours of the citizens, fuel consumed at the toll gates. It also results in better traffic management by reducing travel time and congestion. NHAI has introduced FASTag service on a pan India basis for the same. FASTag is linked to a prepaid wallet from which the toll amount is deducted. The tag leverages Radio-frequency Identification (RFID) technology and is pasted on the vehicle's windscreen. FASTag is presently operational at most of the toll plazas across state and national highways Use of such devices will also give a boost to indus-

tries who manufacture semiconductor chips, RFID devices and related IT systems.

- *Unified Smart Cards For Public Transport*

Smart cards usage has already started in urban places such as metro train services. Smart integrated cards are under consideration by Delhi Government and several authorities in Mumbai. These RFID based cards allow citizens to pay for any type of public transportation such as metro, local trains, bus fares, etc. through a single smart card, resulting into seamless multimodal transportation systems in large cities. The need is to achieve large scale adoption of such smart technologies to improve public transportation in India. This will open large-scale opportunities for the semiconductor industry.

- *Passenger Information System*

Expected time of arrival is displayed on electronic sign boards at the bus stands, train platforms. Such systems also sometimes provide information on personal mobile devices, for example, DIMTS' "Poocho" app for Delhi buses, expected ETA of a bus of particular route no. at a bus stop is also under beta stage in urban bus stops, and NTES app by Indian Railways. This reduces the uncertainty about ETA and reduces the congestion at waiting areas. These display systems can also help the organisations earn revenue by displaying advertisements on their screen systems.

- *Use of Live Traffic Data*

With highly expanded communication capabilities provided by cellular technology and higher proliferation of smartphones, it is now easier to gather traffic data. This data can be leveraged to show expected delays in specific routes and providing alternate routes on a runtime basis for efficient traffic movement, and also reducing carbon footprint.

Hyderabad is going to witness a change in its traffic management system in the coming decade, as the Citywide ITS drive has been approved by the Government at cost of 1180 crores.

8. CONCLUSION

Self-driving cars, safety warning systems, and intelligent driver assistance system needs a lot of efforts in India. However, as the sensor's sensitivity, wireless connectivity,

and computing capabilities for vehicles rapidly increase, the application of proactive safety warning and assisted driving is speeding towards reality. As technology improves, vehicles will become just moving computer with tyres. Driving on roads will be just like surfing the Internet, there will be congestions on the route but lowered incidents or injuries. Thus, with the growing awareness of the importance of security, a planned and well-designed ITS system will make a significant improvement in the transport sector in India giving a major boost to projects like smart city (Vishvesh Prabhakar, 2016).

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