INTELLIGENT & SAFE TRANSPORTATION SYSTEM FOR MODERN DEVELOPING CITIES

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Abstract :

Road traffic congestion is a recurring problem worldwide In India, a fast growing economy, the problem is acutely felt in almost all major modern cities. This is primarily because infrastructure growth is slow compared to growth in number of vehicles, due to space and cost constraints. Secondly, Indian traffic being non-lane based and chaotic is largely different from the western traffic. The difference can be understood fully only through experience, Thus, Intelligent & Safe Transportation System (ISTS), used for efficient traffic management in developed countries, cannot be used as it is in India. ISTS techniques have to undergo adaptation and innovation to suit the contrasting traffic characteristics of Indian roads. In this position paper, we present a comprehensive study of all available ISTS systems, including both research prototypes and deployed systems. We next pose a set of interesting open research problems in the context of Indian ISTS. Finally, we list a set of public and private organizations, that play a role in Indian traffic management and research, as meaningful collaboration between field practitioners and researchers is needed for efficient transfer of relevant technology. Though our paper focuses on the Indian traffic scenario because of our hands-on experience of working withit, many of the problems and solutions outlined in this paper.

Introduction:

Intelligent & Safe Transport Systems and Services refer 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 citizens. Affordable and accessible transport is clearly fundamental to sustainable health, wealth and prosperity in Modern city. It underpins employment, economic growth and global exports, while providing citizens with resources and mobility that are essential to the quality of life. The ability of transport systems to respond to mobility needs of citizens and goods is hampered by a continuous increase in traffic demand as a result of higher levels of motorization, urbanization, population growth and changes in population density. The resulting traffic Congestion reduces the efficiency of mobility systems, increasing travel times, air pollution and fuel consumption. Addressing traffic congestion was one of the initial motivations to look at intelligent transport

Systems solutions for a better utilization of transport capacity through the exchange of real time information on infrastructure and traffic

conditions. Since then, new transport applications based on information and communications technologies have emerged and continue to emerge, ranging from basic traffic management systems to management of containers; from monitoring applications such as closed-circuit television security systems to more advanced applications integrating live data and feedback from a variety of information sources (e.g. parking guidance, weather information).To meet the challenges of achieving virtually accident-free, clean and efficient mobility through ISTS, it is crucial that all elements of transport systems are able to communicate and cooperate in exchanging real-time information. Bi-directional communication is needed from vehicle to vehicle and vehicle to infrastructure. This requires the development of modern city A communication architecture that provides a common frame for cooperative systems to work together. Examples of applications based on cooperative systems that are currently under development are: traffic control and management, intersection collision warning, weather and road conditions warning, and route guidance to avoid traffic congestion. Several services of the Modern city Commission contribute to the development and deployment of ISTS in city. Transport for the Indian Commission To meet the challenges of achieving virtually accident-free, clean and efficient mobility through ITS, it is crucial that all elements of transport systems are able to communicate and cooperate in exchanging real-time information. Bi-directional communication is needed from vehicle to vehicle (V2V) and vehicle to infrastructure (V2I). This requires the development of modern technology Integrated effort essential because transport is inherently transnational in nature, research efforts to solve its problems must also transcend the scope and scale of purely national efforts. The resultant innovations should be applicable across the whole of Indian, and even beyond. Geographical continuity, standardization and interoperability of services are essential, in order to avoid the emergence of a patchwork of ITS applications and services. It is increasingly evident that technological improvements involving individual vehicles or infrastructure components and sub-systems are insufficient.

Solutions must be found at the level of the interactions between the various constituents of transport systems, including users, and their optimal combination. Even with relatively small investments, the integration of existing technologies could create new services bringing more reliable, real-time traffic information and better routing.

1.1 Background of Project

Advanced Traveller Information Systems (ATIS) is one of the user services   provided by   ITS. With   Advanced   Traveller Information   Systems   (ATIS)   information, drivers make informed decisions and are better equipped to plan their route and estimate their travel time. Route planning is   an essential   component   of   ATIS,   aiding   travellers in choosing the optimal path to   their   destinations   in   terms   of   travel distance, travel time.

In   this   proposal   an   advanced   traveller information system for Pune city has been developed in GIS environment. This user-friendly system provides complete information of Hyderabad city such as road network, tourist places   with   in   the   city   limits,   hospitals, government and private offices, stadiums, bus and   railway   stations.   This   system   provides shortest path and path to closest facility based on distance and drive time. A facility consisting of city bus routes with bus numbers, origin and destination points, and all intermediate stations have been included in the system

    A   sustainable   transport   system   must provide mobility and accessibility to all urban residents in a safe and environment friendly mode   of   transport. This is a   complex and difficult task when the needs and demands of people are not only different but also often conflicting.   If   a   large   proportion   of   the population cannot afford to use motorized

    Transport modes – public / private – then they have to either walk or ride bicycles for their mobility. The nature of urban road traffic safety and the   ways   in which the problems created by road traffic conflict need to be reviewed to promote Urban Road Safety. A particular interest is taken in the impact of road safety issues on the well being of the urban vulnerable road users. From this perspective, the   study   will   identify   and   investigate   the

particular problems facing the urban vulnerable road users as a result of road accidents. The urban vulnerable road users may be particularly disadvantaged, as compared to others. Geographic Information System (GIS) usage provides spatial analysis, improved display capacities and data integration capabilities. The study will identify and highlight these issues by using GIS information system to aid policy makers and other stakeholders in their endeavour to promote Urban Road Safety.

1.2Objectives & Scope

The main objective of this article is to present a status report on the nature and impact of road safety in Pune city. The article highlights GIS capabilities such as special analysis tools, graphics and data integration capabilities, etc. to provide enhanced capacity for addressing urban road safety issues for vulnerable road users. The article identifies priority areas for remedial actions, enforcement issues, traffic control and traffic calming measures. The study is restricted to the urban settlement of Pune city under PMC area. The GIS will offer a platform to maintain up to date road accident database and use it for further analysis and planning. The scope of the article is to identify the characteristics of traffic accidents in Pune urban area. Developing GIS based information system will help to integrate land use information, traffic and travel characteristics, and road accident data to assess urban safety particularly for vulnerable Road users . The planning and management of urban environment require huge amount of information regarding almost all Aspects of natural and man- made features of that area. Until lately, such a study could be achieved through days of exhaustive Surveys, map generation and tedious calculations. GIS serve as a powerful tool for spatial and non-spatial analysis of data. This study tried to apply the role of GIS in the management of urban environment. Urban environment basically consists of built up area, i.e. buildings, roads, industries, but in this study try to attend to some amenities in side Pune urban activity zone. With using GIS techniques in the research we can understand how the modern technology can be used in the study of urban

sprawl and its growth trend, updating and monitoring,

1.3 Introduction to Pune City

Pune is second Largest city of state the present population of Pune city is around 31, 57,000 as per 2001 census Population of Pune has increased by 56 % over the last decade in which reflects tremendous increase making it more congested than ever. The expansion process is still continuing both due to its own population expansion and the influx from surrounding areas. Understanding the growth and change brought on by urbanization is critical to those who must manage resources and provide services in these rapidly changing environments the rapid population growth has caused heavy pressure on city administration regarding issues of transportation, atmospheric pollution, water supply, sewerage, electric power and other civic amenities with impacts to the citizenry at large. Since, the provision of most civic services to the public involves geographic aspects (i.e., locate and provide) there is a logical need that all the agencies responsible for providing basic urban facilities to the citizens should have accurate maps, rectified to a common geographic reference for use in the urban environment. Intelligent Transport System (ITS) comes into picture and it holds the promise of sustainability. Intelligent Transport Systems (ITS) is the name given to the application of computer and communications technologies to transport problems. In a rapidly changing society the emphasis on road technology improvements to assist in road management has been identified. The rapid advances in ITS technologies have enabled the collection of data or intelligence which provides relevant and timely information to road managers and users. Keeping traffic moving is the big challenge that all levels of government are facing worldwide. Private travelers, commercial road users, and the public sector are continually searching for new and faster travel routes. Without quality and dynamic data, route selection is often a hit and misses guessing game. The old adage, 'knowledge is power' is the obvious solution to the traffic problem. Customers want real-time information to help them select the best route to take at any given time. They need to know

traffic speeds, incidents (accidents or lane closures), and road conditions.   With Advanced Traveler Information Systems (ATIS) information, drivers make informed decisions and are better equipped to plan their route and estimate their travel time. Fast and accurate information translates into several benefits for ATIS customers such as reduction in travel time, reduction in stress levels, the avoidance of congestion, and perhaps the most important benefit, the avoidance of unsafe driving conditions.

1.4 Case of Pune City

Pune city is an important urban center in Maharashtra and a rapidly growing metropolis of the country. The metropolitan area of Pune extends over 809 sq km. The Pune Metropolitan Area (PMA) consists of Pune Municipal Corporation (PMC), the Pimpri-Chinchwad Municipal Corporation (PCMC), Cantonment Boards of Pune and Kirkee and some villages. The total length of road network in PMC area is about 1800kms. The importance of Pune as an industrial centre has grown rapidly since   the 1960's when industrial expansion in Mumbai region was curtailed. Consequently Pune has become a major centre in the state, having attracted engineering industry such as motorvehicle manufacturing plants buses, cars and motorcycles. In addition to this, a number of multi-national companies have manufacturing bases within the city. Much of the local industry   is concentrated along the   main Pune-Bombay highway, enabling manufactured goods to be dispatched. As per 2001 census population of the Pune city is a home to 26 lakhs people and 1.5 lakh vehicles. For the last two decades Pune has registered a steep growth in number of public-private vehicles. But the road infrastructure and the utilities have not expanded in commensurate with increase in number of vehicles. The city manifests all the problems of a metropolis like increase in traffic congestion, speed   reduction, environmental pollution high incidence of road   accidents and degradation of quality of life. The problem of road accidents has been brought out by an unprecedented growth in motorized vehicles which is

further aggravated by the interstate truck movement that cuts through the Pune city.

The growth of vehicles in Pune has   assumed extraordinary proportions, especially in the case of two wheelers. So far there are about 15.6 lakh vehicles registered in PMC and PCMC area out of which more than 12 lakh vehicles are two wheelers.

Public transport has always been a hallmark of good transportation system. Commuters in Pune are heavily dependent on the personalized mode of transport like two wheelers and the public transport has always taken a back seat. Maxuimum   number of accidents occurs from 0900 to 1300 hrs in the morning and 1800 to 2200 hrs in the evening. Two wheelers, three wheelers and cars are involved in maximum number of accidents. Two wheeler riders alone are involved in more than 45% of fatal accidents and 39% of the fatal accident victims are pedestrians. Thus pedestrians and two wheeler riders in Pune city are the most vulnerable road users exposed to high risk of road accidents on Pune city roads.

Pune district is located between 17° 54' and 10° 24' North Latitude and 73° 19 and 75 10' East Longitude, The district is bound by Ahmadnagar district on the north-east, Solapur district on the south-east, Satara district on south. Raigad district on the west and Thane district on the north-west Pune district forms a part of the tropical monsoon land.

1.5 Road Network

Pune district is well connected with the state capital and surrounding headquarters through road and rail linkages. The road network consists of Express Highway, National Highways, State Highways and Major District Roads. The district has total length of 13.642 km of roads. Following National Highway pass through the district:

1. National Highway No. 4 (Mumbai-Bangalore)

Regio	2011	2021	2031
PMC	3115431	4807868	5443642
PCM	1729320	1915320	2106123
Pune	67861	88603	93134
Khad	77417	85600	89977
Total	4992040	6899412	7734907

2. National Highway No. 9 (Pune-Solapur-Hyderabad)

3. National Highway No. 50 (Pune-Nashik).

1.6 Rail Network

The district has a total rail network of 311 km. Pune and Daund are the two major junction stations. Following are the two main railway routes pass through the district:

1. Mumbai-Pune-Solapur

2. Pune-Miraj

1.7 Air Route

Pune is well connected through domestic airlines with the entire country The airport located at Lohgaon has recently acquired status of an international airport. Also it is proposed to develop an International air-cargo hub near Khed Tahsil of the district.

1.8 Demographic Profile

The total population of the study area in 2001 was 35.6 lakhs. The decadal growth in PCMC area is almost 100% in the past 3 decades. PMC area has registered an average Decadal growth of around 35% and a decline in population is observed in both the cantonments. The estimated population figures of study area for the base year 2008.

Table 1: Demographic Profile Estimation

1.9 Significance of the study

The planning and management of urban environment require huge amount of information regarding almost all Aspects of natural and man- made features of that area. Until lately, such a study could be achieved through days of exhaustive Surveys, map generation and tedious calculations. GIS serve as a powerful tool for spatial and non-spatial analysis of data. In This study tried to apply the role of GIS in the management of   urban environment. Urban environment basically consists of built up area, i.e. buildings, roads, industries, but in this study try to attend to some amenities in side Pune urban activity zone.With using GIS techniques in the research we can understand how the modern technology can be used in the study of urban sprawl and its growth trend, updating and monitoring, Using repetitive coverage, urban environment especially land use the study on   Pune Municipality .Selection of Study Area Pune city in India, growing at a very fast rate, and PMC area in pune spread   over 243.84   SqKm.

94% increase in area from   1961   to 2001,Population grown 400 times from 1961 to 2001,CAGR for 1991- 2001 is 4.94% and 50% of population growth in last decade due to in-migration. Aims and Objectives: The precise aim to this present study is to find out different amenities in PMC area and suggest planning to provide better utility services. Role of Geographic Information System The 19th century witnessed a trickle of urbanization and the emergence of metropolises. To control the world's urban development as crucial for the future of humanity.

1.10 Selection of Study Area

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Conclusion

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 ISTS, so that it gives an overview of the problem and the available solutions and outlines a set of open questions to answer.

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