

A Review of Toll Plaza Density Optimization and Pollution Reduction in ITS

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Abstract – 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 of increased motorization, urbanization, population growth and changes in population density. Congestion reduces efficiency of 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 Transport System is designed for the urban/state/private road transport organization. The system consists of a backend and a hardware component to provide an integrated solution for the driver console unit, electronic ticketing machine passenger information system and vehicle tracking system. Intelligent Transport System provides a single solution for transport companies to schedule and monitor buses with the help of advance technologies such as GPS, Wi-Fi and GPRS. Intelligent Transport System facilitates better public transport services by considering the bus earning, public safety and security. This paper basically discusses the impact and the various application fields of Intelligent Transport System for road transportation. Also, this paper put forward the implementation of various transportation technologies that will be vital for homeland security, vehicular surveillance along with technologies that can make our ride more safe and economical.

Keywords – Modeling and simulation, traffic flow types, electrical toll collection, toll plaza, performance measures.

I. INTRODUCTION

1. What are Intelligent Transport Systems (ITS)?

ITS is the application of computer technology to the transport sector. ITS systems gather data about the transport system, process it, and then use the processed data to improve the management of the transport system, and/or to provide the transport user with more and better information on which to base their transport decisions.

World population increasing at a greater pace has crossed the digit of 7 billion; simultaneously the world economy is also growing. People are used to the greater mobility and hence when it comes to mobility Transportation especially road transportation is the one which is easily accessible to everyone. There is no doubt in higher the people using the transportation system more will be the transportation conflicts (accidents), and hence there comes the demand of proper systematic demand for transportation system which is capable of handling large mass of people on wheels safely and it is made sure that it is environment friendly as well. Worldwide various societies and associations have been setup for the development of intelligent transportation system, first was setup in 1991 by US Department of Transportation: along with this several prototypes have been proposed in

context for the same, only few implemented. Vehicle to vehicle communication, vehicle to infrastructure communication, electronic fees collection are some of the very popular projects undergoing worldwide. When it comes to the developing countries like India, Intelligent Transportation System is in primary stage of development. Each nation whether developed or developing, when implement the intelligent technologies the surface transportation system will be safest, economical and last but not the least Environment friendly.

2. What can ITS help us to achieve?

ITS can help transport planners to achieve policy objectives in many different ways. It can help to tackle congestion, pollution, poor accessibility and even social exclusion. It can also help to reduce journey times and improve reliability – either in actuality, or simply by changing people's perceptions. And it can improve the efficiency with which transport systems function. In certain circumstances – for example, parking guidance systems – it can help to support economic and retail vitality. When thinking about ITS it is vitally important to consider it, not as an end in itself, but as a means to achieve your (transport) policy objectives. It is possible that in some circumstances ITS may not be the best means

of achieving transport policy objectives, but in other circumstances, it will. The trick is to select it for the latter situation, not the former.

Examples of ITS of this Unit will provide some detailed examples of ITS in action, including costs and evaluations, where available. However, in this introduction it is worth giving an idea of some of the applications of ITS.

- Real time information, both for public transport and private road transport, so that users have up-to-the minute information on services, where they are, and on incidents/delays and how to avoid them. On the roads, such information can also improve safety.
- The use of geographical information systems (GIS) and relational databases to keep inventories of transport infrastructure in an area (e.g. the condition of the road network) to better manage and prioritise maintenance work.
- “Smartcard“ ticketing on public transport, to give the passenger the best deal for the bundle of trips that they might be making in a particular period of time, and to provide the operator(s) with detailed information about their passengers’ travel habits. The latter information can be useful for apportioning revenue between operators, as well as for service planning.
- Detailed route planning information (often in real time) for both public transport and car users.
- Parking guidance systems, to reduce parking search time.
- Public transport information in various formats (e.g. audible) for disabled people.

II. OVERVIEW

Intelligent Transportation System technology can be defined as the application of information technology to surface transportation in order to achieve enhanced safety and mobility while reducing the environmental impact of transportation. [1] ITS aims to facilitate a national multi-modal surface transportation system that features a connected transportation environment around vehicles of all types, the infrastructure, and carry-in passenger devices to serve the public good by leveraging technology to maximize safety, mobility, and environmental performance.[1] Its covers all modes of transport and considers all elements of the transportation system- the vehicle, the infrastructure, and the driver or user, interacting together dynamically. The overall function of ITS is to improve decision making, often in realtime, by transport network controllers and other users, thereby improving the operation of the entire transport system. The definition encompasses a broad array of techniques and approaches that may be achieved through standalone technological applications or enhancements to ether transportation strategies.[2] ITS offers scope for integration, and some argue that it is only through

integration of its components that ITS will achieve its full impact. ITS includes array of information! data depending upon the requirement of the implementation theme, and simultaneously integrating these components together to get a good “Info structure” environment for the traffic planning, control and management and boosting the system effectiveness. ITS relies on wide range of technologies and functions such as Communications (Microwave, internet, Bluetooth), Geographical Locations, Geographical Information System, Data acquisition and exchange, Camera system and Artificial vision, Detection and classification, In-vehicle systems and Digital Mapping. In this paper we will discuss the potential of these transportation technologies for sustainability of environment and various application fields.

III. METHODOLOGICAL APPROACH

1. Information Collection

In terms of information the study is principally based on online research, considering elaborated scenarios, short scenarios, research publications and projects goals which are equally important for the objective of this paper because all of them presented novel ideas and interesting functionalities of ITS and Ambient Intelligence in the future world.

2. Problem Identified

Based on various literature available, the problems are identified they are logically placed in three Clusters:

- Lack of Traffic Management System
- Homeland Security System and Vehicles Operation
- Vehicle to Vehicle Co-ordination and implementation of new technologies

Cluster 1: Lack or Traffic Management System Traffic management system is meant to handle large mass of traffic efficiently, but due to presence of large crowd of vehicles the complexity of management system increases and these systems somehow fails to handle the crowd., which results in decrease in mobility, reduced fuel consumption, higher travel time and pollution.

Cluster 2: Homeland Security System and Vehicle Operation Homeland Security System and Vehicle Operation refer to the security and surveillance on the traffic system and vehicles. It helps in keeping the track on the trip of vehicle and real-time identification of vehicle and driver driving the vehicle. The problem identified is that there is no such efficient has been developed.

Cluster 3: Vehicle to Vehicle Co-ordination and implementation of new technologies This cluster is most important from the point of implementation of ITS, vehicle to vehicle coordination refers to the onboard information regarding the nearby vehicle: this would

facilitates in collision control, coordinating them on the basis of the trips planned by the driver. Implementation of new technologies is rare in developing countries. Here the problem identifies is that there is no such technology implemented for public transportation system even though the technologies are available.

IV. LITRATURE REVIEW

Arvind Kumar Busam, “Optimization of Waiting Time At Toll Plazas” Toll squares have a few toll installment types, for example, manual, programmed coin machines, electronic and blended paths. In spots with high traffic stream, the nearness of toll court causes a great deal of traffic blockage; this makes a bottleneck for the traffic stream, except if the right blend of installment types is in task. The goal of this exploration is to decide the ideal path arrangement for the blend of the techniques for installment with the goal that the holding up time in the line at the toll court is limited. A lining model speaking to the toll square framework and a nonlinear whole number program have been created to decide the ideal blend. The numerical outcomes demonstrate that the holding up time can be diminished at the toll court by changing the path arrangement. For the contextual investigation built up an improvement in the holding up time as high as 96.37 percent was seen during the morning top hour.

Athila Rodrigo, Dilrukshi Hewage, “A Study On Electronic Toll Collection Systems In Expressways In Sri Lanka” This paper centers around the determinants that effects, when presenting paid ahead of time and postpaid Electronic Toll Collection frameworks to Sri Lankan interstates. Reason for this examination is to recognize the client inclination among paid ahead of time and postpaid Electronic Toll Collection techniques and to distinguish the determinants that influence such a decision. The investigation is concentrating on breaking down the new usage of Electronic Toll Collection in Sri Lanka, thus the disadvantages of the present money based tolling framework is recognized. Right now money is the main accessible installment alternative for the freeway clients in Sri Lanka. With the quick development of the traffic thickness, even the turnpikes are inevitably getting blocked particularly close to the toll doors. Subsequently, Sri Lankan government stepped up to the plate of presenting electronic installment systems in all respects as of late however just a single prepaid installment choice been considered under their new execution plans. This is of negligible advantage as the clients don't have a freedom to settle on a decision. Along these lines to check the client inclination on electronic toll gathering techniques, five generally actualized strategies been viewed as which were in this way partitioned into paid ahead of time and post paid. In view of the writing, an organized poll study and meetings were done so as to gather essential information. 230 reacts had the option to

gather inside the long periods of November and December 2014 which were utilized to test the hugeness of the distinguished factors utilizing Person's chi squared insights and double strategic relapse investigation. Auxiliary information has been gathered utilizing writing and recently distributed reports from Road Development Authority, National Transport Commission, Ministry of Transport and The Central Bank. In view of the outcomes it was presumed that solitary the accommodation and vehicle class have a noteworthy relationship with the needy variable of paid ahead of time or post paid ETC technique while joined impact of comfort and vehicle classification likewise have a huge relationship to the reliant variable.

Dr. Khali Persad Dr. C. Michael Walton Shahriyar Hussain, “Toll Collection Technology And Best Practices” In this examination item, tolling practices and advancements are introduced. Likely advancements and improvements are evaluated, alongside potential bind ins to other Intelligent Transportation Systems (ITS) arrangements. Eventually, this examination undertaking will create proposals for vehicle recognizable proof/enrollment frameworks with the possibility to interface the tolling capacity to other alluring transportation framework the board capacities.

Jennifer Romich Jennifer Thacker, “The Impacts Of Tolling On Low- Income Persons In The Puget Sound Region” To improve our comprehension of how tolling is probably going to influence low-pay populaces in the Puget Sound locale, this report achieves four targets. It 1. surveys existing examination on the effects of tolling on low-salary family units in the United States 2. evaluates the value of right now accessible Washington and Puget Sound information for assessing the effects of tolling on low-salary populaces 3. builds up a fundamental gauge of the effects of tolling on low-pay populaces living in the Puget Sound locale 4. recommends information accumulation and methodological systems for future research that would yield better gauges of the effects of tolling on low-pay populaces in the Puget Sound district and different pieces of Washington state.

André De Palma, Robin Lindsey, “Traffic Congestion Pricing Methods And Technologies” This paper audits the strategies and advancements for clog estimating of streets. Clog tolls can be actualized at scales going from individual paths on single connects to national street systems. Tolls can be separated by time of day, street type and vehicle qualities, and even set continuously as indicated by current traffic conditions. Regular toll stalls have to a great extent offered approach to electronic toll accumulation innovations. The fundamental innovation classes are roadside-just frameworks utilizing computerized photography, tag and signal frameworks that utilization short-go microwave innovation, and in vehicle-just frameworks dependent on either satellite or

cell arrange correspondences. The best innovation decision relies upon the application. The rate at which clog evaluating is executed, and its definitive extension, will rely upon what innovation is utilized and on what different capacities and administrations it can perform. Since blockage estimating requires the best by and large level of toll separation, clog valuing is probably going to drive the innovation decision.

Shawn M. Turner, William L. Eisele, Robert J. Benz, And Douglas J. Holdener, "Travel Time Data Collection Handbook" This Travel Time Data Collection Handbook gives direction to transportation experts and specialists for the accumulation, decrease, and introduction of movement time information.

The handbook should be a valuable reference for structuring travel time information gathering endeavors and frameworks, performing travel time studies, and diminishing and showing travel time information. Organizations new to travel time information accumulation may wish to embrace segments of the handbook as standard strategies, while offices with information gathering background may wish to consolidate explicit subtleties or criteria. Introductory parts of the handbook depict how to plan information accumulation exercises, including the assurance of parameters, for example, think about size and extension, information gathering system, and other basic examination components. Sections 3 through 6 incorporate a portrayal of every datum accumulation procedure, real points of interest and inconveniences, cost and gear prerequisites, and well ordered guidelines. Related involvement with the information gathering methods is incorporated for instances of utilizations. Part 7 gives direction to diminishing travel time information and planning unthinkable and graphical introductions.

Ender Faruk Morgul, "Real-Time Data Collection Methodology For 2 Transportation Operation Performance Analysis" Ongoing advances in versatile systems and increment in the quantity of GPS-prepared vehicles have prompted an exponential development progressively information age. In the course of the most recent decade, various web based mapping or vehicle following administrations have made their information accessible for outsider clients. This paper investigates openings in using the ongoing traffic information given by online administrations and presents a virtual sensor procedure for gathering, putting away and handling enormous volumes of system level information. So as to survey the legitimacy of the gathered information utilizing the proposed philosophy, we contrast these and information from physical circle identifiers and electronic toll label perusers. Factual examinations demonstrate that there is a solid relationship between's the movement time estimations from framework based sensors and virtual sensors. We at that point direct a movement time

unwavering quality investigation utilizing the virtual sensor information approach and reason that the outcomes are promising for future research and usage.

Marvin Mccallum, John L. Campbell, Christian Richard, And James L. Dark colored, "Incorporated Vehicle-Based Safety System Heavy Truck Driver Vehicle Interface (DVI)" The Integrated Vehicle-Based Safety Systems (IVBSS) program is a four-year, two stage helpful research program led by an industry group driven by the University of Michigan Transportation Research Institute (UMTRI). The program objective is to incorporate a few crash cautioning frameworks into one vehicle such that alarms drivers to potential impact dangers with a viable driver vehicle interface (DVI), while limiting the quantity of extreme admonitions displayed to the driver. Fundamental program techniques for gathering this target incorporate methodically overseeing and organizing all data introduced to the driver, limiting the quantity of framework false alerts, and confining sound-related cautions to higher earnestness impact conditions. The report abridges existing rules, information sources, and structure standards significant to the plan of the IVBSS overwhelming truck DVI; and talks about high-need research issues pertinent to the advancement and field testing of the IVBSS substantial truck DVI.

S. Nadya, S. Z. Dawal, T.M.Y.S Tuan Ya, M.Hamidi, "Word related Noise Exposure Among Toll Tellers At Toll Plaza In Malaysia" Toll tellers working at toll square have capability of introduction to high clamor from the vehicles particularly for the pinnacle level of sound produced by the substantial vehicles. In any case, word related exposures in this work environment have not been enough described and distinguished. Word related commotion presentation among toll tellers at toll square was evaluated utilizing Sound Level Meter, Noise Dosimeter and through poll study. These information were consolidated to assess the work move introduction level and wellbeing effects to the toll tellers by utilizing factual examination. Clamor Dosimeter mouthpiece was situated at the conference zone of the toll teller which working inside the toll stall and full-period estimations were gathered for each work move. The estimations were taken at 20 toll corners from 6.00am to 2.00pm for 5 days. 71 respondents partook in the study to recognize the indications of commotion actuated hearing misfortune and other wellbeing related issues among toll tellers. Consequences of this investigation demonstrated that word related commotion introduction among toll tellers for Mean Continuous Equivalent Level, Leq was 79.2 ± 1.4 dB(A), Mean Maximum Level, L_{max} was 107.8 ± 3.6 dB(A) and Mean Peak Level, L_{peak} was 136.6 ± 9.9 dB. The Peak Level announced measurably altogether at 140 dB, the degree of TLV prescribed by ACGIH. The examination discoveries showed that the essential hazard presentation to toll tellers originates from clamor that

discharged from overwhelming vehicles. The vast majority of the toll tellers show side effects of clamor instigated hearing misfortune and irritated by the wellsprings of commotion at the toll court.

V. CONCLUSIONS

Implementing the use of Intelligent Transport System will definitely be going to affect our ride in a good way. Information Services remain fundamental to passenger satisfaction, which will encourage use of public transport and reduce the use of personal vehicles. This significantly contributes to saving the environment from heavy vehicle pollution and reducing congestion on city wads. At the end we conclude that I.T.S. holds a good point in providing us a good, safe journey.

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