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Analysing the various aspects of traffic congestion by Intelligent Transportation System

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Abstract: - Brisk and massive growth of vehicles has put the nation to think of alternate way to control traffic system. Increasing population, rural to urban migration and economic upsurge has put mammoth amount of pressure on transportation infrastructure, especially on traffic management practices in the urban areas where every hour some scores of new vehicles are added up. To understand the application of Intelligent Transportation System (ITS) as a solution to the current traffic management practices, ITS and its components have been considered to minimize the apathy of traffic congestions, followed by best practices of ITS employed.

Key Words— ***Traffic system, Transportation, Infrastructure, Intelligent Transportation***.

I. INTRODUCTION

A city that is effortless to live in, thanks to the seamless planning that went into every aspect of it, whether it is transportation, infrastructure or overall development - a city which always stands true. This is the dream that has given the birth to Smart Cities Mission. The emergence and development of smart cities in India is active for quite some time now. The emergence of new and exciting technologies that continue to make cities smarter has only added fuel to this dream and one aspect of building a smart city that holds critical importance has to be having an intelligent transport management system. Transport network plays a momentous role in the revolution of a smart city. An intelligent transport management system is the one which is incorporated with the technology of Information and Communication that ensures easy travel options for the people in the city. With millions of people choosing to commute via different public transportation options, having a system that is uninterrupted, trouble-free and quick is crucial. An intelligent transport management system is not only seamless and quick but also safe and reliable. This balance not only helps the commuters but also ensures overall efficiency in the city.

II. LITERATURE SURVEY

The ITS utilization over the period in the developed countries has resulted into effective management of traffic, the ITS and its architecture with different elements are discussed in this section of study.

S.A.Mulay, C.S.Dhekne, R. M. Bapat, T. U. Budukh, S. D. Gadgil (2005) mainly engrossed the ITS covering different domains like progressive computing and intelligent systems, mobile computing and applications, GPS etc. During the rush hours such as office and school timings there are extensive traffic lines and more halting on traffic signals which probably tend to breaking of traffic regulations. Three different modules that address the issues of traffic management have been elaborated. They are Congestion, Detection and Management. Under the above circumstance the behavioral approach of real time in which information about congestion on the road can be identified and communicated to the traveler through internet, text messages on their cell phones, so as traveler can modify their directions accordingly as per the real time data. Secondly, Intelligent Public Transportation system provides latest available positions of the buses nearby user. The expected time taken by the bus to reach the destination, bus number, routes etc. are communicated through cell phones. Use of CCTV cameras, GPS devices in the buses provides real time information about the location of the bus and density of traffic to the commuter. Third module focuses on the traffic signal synchronization which adjusts the signal timers according to the traffic congestion. Traffic jams at signals can be avoided by using this method. All these components are operating without any intervention from human which leads to seldom mistakes. Data centers are essentially required to be developed for the use of these modules which eventually converts into effective management of traffic and decline in the fossil fuel consumption at traffics and reduction in toxic waste as well.

Ioanna Spyropoulou, Matthew Karlaftis, John Golias, George Yannis, Merja Penttinen (2004) have discussed in their paper about present research carried out in the ITS impact assessment and future potential focusing upon road safety. In

first section of this paper previous work carried out on the topic of ITS and its impact on road safety is evaluated. There are different studies are carried out and outcome of these studies are different and sometimes results and conclusions are contradicting, which results into unclear picture about ITS impact. A questionnaire is prepared and through Delphi study the answers and opinions from different groups covering engineers, psychologists, ergonomists and lawyers were recorded. In the second section of the study the Delphi study preliminary results were discussed. Different systems like intelligent speed adaptation, the lateral warning, crossroads warning, traffic and ecological conditions, user assimilation, driver comfort, anti-lock braking system and enhanced routing and system are evaluated for their bang on road security.

Robert L. Bertini, Christopher M. Monsere (2004) represented in their research the benefits of ITS in the Urban areas addressing the congestion and safety issues. While reviewing the literature related to the ITS researcher discussed the scope of ITS benefits based upon real life experiences. This report highlights citing in each category national and international examples and blends documented benefits of ITS. Discussion on principal and thruway Management Systems; Freight Management Systems; Event Management Systems; Shipment Management Systems; Regional Multichannel and Information Systems of travelers; Emergency Management Systems and Information Management. ITS implementation in urban region can result into following potential benefits: Arterial Management System may decrease delays in implementation, Freeway Management System can decrease happening of crashes and also reduces overall travel time, 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 enhanced safety, efficiency, accessibility, mobility etc can be more effective with regional cooperation.

Dinesh Mohan (2009) describes the ITS and its application group with specific categorization like information of traveler, traffic, freight vehicles etc. It has been acknowledged that there is considerable relationship of ITS efficacy with behavioral adjustment. By illustrating examples like ABS (Anti break system), course guidance system, on board driver assistance etc. it is apparent that the man and machine interface outcome is highly composite and it is observed that expertise alone cannot deliver fruitful results in ITS. The major apprehensive area about safety can be focused on the use of ITS tools like ACC (Adaptive Cruise Control), ATIS (Advanced Traveler Information System), VDS (Violation Detection System) etc and VBS (Vehicle Based Systems) like Intelligent Speed adjustment, Collusion Avoidance System, Alcohol Interlock System etc. are also being difining impact on effective transportation management. The public transportation system is addressed and its significance in ITS is pointed out. To seek out the problem of traffic congestion, safety, pollution etc. performance adaptation is a grave issue.

D. Kandar, S.N. Sur, D. Bhaskar, A. Guchhait, R. Bera and C. K. Sarkar (2010) offered in their research about relationship of message and RADAR technologies with ITS. In the current scenario of road transportation, the use of RADAR technology can make accomplishment of ITS more thriving. This research stresses on different elements of RADAR technology and its association with ITS. The primary worry in performance of ITS is communication, precision, cost and compactness of the equipment. Due to the advantage in most of the unease areas RADAR technology is a grasping tool for implementation of ITS.

Gurdit Singh, Divya Bansal, Sanjeev Sofat (2014) presented in their paper existing techniques used in India for controlling of road traffic and ITS need in the present context. India is having non lane road traffic system where all types of vehicles are utilizing the roads which create congestion in the traffic at various locations. Particularly, in metro cities and medium cities this traffic congestion problem is intense. In India conventional traffic management system is utilized by use of traffic lights, traffic policemen, traffic signs etc. The restriction in development in road infrastructure due to space limitation creates a hurdle in controlling the traffic congestion problem. ITS techniques used in the developed countries may not be practicable in Indian context as there is huge difference in the developed countries traffic management and Indian traffic scenario. In India instead of focusing upon fixed sensor technique, use of sensors like GPS, Wi-Fi, Camera and microphone in the smartphones can be helpful in estimating traffic conditions and avoiding the traffic congestion.

III. ITS IN INDIA

ITS is designed to deal with all these kinds of different scenarios in Urban/semi-urban/private and public highway transport organization. ITS mainly consists of a backend and a hardware component to enhance an integrated resolution for driver console unit, electronic ticking machine, passenger information system. Advanced Technologies like GPS, WIFI and GPRS and sensors are used in ITS to schedule and monitor transport companies. In-depth ITS functions by communication from microwave, Internet, Bluetooth and geographical locations, GIS, Acquisition of data, and camera exchange system with artificial vision, detection and classification, In-vehicle system and mapping digitally. In

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India, ITS needs to adaption to local environment, accordingly the sensors, Infrastructure, modules are customized from present local requirements. The knowledge of the commuters and pedestrians is a key issue in Indian perspective. The traveler who overrules the traffic rules also can be identified by those technologies which is one of cause for accidents, Age and education plays an important role to learn about the modules of ITS. A survey on ITS was conducted on Delhi to understand about the ITS modules like APMS, VMS, ATIS. Drivers are in the need of the information about parking the vehicles that reduce the traffic congestion Real-Time Traffic Information (RTTI) is the most focused area which gives the updated traffic alerts to the drivers, passengers, and other users. By the dynamic route guidance system, drivers can receive alerts to avoid accidents, congestion, and unsafe driving conditions. Floating vehicle data, floating phone data and other advanced data collection techniques help the people in accordance with the partnerships of the public and private organization (worldblaze.in).

IV. TRAFFIC SENSORS

Sensors are the devices to sense a wide array of diverse energy structures such as progress, electrically powered signals, and bright energy, thermal or alluring energy. In accordance a variety of sensors available based on its functionality and the user's dependency. It works in the areas of the light level, temperature, force, position, speed and sound. The automobile manufacturers are developing inbuilt vehicle Sensors, and their functions include safety, traffic management& infotainment. In equivalent to usage of cameras at roadsides, Sensors are also used most is to collect data about environmental and traffic conditions, to obtain the scenario about the road conditions and ongoing traffic information, using Sensors on roads is helpful. The different types of sensing and hybrid sensors are used both in–vehicle and on-road.

Magnetic sensors or loops: Under road surface the vehicle counts can be detected. Most of the traffic applications use surveillance attached with video graph facilities to track traffic conditions & detect incidents (Cheung 2004, Coifman, Cassidy, 2002 and paleale.eecs.berkeley.edu)

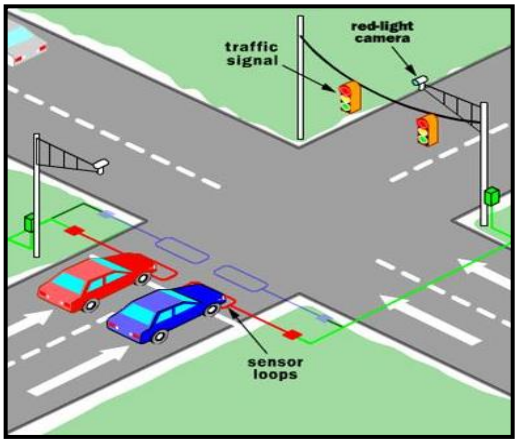

Fig.1. Sensor Loops for Intelligent Traffic System

Images and Videos: Surveillance using video to get the information on traffic status and identify incidents and trouble spots is quite common (http://www.visioway.com). Kastrinaki et al., 2003 went for a survey of the major computer image methods used in traffic applications.

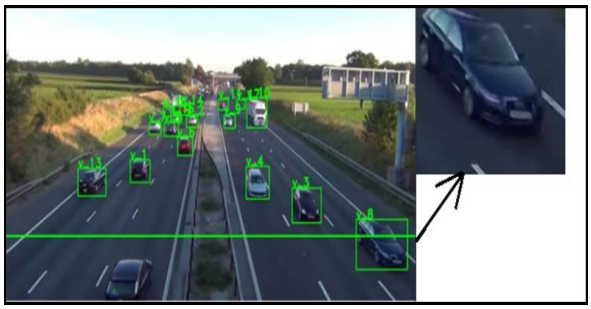

Fig.2. Images and Video Graphic Sensor Operation

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