
RESEARCH ARTICLE

INTELLIGENT TRANSPORTATION SYSTEMS - A LITERATURE REVIEW FOR URBAN TRANSPORT PLANNING

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Abstract: - Transport, tourists and various site visitors' traffic jam is an internationally common hassle. Indian economy is growing very fast; the problem in transport is severely felt in almost all major cities. This is due to infrastructure growth, flood in variety of car segments, due to space and value constraints. However, traffic in India is being non-lane based and uncontrolled is basically different from the western visitors. The distinction can be understood easily and completely handiest through experience; however, a few instance events can be seen. Because of this reason, some intelligent techniques / systems (ITS), used for efficient traffic management at developed international locations, cannot be used as it is in India. Intelligent Transport System becomes better transportation safe, flexible and raise global connectivity by means of productive improvements extract through the group action of advanced publicity technologies into the moving support and in most advanced vehicle.

This paper contains to build a concrete literature review to the field of Intelligent Transportation Systems (ITS). In this literature review it is tried that the efforts made will critically evaluate the prior research work and methodologies related with Intelligent Transportation Systems to study, analysis and evaluation and its relevance in today's varying environmental conditions. The recently published research work in relation to ITS is considered for the study.

Keywords: Intelligent Transport System (ITS), urban transportation management, GPS, GPRS, Wi-Fi, Sensor.

1. Introduction: -

India is the second most populated country in the world, and a quick developing economic system, is seeing horrible road congestion troubles in its towns. Due to population growth and the emergence of economies in developing countries, and the high economic growth in developed countries, the rapid development of technology makes cities more attractive and thereby increases the growth of urbanization. Therefore, people need to satisfy their residential needs. One of these requirements are the fast and optimal transport from one place to another within the city. Therefore, urban management is seriously challenged with adoption and good management of urban transport systems. Constructing infrastructure, levying right taxes to reduce private automotive growth and enhancing public shipping facilities area unit lengthy-term answers to the current trouble. These permanent solution techniques want authority intervention. The government of India has dedicated Rs.234,000 crore¹ inside the urban infrastructure region. Bus mass rapid transit (BRT), metro rails and mono rails are being built in extraordinary cities to encourage the usage of public shipping. However still there's a steep boom Private vehicle. A few cities like urban centre, Pune, Hyderabad and Delhi-NCR, with their rapid growths inside the IT sector, even have a steep increase in population, any increasing transportation needs.

The ITS literature could be very tremendous with papers appearing in apparently unrelated venues. In this paper, the focus is given on a complete listing of ITS literature to offer an outline of all existing strategies. Also follow it up with a set of open research questions within the context of Indian roads and traffic. sooner or later, list a fixed of public and personal sector corporations and educational establishments², who are lively in studies or application on the area, as meaningful collaborations and generation switch should show up if research has to make any practical effect.

2. Methodology: -

2.1 Information assortment:

In terms of data the study is primarily supported on-line analysis, considering elaborated eventualities, short eventualities, analysis publications and comes goals that are equally vital for the target of this paper as a result of all of them given novel concepts and attention-grabbing functionalities of ITS and shut Intelligence within the future world.

2.2 Problems Identifying:

Based on varied literature offered, the issues unit well-known they're logically placed in 3 Clusters: 1) Lack of Traffic Management System 2) authority System and Vehicles Operation 3) Vehicle to Vehicle Co-ordination and implementation of latest technologies.

CLUSTER 1: Lack or Traffic Management System

Traffic management system is supposed to handle giant mass of traffic expeditiously, but due to presence of huge crowd of vehicles the quality of management system will increase and these systems somehow fails to handle the gang, that finally ends up in decrease in mobility, reduced fuel consumption, higher quantity of it slow and pollution.

CLUSTER 2: authority System and Vehicle Operation

Authority System and Vehicle Operation evoke recommendation from the protection and surveillance on the traffic system and vehicles. It helps to remain the track on the trip of vehicle and measure identification of automobile and driver driving the vehicle. The problem well-known is that there's no such economical has been developed.

CLUSTER 3: Vehicle to Vehicle Co-ordination and implementation of latest technologies

This cluster is most significant from the aim of implementation of ITS, vehicle to vehicle coordination refers to the aboard info regarding the about to vehicle: this would facilitate in collision management, coordinating them on the thought of the visits planned by the drive. Implementation of latest technologies is rare in developing countries. Here the matter identifies is that there's no such technology enforced for facility albeit the technologies unit offered.

2.3 Planned Answer:

The solution to the clusters area unit usually delineate as:

SOLUTION to Cluster 1:

This clusters deals with the traffic management system. Hence the planned answer to this cluster is implementation of properly programmed traffic management system, which implies by implementing the GPS, GIS & Remote sensing, the congestion particularly route area unit usually merely legendary and therefore the route can be entertained. Digitalizing and centrally dominant the traffic system may end up inefficient and economical quality beside property to the environment.

SOLUTION to Cluster 2:

This cluster deals with workplace of Authority system and Vehicle operations, the planned answer to this cluster is implementing the wireless communication network with the vehicles and infrastructure by creating associate degree "info structure" environment: this would possibly amendment to remain each vehicle on track, by giving each vehicle a singular identity digitally. Therefore, at intervals the blink of eyes the vehicle record would air screen: this system would to boot amendment to identify and acknowledge the previous journeys of automobile.

SOLUTION to Cluster 3:

This cluster deals with vehicle to vehicle coordination, the planned answer is implementing the wireless communication network between the vehicles by mistreatment Bluetooth, Wi-Fi, varied sensors etc: this would possibly amendment vehicles to be connected with each other, and therefore collision area unit eliminated.

3. Technologies used in ITS: -

The area of ITS is supported by 3 technologies: information assortment technologies, communication technologies and customary information system. Current trends in intelligent transportation systems (ITSs) Congestion, accidents, and pollution issues due to transportation are becoming more severe as a result of the great increase in various travel demands, including vehicular traffic, public transportation, freight, and even pedestrian traffic. To resolve such problems, ITSs have been developed that are able to integrate a broad range of systems, including sensing, communication, information dissemination, and traffic control. Three essential components are necessary for any ITS to perform its function(s): data collection, data analysis, and data/information transmission. Data-collection components gathered all observable information from the transportation system (e.g., traffic flow at a particular point of the road network, average travel time for a particular road section, number of passengers boarding a transit line, etc.); for further analysis of the current traffic conditions. Traditionally, inductive loop detectors^{3,4}, which detect the presence of vehicles based on the induced current in the loop with passing vehicles, and pneumatic tubes⁵, which detect the presence of vehicles supported pressure changes within the tube, have been used to collect basic traffic information such as traffic volume and spot speed. However, because of their high implementation cost and impact on traffic during implementation, these methods are becoming less popular, especially in congested areas. Due to advances in sensing and imaging technology, video cameras and radio-frequency identification (RFID) scanners are increasingly being considered for use in traffic data collection. Cameras are often put in completely different locations within the network to gather traffic videos. The videos are then analysed using specifically designed image processing software (e.g., Auto scope) to determine information such as traffic flow, speed, vehicle types, etc.^{6, and 7}

In this context, automatic license plate recognition^{8, 9} is one crucial area of research, as through the recognition and matching of license plates; it can provide additional information such as selected paths and travel times. On the other hand, radio-frequency identification data (RFID) can commonly be obtained at locations that accept contactless payment or for freight transport. Through the matching of unique RFID, different traffic-related information, such as path choice and travel time, can be extracted^{10, 11}.

Recently, due to increasing penetration of smart phones and advanced communication technologies, Global Positioning System (GPS) data^{12, 13}, media access control (MAC) addresses from Bluetooth and Wi-Fi components^{14, 15}, and mobile phone data^{16, 17} are becoming available for the analysis of traffic conditions or even travel behaviour. Compared to the data sources listed above, these new types of data are more at the level of the individual; as such devices are usually personalized, and capable of continuous tracking (e.g., GPS and mobile phone data). With such characteristics, more detailed and/or behavioural related analysis could be conducted.

4. ITS Applications: -

Many applications of ITS are described as follows:

- **Traffic Control:** It focuses mainly on prioritizing the modes of transport such as buses, cyclist, pedestrians and other emergency vehicles in order to evaluate the performance and study the reasons for traffic emissions and congestion.
- **Disaster management systems:** Various technologies are used for this purpose in order to smooth the traffic flow and to provide medical and other related help in such cases.
- **Vehicle information and navigation systems:** In-vehicle information system warns drivers about adverse climate conditions, road surface conditions, traffic jams and hazards including accidents. Navigation systems offer vehicle location info in real time and route guidance for driver to require optimum route.
- **Driver assistance systems:** In order to save the driver from accidents these systems have replaced some human driver decisions with machine decisions which also help to achieve smoother vehicle control.
- **Air pollution control:** Road transport is the major source of air pollution which has caused impact on human health and environment quality. Various models and protocols are used in ITS to control air pollution^{18, 19}.

5. Review of Literature: -

- A. **Shandiz et al.**²⁰ proposed a method for controlling traffic lights to have maximum flow in route and which results in moving traffic. This algorithm uses real situations. The sensors send the traffic flow information on a computer, and then based on Genetic Algorithm (GA) timing of green light is adjusted. Simulation result shows the total capability of cross and road is reached supported real information. In aims to look at the connection between transport emissions and air quality concentrations and additionally to permit them to speak. Air Quality Stations send air data to Data centre then based on that data the Data centre Request restriction from traffic management. After restricting

vehicles Traffic monitoring centres activate monitoring traffic and then data centre requests extra buses from public transport management. Simulation results show that the system will modify the pollution assessment.

- B. **Robert L. Bertini, Christopher M. Monsere**²¹ represented in their research the benefits of ITS in the Urban areas addressing the congestion and safety issues. While reviewing the literature associated with the ITS research worker mentioned the scope of ITS edges primarily based upon real world experiences. This report highlights citing in every class national and international example and blends documented edges of ITS. Discussion on blood vessel and expressway Management Systems; Freight Management Systems; Incident Management Systems; Transit Management Systems; Regional Multimodal and human info Systems; Emergency Management Systems and knowledge Management. ITS implementation in urban region might result into following potential benefits: vas Management System might decrease delays in implementation, expressway Management System will decrease happening of crashes and additionally reduces overall period, Transit Management Systems focuses on automatic vehicle location and transit signal priority, Incident Management System improves public supports to the DOT activities. The benefits like increased safety, efficiency, accessibility, quality etc is simpler with regional co-operation.
- C. **Dinesh Mohan**²² described the ITS and its application group with specific categorization like traveller information, traffic, commercial vehicles etc. The researcher identified that there is substantial relationship of ITS effectiveness with behavioural adaptation. By illustrating examples like opposing brake system, route system, aboard driver helps etc it's clear that the person – machine interaction outcome is extremely advanced and it is discovered that technology alone can't deliver ends up in ITS. The major concern space concerning safety will be self-addressed with the employment of ITS tools like adjective controller, Advanced Traveller Information System (ATIS), Violation detection system etc and vehicle primarily based systems like Intelligent Speed Adaptation, Collusion Avoidance System, and Alcohol Interlock System etc. are also being promising impact on effective transportation management. The public transportation is addressed and its connectedness in ITS is illustrated. To sought-after out the matter of traffic jam, safety, and pollution etc. behaviour adaptation may be a crucial issue.
- D. **Gurdit Singh, Divya Bansal, Sanjeev Sofat**²³ presented in their paper existing techniques used in India for controlling of road traffic and ITS need in the present context. India has non lane road traffic system wherever every kind of vehicles are utilizing the roads that creates Associate in Nursing congestion within the traffic at varied locations. Particularly, in underground cities and medium cities this holdup downside is intense. In Asian nation standard traffic management system is employed by use of traffic lights, traffic policemen, traffic signs etc. The restriction in development in road infrastructure because of area limitation creates a hurdle in dominant the holdup downside. ITS techniques utilized in the developed countries might not be practicable in Indian context as there's huge distinction within the developed countries traffic management and Indian traffic situation. In Asian nation rather than focusing upon mounted detector technique, use of sensors like GPS, Wi-Fi, Camera and electro-acoustic transducer within the smart phones are often useful in estimating traffic conditions and avoiding the traffic congestion.
- E. **Sumit Mallik**²⁴ undertaken a research to understand the problems due to traffic congestion and role of information technology in creating synergetic effect in communication networks. Due to holdup transportation potency gets reduced and increase within the period of time, pollution etc. Development within the road infrastructure results into additional variety of accidents. In this paper attempt is made to discuss the impact on different application field. Studying earlier work issues known as classified into 3 clusters. First, Lack of Traffic Management System because of significant increase within the variety of the vehicles resulted into traffic congestion. Secondly, Homeland Security system and Vehicle Operations aren't developed resulted into non chase of the vehicles. Lastly, third cluster is Vehicle to Vehicle Co-ordination and implementation of latest technologies. To overcome these issues some solutions area unit urged by the investigator like use of GPS, GIS, remote sensing etc. resulted into efficient mobility of traffic. By keeping police investigation on the road traffic identification of the vehicles became simple for chase. Use of Bluetooth, Wi-Fi, sensors will provide and better coordination between vehicle to vehicle. Due to ITS there's encouragement to be used of public transportation and results into reduction in personal vehicles.
- F. **M. Absar Alam and Faisal Ahmed**²⁵ studied in this paper issues related to non-utilization of traffic demand management measures vis a vis public transport improvement measure. Higher urban increment resulted into holdup that is major downside in Asia and notably in Republic of India. Increase in vehicles isn't solely downside of this holdup, other areas like road infrastructure, private transport cost, psychological factor, policy implementations etc. are also required to be addressed more carefully. With relevancy average travel speed in Indian cities is extremely low because of holdup. Some policy measures like integration in urban designing, encouragement to public transpiration and stress on ITS can most likely yield into effective transport management.

In this study some analysis gaps were known like withdrawal of fuel subsidies compact upon the general public transportation as its price enlarged that affected majority of stake holders. The investment within the transport and its needed rate is mismatched that ends up in shortage of transport ensuing into hunt for alternatives.

There is a terrible demand of creating awareness within the driver community regarding the protection facet of the transportation. Another gap identified related to inadequate parking facilities. To overcome gaps following recommendations are suggested: additional precise integration of transport policies and concrete transport development, sustainable environment and urban growth in consultation with vehicle manufacturers, more focus on parking facilities, adoption of separate lane system for transport, empowering of state transport, and correct driving manual for drivers.

6. Conclusion: -

Explosive growth in traffic density and population has raised numerous problems like pollution, congestion and accidents that became the world of analysis. Hence Intelligent Transport System (ITS) is employed to resolve these transport connected problems. ITS combines numerous technologies like information assortment, communication, machine learning and data processing to produce transport connected services. These services embody control, navigation systems, driver help systems and Fault detection systems. Additionally, to the present ITS additionally solves transport connected problems like disaster management, congestion management and pollution. More improvement in ITS embody addition of latest techniques like web of vehicles, conveyance cloud computing, Agent primarily based computing which incorporates the introduction of Artificial Transport System. A first one is that the continuous improvement of road-vehicle systems (navigation systems, board computers, real time traffic transmissions). A second direction is that the introduction of totally automatic systems (like the "car-sharing" concept) for restricted applications in associate degree early part and bit by bit will increase the range of the applications. A third chance consists on the event and refinement of models of roads, vehicles and humans so we will simulate and set up a lot of economical ITS systems. By combining these techniques, the ITS are often created a lot of economical in finding transport connected issues.

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