



Intelligent Transportation System for Indian Highway Roads in Urban Area

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ABSTRACT

Increase in traffic density in the world results in more and more congestion, air pollution and accidents. Hence Intelligent Transport System (ITS) has been emerged as a solution to various transport related issues. The aim of this research paper is to conduct systematic analysis on ITS. Methods/Statistical Analysis: ITS is defined as the set of applications which are advance and aim to apply intelligent information and communication technologies in order to provide services for transport and traffic management. ITS have combined various technologies such as Data collection, Communication, Data Mining, Machine Learning, Artificial Intelligence and Database Management. By combining these information technologies ITS have provided various applications such as Traffic control, Fault detection systems, In-vehicle information and navigation systems and driver assistance systems. Findings: We have considered the most relevant published work from 2008 onward relative to our objective from different popular digital libraries. We have summarized this work into issues in ITS and techniques used to solve them. Application/Improvements: It has been found that by combining various new technologies such as agent based computing, cloud computing, VANETS etc. ITS have become very efficient to solving transport related issues in smart cities.

Keywords: Agent Based Computing, Intelligent Transport System, Parallel Transportation and Management System, Vehicular Ad-hoc Networks, Vehicular Cloud Computing.

1. Introduction:-

NOWADAYS we have a saturation of the transportation infrastructures due to the growing number of vehicles over the last five decades. This situation affects our lives particularly in the urban areas, while people needs, more and more, to move rapidly between different places. The results are traffic congestion, accidents, transportation delays and larger vehicle pollution emissions. Several solutions were introduced to reduce these problems or their outcomes. Examples are the implementation safety systems, such as safety belts and airbags, and the construction of more and better roads and highways. Nevertheless, presently it is clear that building more roads to reduce traffic congestion is not the "right" solution, because is very expensive, while causing a considerable environmental impact, besides requiring a large space, which is an important limitation within urban areas. On the other hand, it is also straightforward that the improvement of the transport infrastructure is essential for the economic development. So, a compromise solution must be implemented.

The difficulties concerned with this subject motivated the research community to center their attention in the area of ITS (Intelligent Transport Systems). This research studies the technologies and the scientific aspects with the purpose of developing new systems capable of solving some of the referred problems. By exploiting emerging intelligent transportation systems technologies, road-vehicle systems can be safer, more efficient and more environment friendly. While conventional road- vehicle systems depend almost entirely on human drivers, the Transport is the fundamental for the everyday functioning of economy and the society. Over the last few decades there is seen the initiation, development, deployment and huge growth in transport system and significant effect of these developments in our society and life. Hence we can redefine transport system as ITS. Now a day's not only civil and mechanical engineering areas deal with research and development of transportation. Rather the computer science engineering concepts such as Artificial Intelligence (AI), machine learning, communication, internet and many other emerging engineering and information sciences areas become the core of ITS. Therefore, ITS is defined as the set of applications which are advance and aim to apply intelligent information and communication technologies in order to provide services for transport and traffic management. Due to the current energy crisis, globally we have become increasingly aware of the fact that the resources we rely on are not boundless. Interest in the intelligent transportation system comes from problems caused by traffic congestion and a synergy of new information technology for simulation real time and communications networks. Traffic congestion has been increasing worldwide as a result or increased motorization, urbanization, population growth and changes in population density. Congestion reduces efficiency or transportation infrastructure and increases travel time, air pollution and fuel consumption. Now a day's development of roads has created a new havoc which lead to the increase in the accident cases all across the world, in order to over-come from such a problem, Intelligent Transport System holds a good point. Intelligent

moving Systems is the application of computer, electronics, and communication technologies and management master plan in an link to provide passenger information to better the patrol and control of the plain moving system. **Technologies used in ITS**

The area of ITS is supported by three technologies: Data collection technologies, communication technologies and common database system. Further advance techniques are also included in ITS which are discussed in literature review. The description of basic technologies is given:

Data collection technologies: The prime requirement of ITS is accurate and comprehensive data. In recent years distinct techniques have been proposed and implemented for the improvement of data collecting methods. The data collection technologies are mainly divided into two categories: infrastructure-based technology (Inductive loops, sensors, CCTVs) and vehicle-based technology (GPS, cell based and floating car technologies). wireless communications for intelligent inter-vehicle communication.

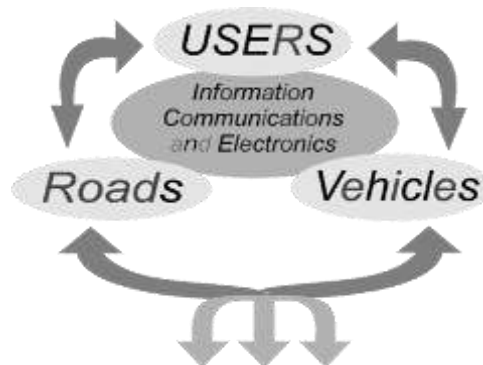
Database management: ITS also makes use of databases for managing the information related to traffic as well as to get a overview of the network based on information received.

ITS is an integrated system that implements a broad range of communication, control, vehicle sensing and electronics technologies to help in monitoring and managing traffic flow, reducing congestion, providing optimum routes to travelers, enhancing productivity of the system, and saving lives, time and money. A Technical Note of the World Bank named "ITS for Developing Countries" addresses the condition of ITS in developing countries, and discusses the long-term, society-wide benefits that ITS can provide and ways that ITS can provide more immediate benefits to individuals by helping to make surface transportation more affordable, more reliable, and more efficient (Yokota, T., 2004). It states that ITS proves to be useful in the following manner:

- Improved mobility for people and freight, including greater access to transportation for the elderly, the disabled, and people living in remote locations
 - Greater compatibility of surface transportation with the environment
 - Fewer traffic-related deaths and injuries
 - A better-managed transportation system.
 - Less travel uncertainty, allowing for better planned, quicker, and less expensive travel
 - So from the above points we can see that ITS covers and improves almost all the aspects of Transportation engineering.

2. ITS BACKGROUND

Intelligent Transportation Systems is a global phenomenon, attracting worldwide interest from transportation professionals, automotive industry and political decision makers. ITS applies advanced communication, information and electronics technology to solve transportation problems such as, traffic congestion, safety, transport efficiency and environmental conservation, as represented in fig. 1.



3. Literature Review:-

Ajaykumar N, et.al, implemented Vehicular Ad-hoc Networks (VANETs) for safe vehicular transportation based on communication between vehicles using ad-hoc networks. The vehicles with ad-hoc network will connect to the other vehicle with VANET technology when they fall in to range of ad-hoc networks each other. The information such as speed of the vehicle, GPS co-ordinates of vehicle, direction of vehicle, and lane in which vehicle is moving is shared with each other. This work proposes a simulation study of an Emergency Braking (EB) application accomplished by car dynamics and drivers' behaviour models using Network Simulator (NS3).

Rasheed Hussain, et.al, proposes a new VANET-cloud service called VWaaS (Vehicle Witnesses As A Service) in which vehicles moving on the road serve as anonymous witnesses of designated events such as a terrorist attack or a deadly accident. When confronted the events, a group of vehicles with mounted cameras collaborate with roadside stationary cameras to take pictures of the Site Of Interest (SoI) around them, and send the pictures to the cloud infrastructure anonymously. The pictures are sent to the cloud in a way that the privacy of the senders can be protected, and kept for forensic evidences to the law enforcement agencies for investigation.

Ravindra S, et.al, explain the location information of a node deployed in Wireless Sensor Networks (WSN), using Time Of Arrival (TOA) measurements in Line Of Sight (LOS) environment. They estimate the position of an unknown source node using localization based on linear approach on a single

simulation platform. The commonly used approaches for measuring position estimate in WSN are Time Of Arrival (TOA), Time Difference Of Arrival (TDOA), Received Signal Strength (RSS) and Angle Of Arrival (AOA), Direction Of Arrival (DOA). Where, the TOA, TDOA, and RSS measurement gives the distance calculation between the source sensor and the receiver sensors while DOA's provide the information of the angle and the distance measurements from the source and the receiver.

Arne Kesting, et.al, proposed to derive lane-changing rules for discretionary and mandatory lane changes for a wide class of car-following models using (Minimizing Overall Braking Induced By Lane Change) MOBIL. Both the utility of a given lane and the risk associated with lane changes are determined in terms of longitudinal accelerations calculated with microscopic traffic models. This determination allows for the formulation of compact and general safety and incentive criteria for both symmetric and asymmetric passing rules. The parameter allows one to vary the motivation for lane changing from purely egoistic to more cooperative driving behavior. The model is applied to traffic simulations of cars and trucks with the intelligent driver model as the underlying car following model.

Alberto Broggi, et.al, presents a robust method for closerange obstacle detection with arbitrarily aligned stereo cameras. System calibration is performed by means of a dense grid to remove perspective and lens distortion after a direct mapping between image pixels and world points. Obstacle detection is based on the differences between left and right images after transformation phase and with a polar histogram, it is possible to detect vertical structures and to reject noise and small objects. Found objects world coordinates are transmitted via CAN bus, the driver can also be warned through an audio interface.

4. Advanced Rural Transports Systems (ARTS)

ARTS are designed to solve the problems arising in rural zones (communities or areas with less than 50,000 residents) . Rural areas roads have a unique set of attributes such as steep grades, blind corners, curves, few navigational signs, mix of users, and few alternative routes. Some of the referred systems used in the urban areas already begun to be implemented in rural areas, such as ATIS, ATMS and APTS.

5. PROMISING DIRECTIONS OF FUTURE RESEARCH

Some of the projects in ITS consist on laboratory prototypes used to explore ideas and particular aspects of this area. The objective is the development of completely autonomous systems, which is a complex task requiring high economical resources and a large variety of technologies encompassing different research areas.

6. Conclusion

Explosive growth in traffic density and population has raised various issues such as air pollution, congestion and accidents that have become the area of research. Hence Intelligent Transport System (ITS) is used to solve these transport related issues. ITS combines various technologies such as data collection, communication, machine learning and data mining to provide transport related services. These services include Traffic control, navigation systems, driver assistance systems and Fault detection systems. In addition to this ITS also solves transport related issues such as disaster management, congestion control and air pollution. Further enhancement in ITS include addition of new techniques such as internet of vehicles, vehicular cloud computing, Agent based computing which includes the introduction of Artificial Transport System. By combining these techniques the ITS can be made more efficient in solving transport related problems.

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