

# **An Overview of Transport Management Technologies**

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**ABSTRACT:** Transportation plays a vital role in today's world and has a deep impact on almost all spheres of human activity including leisure, tourism, supplies and business. But in many areas it is not handled properly. One of the main reasons why there's more congestion is due to more cars on the road. The adult population is increasing and therefore more people want their own personal transport to get around with. As the number of cars increase the chance of congestion also increases. A lack of public transport, or poor public transport options, will also cause problems. If there isn't enough buses, trams, or local trains people are forced to take their cars to work. The ratio of passengers to vehicles decreases, whereas if they were able to take the bus people would feel less of a need to drive their cars. So, it is very important to manage transport effectively. Our paper focuses on the current and emerging trends in transport management by using various technologies and the study will be extended further in future.

**KEYWORDS:** Transport planning; urban traffic; traffic flow.

## **I. INTRODUCTION: ITS**

Intelligent Transport Systems and Services (ITS) refers to the integration of intelligent Transport Systems and Services (ITS) refers to the integration of information and communication technologies with transport infrastructure to improve economic performance, safety, mobility and environmental sustainability for the benefit of all European citizens.

Some of the major technological constituents of ITS are:

- Various forms of wireless communication for both short-range and long-range data exchange(UHF, VHF, WiMAX, GSM, etc.);
- Computational technologies – the present trend is towards fewer and more costly microprocessors, allowing for more sophisticated applications such as model-based process control and artificial intelligence;
- Sensing technology – employing sensors to feed control systems with both vehicle-based data (from devices such as radar, RFID readers, infrared- and visible-band cameras) and infrastructure-based data (from similar devices, as well as inductive or pressure sensors installed or embedded in and around the road).[2]

## **SCOPE:**

The present document specifies the global communication architecture of communications for Intelligent Transport Systems(ITSC). This version of the present document is dedicated to the road transport context. The present document on the ITSC architecture specifies mandatory and optional elements and interfaces of ITSC. Some elements of ITS applications, especially those directly related to ITSC, are also considered.

## **CURRENT SCENARIO:**

- Chronic parking problems in CBD area

- Poor pedestrian infrastructure (absence of subway, footpath, pedestrian crossing etc);
- Absence of bus bays;
- Bus terminal situated in CBD which compels the Buses to ply through the congested corridors of CBD;
- Insufficient traffic management system;
- Absence of integrated terminals for different modes of transport (Road, Rail, Water, Air);
- Absence of truck/ transport terminal at present;
- Declining share of public transport;
- Poor road maintenance(As there is rain for nearly 6 months, roads are damaged very quickly which incur heavy cost on maintenance of the roads);
- Signals, metro –usability funds;
- Vehicle carrying capacity of the road is not growing proportionate with the growth of vehicles;
- Lack of organized Taxi / Auto Stand;
- Encroachment of Road / Footpath by street vendors / Bunk Shops;
- Lack of Public comfort Kiosks;
- Lack of Co ordination among departments; and
- Lack of utility ducts.[2]

#### **Urban and inter-urban traffic management and control:**

Traffic management and control both in urban and inter-urban areas is one of the most complex fields of new technology application in road transport. Its main aim is to improve efficiency, safety and environmental quality of traffic, where the main emphasis is usually put on improving efficiency by on-line monitoring and forecasting of state and use of infrastructure, and provision of services to users.

The monitoring of inter-urban road network from regional traffic control centres includes road status (friction, infrastructure, etc.) and weather (visibility, wind, etc.) conditions monitoring and forecasting. Provision of services consists of emergency and rescue service, information on weather, road conditions, etc. and road maintenance. Fee collection and payment management is also part of inter-urban road management.

New technology applied in traffic management and control includes:

- > Real-time traffic monitoring by different traffic sensors
- > Road surface, temperature, wind, etc. sensors
- > Automatic incident detection by
  - Video image processing or
  - Radar and microwave sensors
- > Ramp metering
- > Electronic tolling systems, etc.
- > different data collection, processing and exchange technologies[1]

**Traffic and Travel Information:**

The objective of traffic and travel information is to promote optimal route and travel mode choice and improve the quality of travel and transport by that.

New technology applied in urban traffic and travel information includes:

- Different traffic sensors
- Different data collection, processing and exchange technologies
- Means of message dissemination, such as:
  - Variable Message Signs
- RDS/TMC
- Dedicated Short Range Communication System
- Road-side beacons
- GSM
- Internet
- Urban travel information centres, etc.

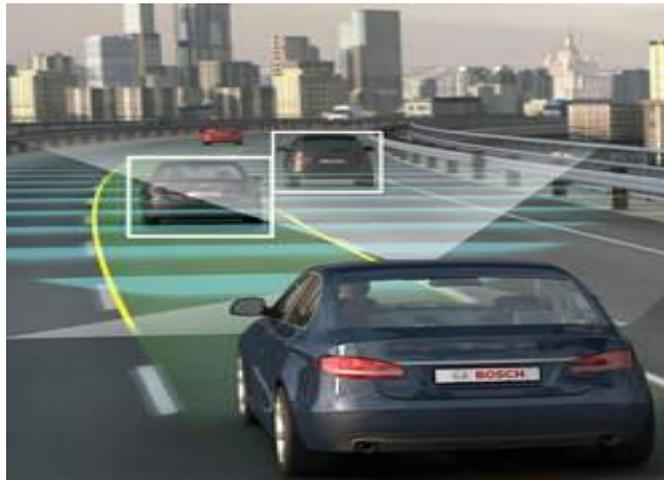


**Fig.1 Traffic and travel information system [6]**

These are advanced technologies (GPS, video cameras, wireless communication, traffic models and algorithms) to provide traffic information that is updated every minute. It collects data from the surroundings (other vehicles, signals etc), thereby helps the commuter. [10]

## **II. VEHICLE-BASED APPLICATIONS DRIVER ASSISTANCE**

Several driver assistance functions are under development or in an experimental phase all over Europe. Their aim is to give help to drivers in some aspect of the driving task, and increase driver comfort, reduce driver workload and improve traffic safety.



**Fig.2. Driver Assistance [7]**

This technology assists the driver for vehicle-vehicle communication to drive better in roads by using GPS etc.

### **Navigation and route guidance**

The objective of navigation and route guidance systems is to help drivers in the navigation task and provide them with the necessary information so that they can arrive at their destination in an efficient and safe way.

Navigation systems provide drivers with information so that they can locate their vehicle in then network and find the optimal route to their destination. Navigation can be either static or dynamic, using either autonomous on-board equipment or external infrastructure. Optimal route can be computed by autonomous or infrastructure-based systems which may use either static or dynamic information.

New technology applied in navigation and route guidance includes:

- Different in-car navigation systems working in ○ Autonomous, or
- An interactive way
- Global Positioning System for autonomous systems
- Digital road network data base in car computers
- Traffic control centres for real time, dynamic information
- Road-side transponders, etc.[1]



**Fig.3. Navigation and Route Guidance [9]**

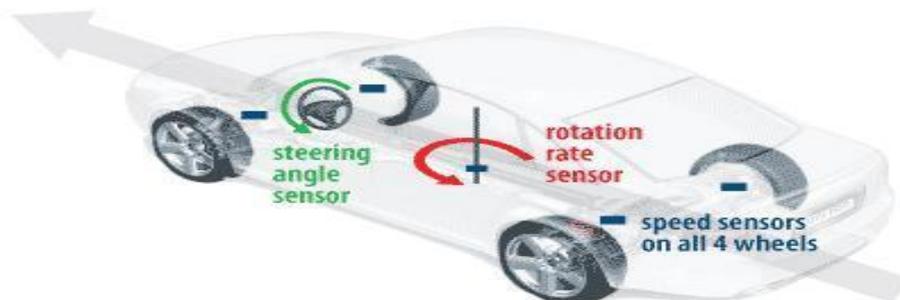
This technology helps the driver in many ways as route guidance, traffic assistance, parking problems. It receives signals from various sectors and functions effectively.

### III. DYNAMIC VEHICLE CONTROL

The objective of dynamic vehicle control is to assist drivers in controlling lateral and longitudinal dynamic behaviour of the vehicle and stabilise driving in order to increase driver comfort, reduce driver workload and improve traffic safety.

New technology applied in dynamic vehicle control systems includes:

- > Distance sensors
- > Video-cameras
- > Lateral sensors
- > Systems to correct vehicle dynamic, etc.[1]



**Fig.4. Dynamic vehicle control [11]**

These sensor acts on driver's input and responds according to the other driving parameters that are required. So, it helps the driver in many ways.

### **Vision Enhancement:**

The objective of vision enhancement is to assist drivers' vision in suboptimal visibility conditions and prevent accidents that would be affected by decreased visibility. A secondary effect of improved vision in those conditions may be higher driving speed which in fact can cause a deterioration of traffic safety, but improve efficiency.

New technology applied in vision enhancement includes:

- Near Infra-Red (NIR) headlights (operates in the infra-red region near visible light)
- Ultraviolet based headlights
- Thermal Imaging or Far Infra-Red (FIR), etc.

Volvo has investigated ultraviolet based headlights, while Jaguar and Renault have developed demonstrator vehicles with NIR systems. The behaviour modification effects of vision enhancement, i.e. increasing speed in bad visibility, need to be evaluated before wide application.

### **IV. DRIVER AND VEHICLE STATUS MONITORING**

The objective of driver and vehicle status monitoring is to detect on time any deterioration of driver or vehicle performance and prevent accidents that would be caused by this deterioration.

New technology applied in driver and vehicle status monitoring includes:

- Sensors of driver status of
- Physiological functions
- Vehicle control functions
- Sensors of vehicle status and functioning
- Systems for intervention, etc.



**Fig.5. Status Monitoring [9]**

This technology helps the driver to find any faults like door unclosed, fuel indicator, seat belt indicator, within the vehicle to prevent from any fault while moving.

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### V. SPEED CONTROL

The objective of speed control is to ensure that appropriate speed is kept on each part of the road network. As inappropriate speed is a major factor in accidents, improving traffic safety is the main aim of speed control.

Speed control can function at different levels, from flexible speed limits, posted by Variable Message Sign gantries, to a speed limiter built in the vehicle that restricts vehicle speed according to actual speed limit. A speed limiter may function in an infrastructure dependent way, getting information from road-side transponders, or as an autonomous system with its own data-base and local positioning system.

New technology applied in speed control includes:

- Variable Message Signs
- Global Positioning System
- Digital road network data base with speed limit information
- Speed limiter in vehicles, etc.

Time perspective and first application areas:

- Advisory and mandatory speed control systems based on VMS have been functioning on shorter road sections in several European countries. This form of flexible advisory speed control can widely be introduced in Europe in the near future.
- Experiments with in-car speed limiter have also been started. This form needs a longer time perspective for technology development and public acceptance before wide introduction in Europe.[1]

### APPLICATION OF NEW TECHNOLOGY IN PUBLIC TRANSPORT

Increasingly people are demanding a better public transport experience. They want accurate information at the right time, in a range of formats, to a range of devices. They also want easy payment methods, reliable and timely services, and value for money. Delivering a better public transport experience in a changing world is a challenge, but also a great opportunity for innovation.

### INFORMATION MANAGEMENT

The efficient management of information is essential for a better integrated and more attractive public transport system. Correct, real time information on the functioning of the multimodal system is a necessary background support

New technology applied in information management:

- Computer modelling
- Traffic simulation
- Means of real time traffic information collection
- Means of communication with the drivers and passengers of public transport vehicles

Projects like EUROBUS, PHOEBUS, and GAUDI has developed and tested data management models in the Third Framework Programme, and further development and harmonisation of the program outputs can be expected.[1]

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#### **PUBLIC TRANSPORT VEHICLE SCHEDULING AND CONTROL**

Priority for public transport vehicles, especially in an urban environment, can improve the efficiency and attractiveness of public transport. Projects within the Transport Telematics Programme implemented public transport priority schemes in London, Turin, Gothenburg and other cities, using bus transponders, inductive loops or radio communication.

New technology applied in vehicle scheduling and control:

- > GPS
- > Transponders
- > Vehicle identification techniques
- > Computer models

Experiments with public transport vehicle scheduling and control systems have been carried out in Bologna (GAUDI), Hasselt and Brussels (PHOEBUS) and in some other European cities. Wider, inter-modal applications are needed in the future.[1]

#### **PUBLIC TRANSPORT VEHICLE PRIORITY**

Along with public transport vehicle scheduling and control, the technology and strategies for public transport priority are now tested and ready for implementation on a basic level. Priority strategies for more complex situations need to be developed and implemented in the future.

#### **PASSENGER INFORMATION**

The objective of passenger information is to provide public transport users and potential users with necessary information in order to improve the attractiveness and convenience of public transport as an alternative to the private car, and provide travellers with a “seamless journey”. New data processing and transfer technology makes data exchange between different travel modes possible, and information can be disseminated via many channels, according to user needs and preferences. Information on public transport schedules, travel time, network, fares, interchanges, etc. can

be given in different public and individual means. New technology makes it possible that information is real time, correct and fits the individual demand.

New technology applied in passenger information:

- > Data exchange between different travel modes,
- > Multi-modal trip planning systems,
- > Public information terminals
- > Information dissemination via radio, teletext, internet, etc.[1]

#### **SMART-CARD TICKETING**

The objective of smart-card ticketing systems is to make fare collection simpler and more comfortable for passengers, and allow more flexibility in public transport fare policy according to requirements of demand management in the overall network. Additional information on customer trips and their preferences for payment

may also open the way to offering customer loyalty schemes and a better understanding of the customer's needs.

Electronic fare collection by smart cards is set to replace traditional paper tickets for public transport. Credit-card sized and a powerful micro-processor, smart cards can be an electronic purse, allowing rapid, non-stop payment in public transport. Operators benefit, too, from quicker transactions.



**Fig.6. Status Monitoring [10]**

Integrated payment becomes possible by smart card technology, i.e. secure open electronic payment or the sharing of a common payment mechanism between different operators in order to offer the passengers convenient way to pay for journeys which may involve travel on the vehicles of more than one operating company, or even more than one travel mode (bus, train, boat, metro, airline, etc.).

New technology applied in fare collection:

- Smart cards with contacts
- Hands free card wallet
- Smart card with transponder
- Contactless smart cards[3]

## **VI. CONCLUSION**

Expected applications of new technology in the road transport have been reviewed in the previous chapters. Although there is some development in the area of new materials, especially new energy sources for transport, the main area of expected development is based on new possibilities of information acquisition, -processing and dissemination. There are several parallel developments in the road sectors of transport, and the importance of integrated, intermodal transport of passengers and goods will bring the different transport modes closer in the future.

The present report approaches new developments in transport in two different ways. First, the new functions/applications are discussed and then the following parts gives glimpse new technologies. A list of new technologies that are predicted for implementation in some or many transport areas is presented here, indicating which transport areas are going to use them in the near future. Most of the technologies in the list cover many related technological possibilities, not only one specific technology.

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