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Intelligent Transport System

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Abstract—*Travel time estimation and mobility is an integral part of transportation management of any modern society. The use of advanced technologies in collecting travel time information has been a major concern for transportation engineers and system operators who rely on such data to improve safety and emergency response of the transportation system.*

Traffic Congestion has the adverse effects which are reduction in efficiency, mobility or transportation infrastructure and increases travel time, air pollution, fuel consumption and accident cases. Traffic congestion has been increasing worldwide as a result of increased motorization, urbanization, population growth and changes in population density.

Intelligent Transport System is designed for the urban/state/private road transport organization. Intelligent Transport System provides an efficient solution for transport companies to schedule and monitor vehicles with the help of advanced technologies such as GPS, Wi-Fi and GPRS.

This paper in general discusses the impact and the various application fields of Intelligent Transport System for Road Transportation System. Also, this paper puts forward the implementation of better public transport services by taking into account the bus earning, public safety and security in all angles using vital transportation technologies.

Keywords: *Travel Time, Mobility, Safety, GPS and Wi-Fi use, GPRS.*

1. INTRODUCTION

World population is increasing rapidly nearly crossing the digit of 8billion; simultaneously pacing the growth of world economy. When it comes to transportation, especially road transportation, which is easily available to use mobility is of vital importance. Common public transportation systems provide a cost-effective way to move more or less freely in urban areas. A key characteristic of subway, bus, train and tram networks is the exclusive existence of fixed stops and schedules. The static design makes passengers passively bundle their demand for trans- portation in terms of place and time.

The problem of travel time prediction is an important part of the intelligent transportation systems domain. The demand of proper transportation system comes in picture as undoubtedly higher the people using the transportation system more will be the transportation conflicts.

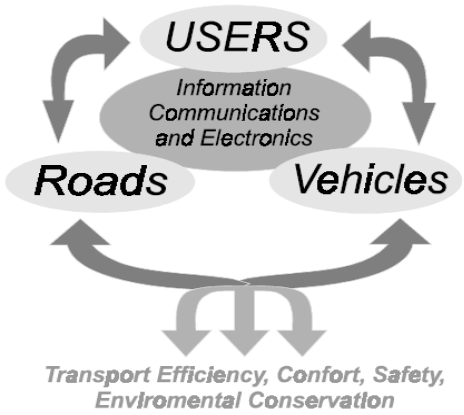

Fig. 1 Overview

The major objective of ITS is to evaluate, develop, analyze and integerate new sensor, information and communication technologies and concepts to achieve traffic efficiency, improve environmental quality, save energy, conserve time and enhance safty and comfort for drivers, pedestraians and other traffic groups. Worldwide various societies and associations have been setup for the development of intelligent transportation system, first was setup in 1991 by US Department of Transportation. Vehicle to vehicle communication, vehicle to infrastructure communication, electronic fees collection are some of the very popular projects undergoing worldwide In India, Intelligent Transportation System has a long way to go as it is in primary stage of its development.

2. HISTORY OF ITS

ITS has been around since the thirties and it has been slowly creeping into our lives. The major developments on ITS were made in Europe, U.S. and Japan and it has gone through three phases: preperation (1930-1980), feasibility study (1980-1995) and product development (1955-present). The origin of the formal ITS program dates back to the ninteen forties with the development of Electronic Route Guidance System, or ERGS in U.S., to provide drivers with oute guidance information based on real-time traffic analysis. The same era saw the development of the Japanese Comprehensive Automobile

Traffic Control System (CACS) program, presumably one of the earliest public-private partnership effort in the world to test an interactive route guidance system with an in-vehicle display unit. In Europe, the program for a European Traffic System with Higher Efficiency and Unprecedented Safety was designed by auti manufacturers and this was followed by 'Dedicated Road Infrastructure for Vehicle Safety in Europe' project set up by European Community.

3. APPLICATIONS OF ITS IN INDIA

While india has already made a foray into ITS in organizing traffic, more extensive and urgent integeration of advance technology and concepts into mainstream traffic management is imperative. ITS is still in its infancy in India, with decision-makers, key planners and agencies in the process of understanding its potential. Full potential of ITS can be achieved only by implementation at a network level rather than in small corridors. Indian traffic can benefit from several possible ITS applications. *One set of applications is for* **traffic management** *which are:*

3.1. Intersection control - At intersections, deciding the total signal cycle and the split of green times among different flows, is one of the most basic traffic management applications.

3.2. Incident detection - Pinpointing locations of accidents or vehicle breakdown is important to handle the emergency situations.

3.3. Vehicle classification - Knowing what kind of vehicles, and in what proportions, ply a certain road stretch, helps to choose appropriate road width and pavement materials.

3.4. Monitoring - Pollution and road quality monitoring are necessary for taking corrective mea- sures.

3.5. Revenue collection - Toll taxes for infrastructure maintenance andfines for rule enforcement need to be collected.

3.6. Historical traffic data - Long term data helps to plan new infrastructure, calibrate traffic signal times, add public transport and so on.

Another set of applications can aid the **commuters** on roads which are:

3.7. Congestion maps and travel time estimates - These help commuters in route selection.

3.8. Public transport information – Information about arrival of public transport helps in choice of travel mode and reduces wait delays.

3.9. Individual vehicle management - Getting information about parking places or estimates of carbon footprint, help owners of private vehicles.

3.10. Accident handling - Emergency services after accidents are a vital necessity.

Fig. 2

4. ITS TAXANOMY

The most commonly used classification of ITS is based on the positioning of the systems as given:

4.1 Vehicle level: Technologies deployed within vehicles, including sensors, information processors and displayed that provides information to the driver.

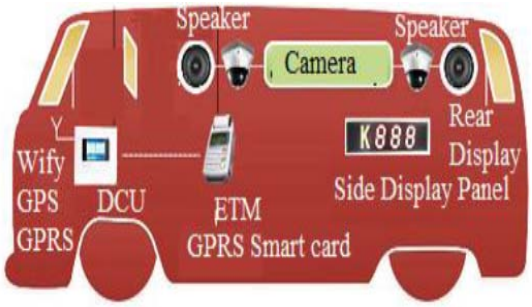

Fig. 3(a) Vehicle level

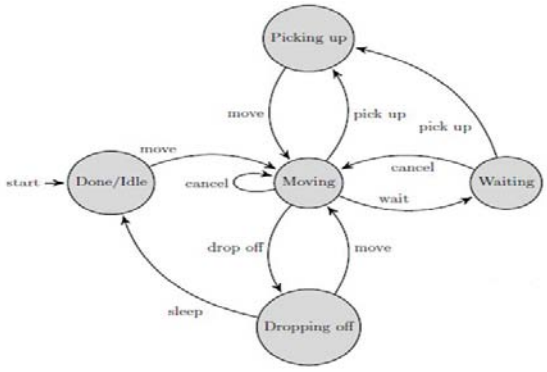

Fig. 3(b) Vehicle level

4.2 Infrastructure level: Sensors on and by the side of roads collect important traffic data. Tools of communication provide drivers with pertinent information to manage traffic better. These tools include roadside messages, GPS alerts and signals to direct traffic flow.

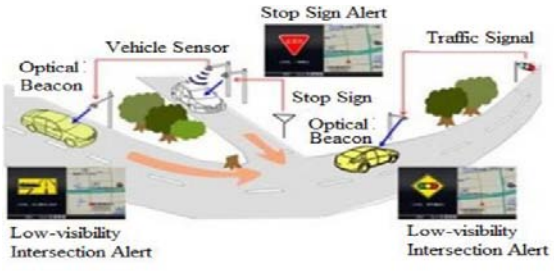

Fig. 4: Infrastructure level

Cooperative level: Communication between vehicles, and between infrastructure and vehicles involving a synergic combination of vehicle level and infrastructure level technologies.

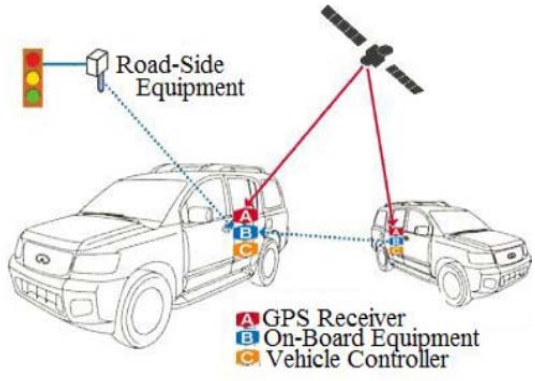

Fig. 5: Cooperative level

In general, ITS applications have been subdivided into six interlocking technology areas.

4.3 Advanced Traffic Management Systems (ATMS) integrates various sub-systems (such as CCTV, vehicle detection, communications, variable message systems, etc.) into a coherent single interface that provides real time data on traffic status and predicts traffic conditions for more efficient planning and operations. Dynamic traffic control systems, freeway operations management systems, incident response systems etc. respond in real time to changing conditions.

Fig. 6: ATMS

4.4 Advanced Traveler Information Systems (ATIS) provides users with travel related information to assist decision making on route choices, estimate travel times, and avoid congestion. Technologies used to gather information are:

- GPS enabled in-vehicle navigation system
- Dunamic road message signs for real time communication of information on traffic congestions, bottlenecks, accidents and alternate route information during road closures and maintenance.
- Website to provide a color coded network map showing congestion levels on highways.

Fig. 7: ATIS

4.5 Advanced Vehicle Control Systems (AVCS) are tools and concepts that enhance the driver's control of the vehicle to make travel safer and more efficient. For example: collision warning systems alert the driver to a possible imminent collision. In more advanced AVCS applications the vehicle would break or steer away from the collision, based on input from sensors on the vehicle.

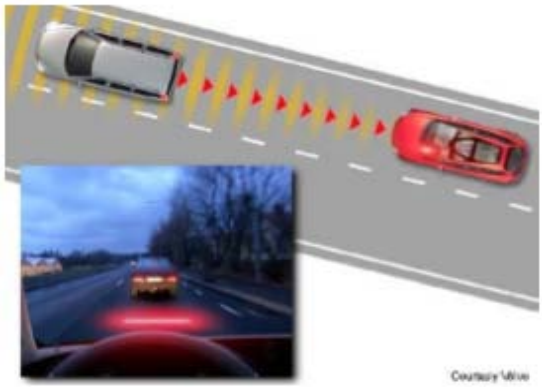

Fig. 8: AVCS

4.6 Commercial Vehicle Operations (CVO) comprises the coordianation of satellite navigation systems, a small computer and digital radio, which can be used in commercial vehicles such as trucks, vans and taxis. This system affords constant monitoring o tuck operations by the central office and provides traceability and safety.

Fig. 9: CVO

4.7 Advanced Public Transportation Systems (APTS) applies state-of-art transportation management and information technologies to public transit systems to enhance efficiency of operation and improve safety. It includes real-time passenger information systems, automatic vehicle location systems, bus arrival notification systems.

Fig. 10: APTS

4.8 Advanced Rural Transportation Systems (ARTS) provides information like automated road and weather conditions reporting and directional information about remote road and other transportation systems. This type of information is valuable to motorists travelling to remote or rural areas.

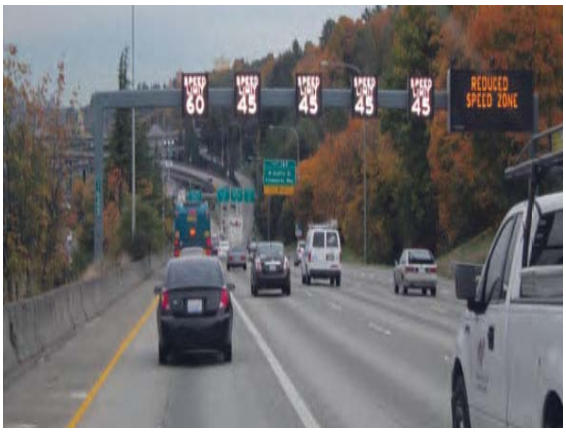

Fig. 11: Example of ARTS

5. CONCLUSION

It is vital to plan key initiatives and activities which advances and improves the development and use of ITS in India since traffic congestion is an important problem in Indian cities. The characteristics of Indian roads and traffic make the problem interesting to solve. There is scope for evaluating existing ideas in different and challenging traffic scenarios, innovate new solutions and empirically evaluate ideas in collaboration with public and private sectors.

Initiatives include activities addressing the Global Navigation Satellite System (GNSS), encouragement of international standards development through liaison with the International Organization for Standards, work force development/ trainingand improved supply chain management processes in a suitable fashion. . In this paper, we make a small effort to put together the different ideas and people relevant in Indian ITS, so that it gives an overview of the problem and the available solutions and outlines a set of open questions to answer.

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