AN OVERVIEW ON INDIAN ITS & FOREIGN ITS TO DEVELOP ITS IN NAGPUR CITY

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Abstract - *Supervision the development of traffic is a big problem all over the world. Intelligent Transportation System (ITS) provides solution to these problems with the help of new technologies. Intelligent Transportation Systems is the application of computer, electronics, and communication technologies and management strategies in an incorporated manner to provide traveler in sequence to increase the safety and efficiency of the road transportation systems, to work out and supervise the traffic troubles. In the present study we have studied major parts of the Intelligent Transportation System. The Objective of the paper is Study on the whole development of intelligent transport system in the human race and match up to with Nagpur intelligent transport system. Hence structural design and urbanized models over the years of major branches of ITS have been reviewed here to make a comparison analysis of Nagpur city Intelligent Transportation System. It will lead to the gaps in the awareness which can be further studied. The paper things to see the conclusions extracted from the studies of dissimilar systems and also give the future possibility in the field transportation to make it more users friendly and available.*

***Key Words*: Intelligent Transportation System communication technologies, Management strategies & traffic troubles.**

1. INTRODUCTION

Intelligent Transportation Systems (ITS) is a recognized route to resolve, or in any case minimize traffic problems. Intelligent Transportation Systems cover all modes of transportation - air, sea, road and rail, and intersects a variety of components of each mode - vehicles, infrastructure, communication and operational systems. Various countries have developed strategies and techniques, based on their geographic, cultural, socio-economic and environmental surroundings, to integrate the various components into an consistent system. In general, any of the ITS applications uses a Traffic Management Centre (TMC) where data is composed, analyzed and united with other operational and control concepts to deal with the complex transportation problems.

A) Intelligent Transportation Systems classification

The ITS categorization is mostly based on the application of the system to precise level like vehicle level, infrastructure level and cooperative level, where the sensors, information processors, communication system, roadside messages, GPS updates and automated traffic prioritization signals, etc, are the key facial appearance in these system. The most frequently used cataloging of ITS is based on the positioning of the system as specified below,

i) *Advanced Traffic Management Systems (ATMS*)

ii) Advanced Traveler Information Systems (ATIS)

iii) Advanced Vehicle Control Systems (AVCS)

iv) Commercial Vehicle Operations (CVO)

v) Advanced Public Transportation Systems (APTS)

vi) Advanced Rural Transportation Systems (ARTS)

2. LITERATURE REVIEW

Zhenlin et al. (2012) studied the efficiency of the Beijing Intelligent Traffic Management System (ITMS). In this study urban transportation systems, socio-economic system and energy environment system were taken as the input system and the road traffic management efficiency and urban transport putting indicators as the output system. The field data of Beijing from 2000 to 2010 are used for empirical analysis. The results of the study showed that the ITS improved the overall efficiency of the Beijing transportation.

Purushothaman et al. (2011) proposed a similar GIS based Emergency Response Management System for Mysore City, India. The developed system provides the network based spatial analysis such as connectivity, finding paths, allocation, finding the neighboring facility, defining service areas, dynamic segmentation.

Ganeshkumar and Ramesh (2010) designed Emergency Response Management and Information System (ERMIS) for Madurai city, Tamil Nadu. In this study a detailed GIS database of transportation network, accident locations, hospitals, ambulance locations, police and fire stations was prepared and spatial analysis was also carried out for accident records of years 2004–2008. Route finder was designed to find shortest, time saving routes and service areas.

Kumar et al. (2005) developed a GIS based advanced traveler information system for the Hyderabad city, India

under Arc View GIS environment. GIS-enabled modules for the shortest path, closest facility, and city bus routes were incorporated in the system. The developed system provides information about fundamental facilities in Hyderabad City.

Faghri and Hamad (2002) studied the use of GPS in traffic management. In their study application of GPS was implicated in collecting traffic data such as travel time, speed and delay on 64 major roads in the state of Delaware. When mean and variance of the results obtained by both the methods were compared and no significant difference was observed. GPS data was found to be 50% more efficient in terms of manpower.

Hernandez et al. (2002) incorporated the use of artificial intelligence techniques in traffic management and gave a multiagent architecture for intelligent traffic management systems. Two multi-agent knowledge based systems, InTRYS and TRYSA2 were developed to perform decision support for real-time traffic management. The performance of both the systems was evaluated and general applicability of multi-agent architectures for intelligent traffic management was given.

Thapar (2001) presented a GIS based emergency response management system for Hyderabad city which can provide the useful information regarding different facilities and optimum routes during emergency situations. In this study the probable risk zones were determined based on the land use, building activities as per National Building Code (NBC) guidelines. Efficiency and effectiveness of the fire service was studied and based on this an Emergency Response Management System was developed.

Logi and Ritchie (2001) described a real-time Knowledge Based System (KBS) for decision support in the assortment of integrated traffic control plans subsequent to the occurrence of non-recurring congestion. In this study, two algorithms were developed i.e. data fusion algorithm for the analysis of congestion and an algorithm for the selection of control plans. The substantiation results showed that by the use of Traffic Congestion Management (TCM) travel time reduced between 1.9% and 29.0% and typical stop speed reduced between 14.8% and 55.9%.

3. COMPONENTS OF INTELLIGENT TRANSPORT SYSTEM

A Traffic Management Centre (TMC) is the hub of transport administration, where data is collected, and analyses and combined with other operational and control concepts to manage the complex transportation network. It is the focal point for communicating transportation-related information to the media and the motoring public, a place where agencies can coordinate their responses to transportation situations and conditions. Typically, several agencies share the administration of transport infrastructure, through a network of traffic operation centers.

3.1 ITS: Key Drivers and Tools

- Information technology
- Communications technology
- Mobile Apps
- Cloud computing
- Sensors
- Cameras
- GPS
- Digital radio
- RFID (Radio Frequency Identification)

Software needed for different applications. Indian firms among the global leaders in development of Information and communication technology

3.2 Potential of ITS in Transport

- Inter and intra vehicle systems
- Traffic management systems
- Transport coordination and multimodal integration
- Travelers and user information

3.3 ITS applications

Indian traffic can benefit from several possible ITS applications. One set of applications is for traffic management.

(i) 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.

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

(iii) 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.

(iv) Monitoring - Pollution and road quality monitoring are necessary for taking corrective measures.

(v) Revenue collection - Toll taxes for infrastructure maintenance and fines for rule enforcement need to be collected.

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

Another set of applications can aid the commuters on roads.

(1) Congestion maps and travel time estimates - These help commuters in route selection.

(2) Public transport information - Information about arrival of public transport helps in choice of travel mode and reduces wait delays.

(3) Individual vehicle management - Getting information about parking places or estimates of carbon footprint help owners of private vehicles.

(4) Accident handling - Emergency services after accidents are a vital necessity.

4. INTELLIGENT TRANSPORTATION SYSTEM AROUND THE WORLD

Developments in intelligent transport system are driven strongly by socio-economic needs, and environmental demands. A research report titled "Intelligent Transportation Systems: A Global Strategic Business Report", published by Global Industry Analysts, Inc., provides a comprehensive review of trends, product developments, mergers, acquisitions and other strategic industry activities within the domain of ITS.

According to this report, the global market for intelligent transportation systems (ITS) is projected to reach US $18.5 billion by 2015. The United States of America has the largest regional market for ITS, accounting for a share of almost 40% of global revenue generated.

Table -1: Comparison in-between ITS-method of world

ITS-America	Telephonic Data Dissemination, IntelliDriveSM, Next Generation 9-1-1, Cooperative Intersection Collision Avoidance Systems, Congestion Initiative, Integrated Corridor Management Systems, Clarus Initiative, Emergency Transportation Operations, & Mobility Services
ITS-Japan	Vehicle based navigation system, Gas rate gyroscope as a direction sensor, Toyota Electro Crown model, Cathode Ray Tube to display the map. **First phase:** Use of in-vehicle navigation systems and electronic toll collection. **Second phase (2005):** Included rapid emergency and rescue activities, Establishment of public transport organizations, Improvement of information services to improve the convenience of transportation. **Third phase (2005-2010):** involves improvement of infrastructure and in-vehicle equipment. **Fourth Phase (after 2010)**: Advanced information and telecommunications society, Extensive optic fiber network, traffic information gathered, Traffic Control and Surveillance Centers, The Universal Traffic Management System (UTMS) & Two-way infrared method.
ITS-Europe	Road Transport Informatics (RTI*),* Road Infrastructures for Vehicle safety in Europe (DRIVE), Program for European Traffic with Highest Efficiency and Unprecedented Safety (PROMETHEUS). Invent, and Prevent method., AGILE project developed a global navigation satellite service, Improve cross-border traffic and transport, The NextMAP project assessed (geometric accuracy, additional information) & Advanced Driver Assistance Systems (ADAS) applications
ITS-Nagpur (India)	Rapidly growing metropolis, Run city buses, Cement Roads with widening the roads, metro in Nagpur. For transportation system Bus, Rail, and metro, LRT, BRT with efficient speed, frequency, facilities, comfort, convenience, and reliability. Passenger Information System (PIS). Automatic Vehicle Location System (AVL), Security Camera Network System (SCN), Bus Driver Console (BDC), On Board Ticketing Machines, Central Control Centre, Online ticket booking, Applications based vehicle booking.

Table No.2: Nagpur transportation Inference as per MOUD Guidelines

SR. NO.	Benchmark	Inference as per MOUD Guidelines
1.	Public Transport Facilities	The system may require route rationalization and bus augmentation to improve the performance
2.	Intelligent Transport System(ITS) Facilities	The city lacks adequate ITS facilities.
3.	Sustainability of public transport	The Public Transport of a city is financial not sustainable and needs considerable improvement
4.	Travel speed	Small increase in flow may cause substantial increases in approach delay and hence decrease in arterial speed
5.	Integrated land use Transport system	Faint coherence between city structure and public transport system.
6.	Non Motorized Transport	The city lacks adequate NMT facilities.
7.	Pedestrian infrastructure	The city has pedestrian facilities which may need some improvements at intersections, footpaths and street lighting as some parts of the city are not served by it.

5. MAP OF STUDIED AREA

Fig: Map of Kamptee Road to Buldi Nagpur

6. RESULTS AND CONCLUSION

1. The fuel consumption per year is reduced by approximately 1.5 - 2% with implementation of ITS components.
2. Automatic signal system is designed under ITS for Nagpur city area.
3. By this project we save the environment from pollution through reducing CO and NOx emission.

Fig: 6.1.1 Fuel Consumption in one year

Direction	Without Signal Synchronization	With Signal Synchronisation
Build To Kamptee	2107875 Lit	1861500 Lit
Kamptee To Buildi	2025750 Lit	1861500 Lit

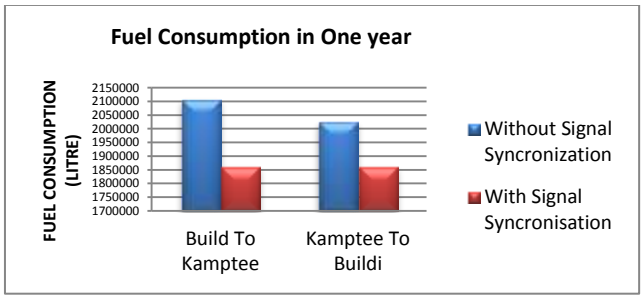

Fig: Graphical representation 6.1.2 As per Table 6.1.1

	Without Signal Synchronization	With Signal Synchronisation
CO	1053.93	930.75
Nox	1370.19	1209.75

Fig: 6.1.3 CO & NOx emission for one year (For Minimum emission Factor)

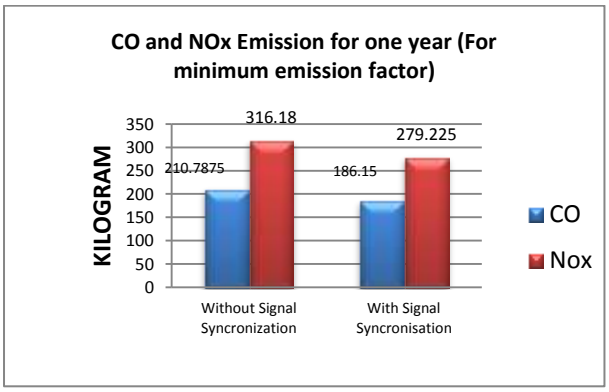

Fig: Graphical representation 6.1.4 As per Table 6.1.3

	Without Signal Synchronization	With Signal Synchronisation
CO	632.3625	558.45
Nox	843.15	744.6

Fig: 6.1.5 CO & NOx emission for one year (For Average emission Factor)

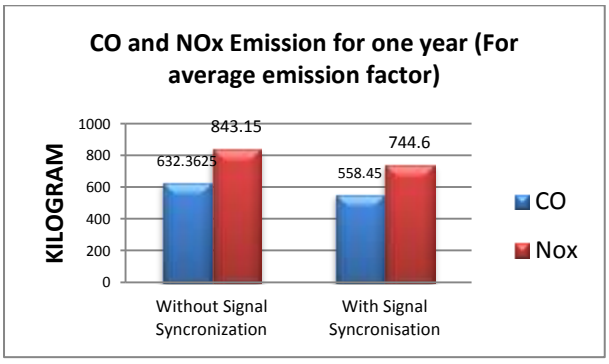

Fig: Graphical representation 6.1.6 As per Table 6.1.5

	Without Signal Syncronization	With Signal Synchronisation
CO	210.7875	186.15
Nox	316.18	279.225

Fig :6.1.7. CO & NOx emission for one year (For Maximum emission Factor)

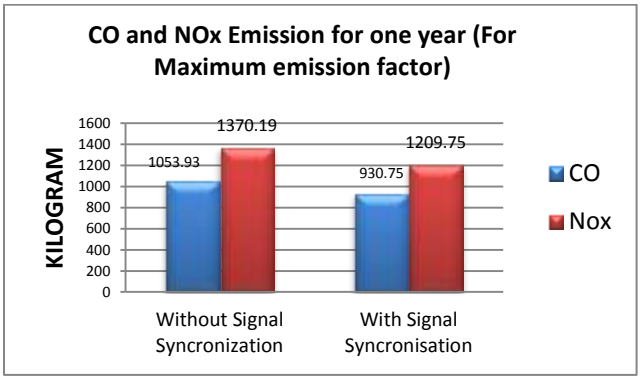

Fig : Graphical representation 6.1.8 As per Table 6.1.7

CONCLUSIONS

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. In this paper, we make a small effort to put together the different ideas and people relevant in Indian ITS.

Based on the international understanding the best practices observed in the country which is urbanized such as USA, European nations, United Kingdom, etc, the function of ITS seem a promising solution for advanced traffic control and management. In array to complete the full potential of ITS in Nagpur, a careful systematic approach is required in the propose and scheduling, development and implementation, which tackle the problems of user needs and benefits, system architecture and integration issues while at the same time giving due intelligence to other national and international medium and long-term objectives related to such issues as land use and regional planning, infrastructure design, carrying system management, and many other important areas that are directly or indirectly inclined as a result of ITS accomplishment.

Once implemented, it will bring Nagpur on the global map as one of the smartest cities of the world with best transport management. Recent expectations in relation to this potential have suggested, for example, that ITS will lead to a 50 per cent reduction in road fatalities; a 25 per cent reduction in travel time; a 50 per cent reduction in traffic delays; and a 50 per cent reduction in city pollution.

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REFERENCES

[1] “Intelligent Transportation System standards program strategic plan for 2o1 1- 14" by B.Christie,Ann D.,San G., Suzanne s. , R.I.T.A., US Dept. of Transportation (FHWA-JPO-1 1-052), page 6,7,21

[2] “ITS handbook” world road associations, page 1,4,6,67,81.

[3] R. Sen, P. Siriah, and B. Raman. Roadsoundsense: Acoustic sensing based road congestion monitoring in developing regions. In IEEE SECON, June 2011.

[4] S. Roy, R. Sen, S. Kulkarni, P. Kulkarni, B. Raman, and L. Singh. Wirelessacrossroad: Rf based road traffic congestion detection. In WISARD, January 2011.

[5] http://www.technologyreview.in/ computing/37647/.

[6]http://asiancorrespondent.com/39640/isindia-waiting-for-its-longest-trafficjam/.

[7] W. McShane, R. P Roesss, and E. Prassas. Traffic engineering. In Prentice-Hall, Inc, 1998.

[8] S. Cheung, S. Coleri, B. Dundar, S. Ganesh, C. Tan, and P. Varaiya. Traffic measurement and vehicle classification with a single magnetic sensor. Paper ucb-its-pwp-2004-

7, California Partners for Advanced Transit and Highways (PATH), 2004.

[9] B. Coifman and M. Cassidy. Vehicle reidentification and travel time measurement on congested freeways.

Transportation Research Part A: Policy and Practice, 36(10):899–917, 2002.

[10]http://paleale.eecs.berkeley.edu/ ˜varaiya/transp.html.

[11] http://www.scats.com.au/index.html.

[12] http://www.visioway.com,http://www. traficon.com.

[13] V. Kastrinaki, M. Zervakis, and K. Kalaitzakis. A survey of video processing techniques for traffic applications. Image and Vision Computing, 2003.

[14] I..Magrini G. Manes A. Manes B. Barbagli, L. Bencini. An end to end wsn based system for real-time traffic monitoring. In EWSN, February 2011.

[15] V. Tyagi, S. Kalyanaraman, and R. Krishnapuram. Vehicular traffic density state estimation based on cumulative road acoustics, 2011.

BIOGRAPHIES

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