A Review on Feasibility Study of An Intelligent transportation System

Mr.Nishant Yashwant Pawar[1], Prof.Kapil Tiwari[2]
[1]Dept of Civil Engineering
[2]Professor,Dept of Civil Engineering
[1, 2]G H Raisoni University Amravati

Abstract- *The Intelligent Transportation System is a new innovation that employs modern technology to tackle a range of problems. Its suitability for real-world difficulties in developing countries such as India, such as traffic congestion, infrastructure demand, high traffic loads, and non-lane traffic systems. It is necessary to evaluate the potential of a technology in order to establish its feasibility. The purpose of this article is to calculate the utility cost ratio of implementation so that it may be weighed without modifying the current infrastructure architecture. The ultimate result is a utility cost analysis technique that takes into consideration social, economic, and environmental factors. As a consequence, the analysis is promptly analysed so that the technology may be deployed as needed.*

Keywords- Investments, Congestion, Intelligent Transportation System (ITS), Benefits.

I. INTRODUCTION

1.1 GENERAL

The Intelligent Transportation System (ITS) is a concept for reducing or at least limiting traffic congestion that is still evolving. Population growth and quick development have resulted in an increase in the number of cars on the road. And, in many locations, the growing number of cars began to outnumber the road's capacity. Congestion happens in some areas when the demand limit is surpassed. Several studies on traffic have been released.

To address the primary issue of traffic congestion and a reduction in the quality of service provided by roads, government authorities spend a significant amount of money on improvements such as road expansion, over or under bridge construction, and so on. However, owing to a lack of room and other constraints, it was unable to attain full advantages. Then, as a result of the emission of hazardous gases such as CO and NOx, the congestion issue has an impact on human health, since air quality is reduced as a result of the increased vehicle population.

1.2 Criteria of Smart Cities

Various research on the assessment and monitoring of smart city development have been performed. The European Union (EU) Urban Audit Dataset was used by Caragliu, Del Bo, and Nijkamp (2011) to examine variables that influence the performance of smart cities. The EU Urban Audit provides data on over 250 variables in the areas of population, social factors, economic factors, citizen engagement, training and education, environment, travel and transportation, information society, culture and entertainment for European cities. The dataset, however, does not include an index for measuring intelligence in cities. Focusing on the urban environment, Karags et al. (2011) found that education, accessibility, and the use of ICTs in public administration are all significantly linked to urban intelligence.

iSmart economy

Innovation, entrepreneurship, financial image and brand, labor market flexibility, interaction with foreign markets, and the ability to adapt are all part of the smart economy (Gifinger et al., 2008; Monferdzadeh and Berardi, 2015). One of the major motivations for smart cities is towns with high levels of economic competitiveness (Giffinger et al., 2013). Competition, on the other hand, is an absolute concept, and maintaining current and future competitiveness (Economist Intelligence Unit (EIU)) is critical for economic development, the business and regulatory environment, organizational quality, human capital, cultural aspects, and governance (Economist Intelligence Unit (EIU)). As Friedman put it Friedman.

ii. Smart mobility

Local and super-local accessibility, ICT availability, and contemporary, sustainable, and secure transportation systems are all examples of smart mobility (Monfarazade and Berardi, 2015). The Smart City must make full use of existing ICT infrastructure to boost its economy and competitiveness as part of a comprehensive and integrated city-building strategy. In an effort to categorize a smart city (probably the

closest thing to one), Komnenos (2002) lists four potential definitions. The first is a broad category of electronic and digital applications for communities and cities that may be used to successfully integrate the word with concepts such as cyber, digital, wired, informational, or knowledge-based cities. The second meaning is the use of information technology to significantly and fundamentally alter life and work in an area (see Roy, 2001 for a comparison to the concept of smart communities in the literature).

Fig 1: Homogeneous Traffic

Fig 2: Heterogeneous Traffic

1.3Intelligent Transportation Systems Taxonomy

Clever transportation gadget takes a critical section in world. Sensible transportation computing device ITS is the common of the enhancement of next-generation technologies. it is a novel strength of mind that interoperates in one-of-a-kind fields of transportation device such as transportation administration control infrastructure operations insurance policies and manipulate techniques etc. there is a large range of compensation that received from its deployments.

i) Advanced Traffic Management Systems (ATMS)

It integrates various subsystems (CCTV, vehicle identification, communications, variable messaging systems, etc.) with a comprehensive single interface that provides real-time data on traffic conditions and assesses the situation for more efficient planning and operation. Dynamic traffic control systems, freeway operation management systems, event response systems, etc. respond to change in real time.

ii) Advanced Vehicle Control Systems (AVCS)

To make travel safer and more efficient, tools and ideas that enhance vehicle driver control are available. A car collision warning system, for example, alerts the driver of imminent danger. In more sophisticated AVCS implementations, the vehicle may autonomously break down or overcome friction depending on sensor input. Both systems offer vehicle autonomy and may bring substantial advantages in terms of increasing safety and decreasing accident-causing traffic congestion. By incorporating high-tech gadgets and processors inside cars, software applications and artificial intelligence systems intended to integrate internal operations, ubiquitous computing, and other programs into more traffic may be included system.

iii) Commercial Vehicle Operations (CVO)

It comes with a satellite navigation system, a tiny computer, and a digital radio for use in commercial vehicles including trucks, vans, and taxis. Through the Central Office, this technology enables constant monitoring and identification of truck activities safety.

1.4 History of Amravati City

Amravati is often a Maharashtra city in India. After Nagpur, Amravati is the second biggest and most populated city in Maharashtra's Vidarbha region. It is the administrative center of the district of Amravati. It also serves as the headquarters of the Amravati Division, one of the state's six divisions. The temples of Sri Ambadevi, Sri Krishna, and Sri VenkateswaraSwamy are among the city's historical attractions. The city is known for the Hanuman VyayamPrasar Mandal, one of India's biggest sports complexes with facilities for a wide range of sports.

- **Road**

Amravati Municipal Corporation is in charge of the city bus service. Public transportation also includes private vehicle rickshaws and bicycle rickshaws. In Amravati, Vidarbha also operated the first women's special city buses. The Maharashtra State Road Transport Corporation (MSRTC) is the state's public transportation system. Services for intercity and interstate travel are available.

- **Railway**

Amravati, New Amravati, and Badnera Junction are the three railway stations in the city. Amravati station, in the city's center, acts as a terminus for trains and other cities. The railway line cannot be extended beyond this point. As a consequence, a new station was constructed outside of the city when one was required. On the Nagpur-Itarsi main railway line, a new railway line has been built to link Badnera Junction and Narkhed. The Amravati Railway Station is on a branch line that connects Badnera and Amravati.

1.5Basic Objective Of Research Work

1. To investigate the benefit-to-cost ratio of ITS characteristics in the Indian context and effect of intelligent transportation systems (ITS) on fuel use.(Added in Methodology)
2. To investigate the effect of IT'S on the social, economic, and environmental advantages that it provides.
3. To conduct a comparative examination of ITS deployment on roads with other modes of transportation.
4. To estimate the cost of infrastructure as well as public opinion on the suggested Intelligent Transportation System.

1.6Scope Of Project In Broad Sense

Traffic is made up of a variety of various kinds of vehicles, including automobiles, buses, lorries, two-wheelers, three-wheelers, and other similar vehicles. These two- and three-wheelers are of tiny stature; as a result of their existence, lane discipline is compromised. The flow of traffic has been disrupted. Induction loops may not be helpful for data collection in certain situations. conditions. Currently, researchers are using either manual data collecting approaches or video filming-based technologies to acquire information. We personally gathered vehicle traffic count (PCU) data from a variety of sources. Amravati is a city in India. These techniques are helpful in gathering certain macro-scale information, such as categorized traffic statistics, for analysis flow and is not helpful in gathering microscopic data, therefore we need to do further research. Deployment of ITS and recommendations for implementing so that we may solve these difficulties More advantages should be considered.

II. LITERATURE REVIEW

Humans are killed and injured in fatal highway traffic collisions. As a result, a method for forecasting and avoiding road accidents is needed. Researchers are taking further steps to build and improve certain structures in this sense. A review of journal papers on road injury prediction and avoidance is discussed, along with a systematic discussion.

2.1 (Dinu&Veeraragavan, 2011) said that in paper "Random parameter models for accident prediction on two-lane undivided highways in India" The paper is concluded with a discussion on modeling results and the limitations of the present study. This study is an attempt to employ random parameter modeling to develop accident prediction models for Indian two-lane undivided rural highways that operate under mixed traffic conditions. The heterogeneity in the process of accident occurrence across locations due to a number of factors (e.g., variability among vehicle types, variability in driver behavior) is expected to be accounted for in this modeling approach.

2.2 (Garrido et al., 2014) said that in paper "Prediction of road accident severity using the ordered probit model" in paper from Transportation Research Procedia In this study, the ordered probit model was used to examine the influence of a number of factors on the injury severity faced by motor-vehicle occupants involved in road accidents. All the findings presented above are consistent with the ones from several former studies and, at the same time, seem to be intuitively reasonable.

2.3 (Grushetsky et al., 2020)studied in this paper "Road accident prevention model involving two-wheeled vehicles" in paper from Transportation Research Procedia authors main conclusion for this paper is RTA prevention is possible only in a DTWVRE operating situation or when a driver has technical capabilities to prevent a road accident. This conclusion allows for identifying weak points in the traffic safety system depending on a specific situation to take relevant measures and make an effective decision.

2.4 (Barua et al., 2013) said that in paper "Road Accident Prevention Unit (R.A.P.U) (a prototyping approach to mitigate an omnipresent threat" in paper from Proceedings - 2013 Texas Instruments India Educators' Conference, TIIEC 2013 authors main conclusion for this paper R.A.P.U is an easy-to-install system that can be implemented in most situations. However if the driver actually fails to wear the Sensor Framework Unit, the device cannot be used. Also there is always the issue of adjustment of the calibration potentiometer in the I.R Sensor to ensure the ambient light does not interfere with the sensing process.

2.5 (Garrido et al., 2014) said that in paper "Prediction of road accident severity using the ordered probit model" in paper from "Transportation Research Procedia" In this study, the ordered probit model was used to examine the influence of

a number of factors on the injuryseverity faced by motor-vehicle occupants involved in road accidents. The model estimation results suggest that some types of road accidents, namely the rollover-type, run-off-road, collisions against fixed objects and head-on collisions, appear to be the major contributors for the most severe injury level.

2.6 (Deublein et al., 2014) said that in paper 'Prediction of road accidents: comparison of two Bayesian methods" in paper from "Structure and Infrastructure Engineering" In this paper, the ability of the using the Bayesian Probabilistic Networks method and the Empirical Bayes method to develop models that result in accurate prediction of accident events were compared. In both methods Bayesian inference and updating algorithms are used and both combine theoretical safety performance functions with real observations of accident events. This is done by using a multivariate Poisson-lognormal regression analysis for the assessment of prior inferences that are then used to update the theoretical relationships with information of real observations.

2.7 (Deublein et al., 2014) said that in paper "Prediction of road accidents: comparison of two Bayesian methods" in paper from Structure and Infrastructure Engineering In this paper, two Bayesian methods for the development of accident prediction models are compared: the well- acknowledged Empirical Bayes (EB) method and a recently developed method based on Bayesian Probabilistic Networks (BPNs). In this paper, a brief introduction to the general Bayes probability and inference theory is given, and the differences between Empirical and Full Bayes approaches are summarised to provide a basis for the distinction and comparison between methods developed for implement- ing these approaches. The differences between the EB method and the BPN method are outlined, and their capabilities with respect to developing models that result in the accurate prediction of accident events were compared.

2.8 (Gokulakrishnan&Ganeshkumar, 2015) said that in paper "BEAM-HW: Bandwidth Efficient Acknowledgement based Multicast Protocol for High_Way: A Novel Protocol for Emergency Warning in VANET" The main objective of this paper is to design a highway road accident prevention system to proactively alert vehicles about a possible accident with an Emergency Warning Message. This paper is highly motivated by the road traffic accidents that happen all over the world and especially in Indian express highway road.

2.9 (Razzaq et al., 2016) said that in paper "Multi-Factors Based Road Accident Prevention System" in paper from 2016 International Conference on Computing, Electronic and Electrical Engineering, ICE Cube 2016 – Proceedings in this project author proposed system works accurately when applied to an agent. It follows all the pre-defined rules. It was tested by increasing each factor's value individually and collectively which resulted in the controlled behavior of the vehicle. It was also tested for a cruise implementation. When the value of environmental factor was set to alarming ones, all the vehicles controlled their speed to minimize. All the tests were done in the single lane.

2.10 (Deublein et al., 2013) said that in paper "Prediction of road accidents: A Bayesian hierarchical approach" in paper from Accident Analysis and Prevention In this paper a novel methodology for the prediction of the occurrence of road accidents is presented. In this paper, a methodology is proposed to determine modelsthatcan be used to predict the number of injury accidents and injury severities of road users that occur on roads, where no or little data exist for the specific road segment in question.

2.11 Weiming Hu et al. (2004) proposed a technique for predicting traffic accidents that is based on vehicle monitoring. A fixed camera is used to capture pictures of traveling trajectories, which are then used in conjunction with 3 dimensional model dependent vehicle monitoring to create the final images in this framework. The activity patterns of the cars are next investigated with the use of a fuzzy self-organizing neural network system. Traffic accidents are predicted using this method, which makes use of a risk model.

2.12 JoakimSorstedt et al. (2011) developed an approach for dependable vehicle motion modeling that takes into consideration the actions of the driver. The inclusion of the driver's impact enhances the prediction capacity and accuracy of the model significantly. The accuracy of the model's prediction is anticipated to be shown via extensive validation using a large number of drivers in a variety of test situations.

2.13 Ciro Caliendo et al. (2007) presented a model for the prediction of multi-lane highway accidents Designed for an Italian four-lane motorway with a split median, this model was built to scale. Using injury data collected from the aforementioned roadway between 1999 and 2003, this model was developed.

2.14 Juan de Ona and Laura Garach (2012) In Spain, a methodology for predicting two-lane rural highway accidents was introduced.

This model makes use of regression analysis to forecast accidents caused by speed decrease between consecutive curves, successive tangents, and successive tangents and subsequent curves.

2.15 Saravanan et al. (2014) developed a technique for predicting the probability of a traffic accident on the highway A collision zone on a road is attempted to be located using this technique, which calculates the accident probability rate based on factors such as road conditions, vehicle type, and pedestrians.

2.16 Williams Ackaah and Mohammed Salifu (2011) In Ghana, a two-lane rural highway accident prediction model was developed and implemented

The estimate was based on data from several sources, including crashes, traffic flow, speed, highway characteristics, and road layout.

On the basis of the results, it can be concluded that this model is beneficial to road traffic engineers in the design and construction of protected highway roadways.

2.17 George Arnaout and Shannon Bowling (2011) It has been proposed that highway traffic congestion be reduced via the use of reciprocal adaptive cruise control
Cooperative adaptive cruise control is a vehicle control system that is incorporated into the engine and provides integrated driver aid for vehicle control.

2.18 Zongjian He et al. (2012) To facilitate complicated vehicular route planning based on real-time traffic prediction, researchers developed the MICE protocol (Model-driven Infrastructure-free Collection and Estimation) and implemented it.

2.19 Swati Raut et al. (2015) a technique for predicting the probability of a vehicle accident at a highway road junction was proposed When it comes to accident detection, this system makes use of an intelligent control unit as well as intervehicle connection and vehicle-to-infrastructure communication.

2.20 Mario De Felice et al (2014) Road traffic management and accident detection are two applications for which two distributed protocols have been proposed. Using an open street map and data from a 70-kilometer stretch of highway in Rome, Italy, we were able to build this protocol suite

2.21 MusaabZeyad Aswad (2014) suggested a dynamic bayesian model-based context-aware pre-crash scheme. By using a complex bayesian network algorithm for reasoning, this system offers an interface for an efficient context-aware pre-crash system. This architecture can be used for any reasoning system, like fuzzy logic and neural networks. This design is divided into three phases: application, implementation, and maintenance.

2.22 Izhak Rubin and colleagues (2014a) provided an idea for a system for delivering critical public safety information The RSU on the highway transmits critical protection warnings to automobiles in its local vicinity as well as vehicles passing by using VBN technology, according to the company. The author used a variety of vehicular transport senses in his writing.

2.23 Francisco Cuomo et al. (2014) developed the VBN protocol, which uses a VANET architecture to increase output. To integrate computational and simulation analytical methods into the system, the authors utilized the IEEE 802.11p CSMA / CA MAC protocol

2.24 Isaac Rubin et al (2014b) presented a lane-based electoral approach for the selection of relay nodes based on the vehicle backbone network architecture in Highway VANET. Related. In the lack of lane residency information, this recommends utilizing the Group-Based Selection (GBE) method to decide which lanes to use.

2.25 Pierpaolo Salvo et al. (2012) developed a forwarding method to improve the coverage area of RSUs in urban settings by using a forwarding algorithm. The authors show how single-hop connection limits access to RSUs and highlights the need of multi-hop hype and inter-vehicle

2.26 Junliang Liu et al (2013) VANET may benefit from an on-time alarm transmission system, according to the proposal. In two-dimensional vehicle networks, this procedure is reliant on receiver agreement on forwarding methods, which is achieved via consensus

2.27 Muhammad AwaisJaved et al. (2014) A multi-hop broadcast system for emergency alert communication has been proposed. The issues of transmitted storm, severe interruption, and concealed nodes are all addressed in this article in some way

2.28 Sok-Ian Sou and OzanTonguz (2011) proposed a technique for estimating the growth in highway VANET connection by utilizing a mathematical model to calculate the increase in VANET connectivity the very minimal minimum in RSUs.

2.29 Yuan Yao et al (2013) A technique for assessing the effectiveness and dependability of IEEE 802.11p protection necessary broadcasts on the control channel has been proposed

by the research team. In this paper, the authors propose two markov chain models for further investigation.

2.30 ChakkaphongSuthaputchakun et al. (2014) suggested 3P3B: a multi-hop broadcasting system for time-critical emergency message propagation in VANET. The protocol communicates using IEEE 802.11p technology. By minimizing contention cycle jitter and shortening channel access duration, the 3P3B protocol ensures that emergency messages are sent quickly and reliably.

2.31 JengFarn Lee et al. (2010) proposed a method for the delivery of emergency messages in a timely and accurate manner via the VANET This method guarantees that emergency notifications are delivered on time and to all of the cars that are supposed to receive them. This

2.32 Xing Fan et al. (2014) proposed the use of a multi-hop broadcast system with RSU assistance. In addition, this method conveys that, regardless of the number of vehicles on the road, throughput and network usage are greater when using this scheme, which ensures rapid emergency message delivery.

III. METHODOLOGY

The purpose of study is to provide the smart solution of our conventional traffic flow. Our main focus on effect of intelligent transportation systems. In this Chapter, the impact of intelligent transportation framework decrease fuel utilization, emission of exhaust pollutants and road-vehicle crashes under heterogeneous activity condition, and their impact on the related destination are examine.

IV. CONCLUSION AND FUTURESCOPE

4.1 Conclusion

There is a previous post and a pre-impact in the current debate. The goal of this research is to offer the bare minimal infrastructure and to give current research in the ITS field through a literature evaluation. Expanding ITS may decrease the frequency of accidents and save millions of lives, according to a prior debate. For the Amravati city we suggest some ITS as shown in fig 4.8 and from over all calculations and from results and discussion the impact of social, economic and environmental factors we have comparative graph, it can be seen thatfuel saved is more for vehicular flow and for vehicular emission decrease in exhaust pollutants in society and crashes can be minimized/decrease and thus benefit costratiosareobtained. The All conclusion are conclude from the below points

- Intelligent transportation systems decrease fuel usage by approximately 8% to 10% and even rise when used on a fully operational ITS network; in the long term, it also helps to minimize hazardous pollutants.
- These ITS advantages will have a positive effect on the country's socioeconomic growth, resulting in many job possibilities. This indicates that ITS is beneficial to society, the economy, and the environment.
- It is critical to the growth of any metropolitan metropolis, as it aids in the reduction of traffic congestion, accidents, pollution, and fuel consumption. When the socioeconomic and environmental aspects of a specific expansion are taken into consideration, the maximum positive benefit cost impact on positive signal control is 5.89 As a consequence, compared to road infrastructure, its installation is more expensive and appealing.

4.2 FutureScope

1. Several operational trials for the Rail Intersection Program Region, the newest area of ITS, are under ongoing, but no data has been published so far.
2. Many governments are increasingly exploring the advantages of ITS in facility and equipment maintenance and repair. Over the following several years, as the program develops, more data will become accessible.
3. We can all assess the cost-benefit ratio of expanding intelligent transportation.
4. CO and NOx were chosen as the study's two gases. Other gases may benefit from further study.
5. To get additional advantages, certain ITS deployments may be expanded to other routes in metropolitan areas.

REFERENCES

[1] Weiming Hu, “A Survey on Visual Surveillance of Object Motion and Behaviors” Ieee Transactions On Systems 2004
[2] JoakimSörstedt, “A New Vehicle Motion Model for Improved Predictions and Situation Assessment” Ieee Transactions On Intelligent Transportation Systems 2011
[3] CiroCaliendo, “The Association Of Rainfall And Geometric Characteristics On Traffic Crashes” 4th International Siiv Congress 2014
[4] Juan de Oña and Laura Garach, “Accidents Prediction Model based on Speed Reduction on Spanish Two-Lane Rural Highways” Elsevier Ltd. 2012
[5] CoumaravelouSaravanan, “Medical Students’ Experience of and Reaction to Stress: The Role of Depression and Anxiety” Hindawi Publishing Corporation 2014
[6] Williams Ackaah, “Crash prediction model for two-lane rural highways in the Ashanti region of Ghana”

International Association of Traffic and Safety Sciences 2011

[7] BartłomiejPłaczek, “A real-time vehicles detection algorithm for vision-based sensors” 2010

[8] George Arnaout1 , Shannon Bowling, “Towards reducing traffic congestion using cooperative adaptive cruise control on a freeway with a ramp” Journal of Industrial Engineering and Management 2011

[9] Zongjian, “Research and Evaluation of Network Virtualization in Cloud Computing Environment” 2012 Third International Conference on Networking and Distributed Computing

[10] Swati B. Raut, “Survey on Vehicle Collision Prediction in VANET” IEEE International Conference on Computational Intelligence 2015

[11] Mario De Felice, “Vehicular Ad-Hoc Networks sampling protocols for traffic monitoring and incident detection in Intelligent Transportation Systems” 2015 Elsevier Ltd.

[12] MusaabZeyad A. R. Aswad, “Context Aware Pre-Crash System For Vehicular Ad Hoc Networks Using Dynamic Bayesian Model” 2014