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A Road Map of Intelligent Transport System and Traffic Management

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ABSTRACT:-

An intelligent transportation system (ITS) is an advanced application which, without embodying intelligence as such, aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

In connection with the 'Strategy for New India @ 75,' the local government of the State of Maharashtra is promoting the construction of the Nagpur Mumbai Super Communication Expressway (hereinafter called the NMSCE) which connects Mumbai, the commercial central city in the State and the largest economic city in India, and Nagpur, an administrational central city. The construction of the Expressway, which reaches a total of 701 km, is expected to have economic growth effects such as an increase in the efficiency of passenger transportation and logistics within the State, and new establishment of industrial complexes in nearby regions, etc. Hence, the project is attracting interest and attention from across India as a large infrastructure project.

Key Words: - ITS, TMC, NMSCE, AMM, VIDS, Toll Collection TCS

1. Introduction:-

The Samruddhi Mahamarg or Nagpur-Mumbai Expressway (officially known as Hindu Hrudaysamrat Balasaheb Thackeray Maharashtra Samruddhi Mahamarg) and Maharashtra Expressway-2 (ME-2), is a partially opened 6-lane wide (expandable to 8), 701-km long access-controlled expressway in Maharashtra, India. It is amongst the country's longest greenfield road projects,[3] which will connect the two capital cities of the state, its capital, Mumbai, and its third-largest and vice-capital city, Nagpur.[4] The project is being led by the state infrastructure arm Maharashtra State Road Development Corporation (MSRDC). It is essential to introduce the TCS in order to enhance the efficiency in collecting the toll for the NMSCE, prevent the omission of toll, and minimize the waiting vehicles in the toll plaza (the business office plaza) sections. Meanwhile, the Indian government has announced the related technology standard (FASTag6) for collecting toll and managing vehicle registration across the country, and the RFID tag is now an obligation for newly released vehicles, so the RFID-type TCS must be installed on the NMSCE also for observing the higher national policies.

2. Objectives of Paper:-

- To enhance the efficiency in traffic management through establishment of the ITMS and the traffic center.
- To establish systems to collect and provide various traffic information to users, and immediately detect and deal with an accident.
- To improve the efficiency in toll management through the establishment of the TCS, and prevent the toll from omitted or leaked.

3. Literature Review:-

Guanxiong Liu, Hang Shi; Abbas Kiani, Abdallah Khreishah, Joyoung Lee, Nirwan Ansari, Chengjun Liu (2022), Smart Traffic Monitoring System Using Computer Vision and Edge Computing

Smart Traffic Monitoring System Using Computer Vision and Edge Computing, IEEE, Vol 23 Isuue 8, pp 12027 – 12038

Traffic management systems capture tremendous video data and leverage advances in video processing to detect and monitor traffic incidents. The collected data are traditionally forwarded to the traffic management center (TMC) for in-depth analysis and may thus exacerbate the network paths to the TMC. To alleviate such bottlenecks, we propose to utilize edge computing by equipping edge nodes that are close to cameras with computing resources (e.g., cloudlets). A cloudlet, with limited computing resources as compared to TMC, provides limited video processing capabilities. In this paper, we focus on two common traffic monitoring tasks, congestion detection, and speed detection, and propose a two-tier edge computing based model that takes

into account of both the limited computing capability in cloudlets and the unstable network condition to the TMC. Our solution utilizes two algorithms for each task, one implemented at the edge and the other one at the TMC, which are designed with the consideration of different computing resources. While the TMC provides strong computation power, the video quality it receives depends on the underlying network conditions. On the other hand, the edge processes very high-quality video but with limited computing resources. Our model captures this trade-off. We evaluate the performance of the proposed two-tier model as well as the traffic monitoring algorithms via test-bed experiments under different weather as well as network conditions and show that our proposed hybrid edge-cloud solution outperforms both the cloud-only and edge-only solutions.

Kantip Kiratiratanapruk, Supakorn Siddhichai, Vehicle Detection and Tracking for Traffic Monitoring System, Conference: TENCON 2006. 2006 IEEE DOI:10.1109/TENCON.2006.343888

This paper presents a real-time video traffic monitoring application based on object detection and tracking, for determining traffic parameters such as vehicle velocity and number of vehicles. In detection step, background modeling approach based on edge information is proposed for separating moving foreground objects from the background. An advantage of edge is more robust to lighting changes in outdoor environments and requires significantly less computing resource. In tracking step, optical flow Lucas-Kanade (Pyramid) is applied to track each segmented object. The proposed system was evaluated on six video sequences recorded in various daytime environment.

Anshu Adwani, Kirti H. Madan, Rohit Hande(2015), Smart Highways Systems for Future Cities, Vol. 3, Issue 7, pp- 2320-9798

This paper emphasizes an intelligent Highway is an innovative concept for smart roads of future smart cities. It is a program of innovation that links a different way of looking at things with innovative ideas that apply the opportunities offered by new technologies in smart ways. Nowadays safety on road has become an important factor in our life because there is an increasing amount of accidents on the road and there are some places where accident occur frequently such as crossings, turns. Also there is a big problem of traffic jams on the road. Due to heavy rain fall, there is a possibility of

Water overflow on the bridges and accident may occur. In hilly area there is a possibility of landslide. so, there came a need to design a system which can detect these unexpected events. So we are designing a system that is "An Intelligent Highway system with (Weather Accidents Landslides and traffic) W.A.L.T." which is an innovative concept to maintain safety on roads.

Bikash Agarwal, Sanidhya Rasiwasi, Shyam Agarwal, and Roshan Kumar (2012), Intersections of Intelligent Highway Control System for Managing Traffic on Highway, Vol. 4, No. 2, pp-127-135

This paper describes the control strategies for synchronizing the movement of the vehicles on the highway which has a narrow road linked to it using radiocommunication. The sensors detect the vehicles on the roads and the highway control scheme uses the Radio Communication measurements to broadcast the position of the vehicles on the highway to the vehicles on the narrow road. The narrow road vehicle takes the action whether to increase ordecrease its speed based on the information broadcasted to it. The entire method of controlling the speed of the vehicle is based on the sensing of the vehicles and calculation of time required for the vehicle to reach from one point to another. This management scheme prevents the accidents on highway intersection and cross-roads and possible collisions due tonegligence of the driver. It also reduces the time delay for thenarrow road vehicle while entering the highway.

This paper describes the Radio Communication, discusses key issues in system design, and provides experimental results. If this control system is implemented in the real world, then the accidents on the highways can be reduced to a great extent. Also the wastage of time due to long waiting in traffic can also be reduced. This system will be of great help in designing the fully autonomous traffic control system which includes both intelligent vehicles and highways. This small scale model when implemented in large scale in real world with better communication, sensors, tracking device and with more optimized algorithm will prove much more efficient.

4. ITS Development Roadmap:-

India is very actively performing the new construction, extension, and improvement of facilities in accordance with economic development, and is in the early stage of introducing the ITS for solving traffic problems.

4.1 Traffic Management ITMS:-

2020-2030 ITS Introduction
Introduction of visual traffic situation monitoring system (CCTV)
Introduction of VIDS: Some points with isk of accidents such as the ICs
Introduction of the real-time control system for travel speed and traffic volume (VDS, ATCC)
Introduction of traffic management system using the traffic center electronic maps

Introduction of real-time control system on road meteorological situations (WMS)
Collection/analysis of traffic control data and use of the data in traffic management area
Provision of real-time road situation/traffic situation information to road users (VMS, smartphones, etc.)
Fast accident responses of traffic centers and traffic management (connection to police, hospitals, and rescue vehicles, detour information provision, etc.)

2030-2040 ITS Advancement
Maintenance of monitoring systems, improvement of CCTV performance
Extension of VIDS points, advancement of algorithms
Expansion of points and improvement of performance for the VDS and the ATCC, introduction of new technologies such as the V2X, C-ITS, etc.
Improvement of performance of electronic maps, advancement of traffic management techniques
Expansion of WMS points and advancement of performance
Advancement of analysis techniques and expansion of information collection channels based on new technologies such as the V2X and the C-ITS
Diversification of traffic information channel provision channels (V2X, C-ITS, etc.)
Advancement of response strategies, active traffic management (reduction of response time, provision of optimal paths, etc.)

4.2 Toll Collection TCS:-

2020-2030 ITS Introduction
Introduction of ETCS in accordance with the introduction of the FASTag, and the single-lane ETCS
Toll management such as calculation and accounting system introduction

2030-2040 ITS Advancement
Expansion of ETCS lanes and introduction of multi0lane ETCS
Advancement of toll management systems for minimizing the vehicles with unpaid toll

4.3 Road Maintenance and Management IRMS:-

2020-2030 ITS Introduction
Introduction of pavement monitoring system (AMM)

2030-2040 ITS Advancement
Improvement of AMM performance and expansion of the latest maintenance and management systems using the IoT

It is necessary to introduce the ITS in a stepwise manner by considering the efficiency in performing the project such as the level of connected infrastructure and maturity of managers/users. Currently, the installation of basic systems for road and traffic management is planned, and a roadmap for expanding and applying the plan in the future is presented

Conclusion:-

In this paper in-depth study of Intelligent transport system from the existing literature are studied. visual traffic situation monitoring system, the real-time control system for travel speed and traffic volume (VDS, ATCC), real-time control system on road meteorological situations (WMS), Provision of real-time road situation/traffic situation information to road users (VMS, smartphones, etc.), Fast accident responses of traffic centers and traffic management (connection to police, hospitals, and rescue vehicles, detour information provision, etc.). For the collection of toll, ETCS in accordance with the introduction of the FASTag, and the single-lane ETCS and Toll management such as calculation and accounting system introduction has been studied. This paper also describes the future advancement of ITS (i.e year 2030-2040)

References: -

1] Guanxiong Liu, Hang Shi; Abbas Kiani, Abdallah Khreishah, Joyoung Lee, Nirwan Ansari, Chengjun Liu (2022), Smart Traffic Monitoring System Using Computer Vision and Edge Computing

Smart Traffic Monitoring System Using Computer Vision and Edge Computing, IEEE, Vol 23 Isuue 8, pp 12027 – 12038

2] Kantip Kiratiratanapruk, Supakorn Siddhichai, Vehicle Detection and Tracking for Traffic Monitoring System, Conference: TENCON 2006. 2006 IEEE DOI:10.1109/TENCON.2006.343888

3] Anshu Adwani, Kirti H. Madan, Rohit Hande(2015), Smart Highways Systems for Future Cities, Vol. 3, Issue 7, pp- 2320-9798

4] Bikash Agarwal, Sanidhya Rasiwasi, Shyam Agarwal, and Roshan Kumar (2012), Intersections of Intelligent Highway Control System for Managing Traffic on Highway, Vol. 4, No. 2, pp-127-135

5] Surya Prasad Timilsina1, Sateesh Kumar Ojha1, Bharat Ram Dhungana2 (2020) "Causes of Delay in Construction of Motorable Bridges under "Design and Build Model" of Bridge Project, Department of Roads, Nepal" Scientific Research Publication, PP. 1451-1462

6] Ahsan, K. and Gunawan, I. (2010), "Analysis of cost and schedule performance of international development projects", International Journal of Project Management, 28(1), 68-78,

Links:-

1. https://www.youtube.com/watch?v=OnjX0O9dPMc
2. https://www.youtube.com/watch?v=d1DndVz9dAs
3. https://www.youtube.com/watch?v=YY1mN_ibteU
4. https://www.youtube.com/watch?v=VRRPy-yEKRM