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Advanced Traffic Management System (ATMS) for Reducing Congestion and Collisions on Road

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ABSTRACT

The Advanced Traffic Management System (ATMS) field is a primary subfield within the Intelligent Transportation System (ITS) domain. The ATMS view is a top-down management perspective that integrates technology primarily to improve the flow of vehicle traffic and improve safety. Real-time traffic data from cameras, speed sensors, etc. flows into a Transportation Management Centre (TMC) where it is integrated and processed and may result in actions taken with the goal of improving traffic flow.

Keywords: ITS (Intelligent Transport System), ATMS (Advanced Traffic Management System), TMC (Transportation Management Centre).

I. INTRODUCTION

Due to the ever-increasing traffic demand, modern societies with well-planned road management systems, and sufficient infrastructures for transportation still face the problem of traffic congestion. This results in loss of travel time, and huge societal and economic costs. Constructing new roads could be one of the solutions for handling the traffic congestion problem, but it is often less feasible due to political and environmental concerns. An alternative would be to make more efficient use of the existing infrastructure. The goal of an Advanced Traffic Management System (ATMS) is to efficiently manage existing transportation resources in response to dynamic traffic conditions. An advanced traffic management system must incorporate all modes of transportation if it is to provide an effective management solution. Increasing traffic congestion coupled with improved.

The objectives of ATMS are to increase capacity and operational efficiency, increase productivity of commercial vehicle, improve safety, increase traveller control and convenience, improve public transportation services and operations, improve cooperation amongst transportation operators, reduce environmental and energy impacts.

II. METHODS AND MATERIAL

A. Literature Review

"Reference [1]", Presented a comprehensive study of all available ITS systems, including both research prototypes and deployed systems and also pose a set of interesting open research problems in the context of Indian ITS. They make a comprehensive list of ITS literature, to give an overview of all existing techniques. Also follow it up with a set of open research questions in the context of Indian roads and traffic. Finally, they list a set of public and private sector organizations and academic institutions, which are active in research or application in this field, as meaningful collaborations and technology transfer should happen if research has to make any practical impact. Also suggested the number of sensors and applications of ITS for Indian cities.

"Reference [2]", In this literature different control methodologies have been presented for controlling and managing a traffic network in which vehicles are driven by humans. They presented a survey of traffic control frameworks for IVHS that integrate the intelligence of both the roadside infrastructure and the IVHS to improve the traffic performance and to discuss the potential application of control design methods that are

currently used for traffic control purposes to IVHS-based traffic management and control systems. They presented existing IVHS frameworks that combine roadside infrastructure and vehicles for efficient traffic management, and provide a comparative analysis of these frameworks also briefly sketches how the currently used control design methods presented and could potentially be applied in these IV-based traffic control frameworks.

B. Data Requirement and Methods

For designing an effective traffic management system, it requires various field data and appropriate methods for evaluation, examination and fixing it to meet the requirement of road users. Various data require are traffic volume count, spot speed study, speed and delay study, Origin and Destination study, Parking and Accident study, Intersection Occupancy.

Before calculating travel and delay times we should select the route that is going to be subjected to solving traffic problems. The most appropriate times for data collection are: morning, evening, and peak times of traffic in routes that is having the maximum traffic load. Depending upon the collected data and various applications of ATMS can be applied such as Ramp Metering System (RMS), Real-time traffic monitoring, Dynamic message sign monitoring and control, Incident monitoring, Traffic camera monitoring and control, Active Traffic Management (ATM), Chain control, Ramp meter monitoring and control, Arterial management, Traffic signal monitoring and control, Automated roadwork zones or speed limits on a specific highway segment. They may also suggest vehicles to take alternative routes, limit travel speed, warn of duration and location of the incidents or just inform of the traffic conditions. VMS are available as fixed VMS as well as portable trailer mounted ones.

- Automatic Traffic Counter and Classification System (ATCC): ATCC keeps a count of vehicles for a specific highway segment. Along with this, the vehicles can be classified according to their classes. Passive Infrared or Doppler radar technology is used for ATCC.
- Weather Monitoring System (Meteorological Station): It is used for recording environmental parameters such as wind speed and direction, air temperature, relative humidity, visibility and road surface temperature.
- Emergency Call Box (ECB) System: In case of any emergency such as accidents, ECB serves the need to communicate with the police or ambulance service.
- CCTV (Closed-Circuit Television) Monitoring System: CCTV is used for continuous video monitoring at specific highway segments to convey the event information such as traffic conditions and accidents to the control room.
- The Supervisory System at the Control Room: ATMS operation and function is based on a centrally managed system in which operators located in the Control Room are able to use systems (including computers and communication devices). For example, if a visibility sensor detects poor visibility due to fog, this information is transferred to the control room, in turn passes it on to a VMS.

Before and after applications of the ATMS, the studies are carried out with the aim of evaluating the quality of traffic flow within a given route, monitoring the variations of total travel and delay times, and measuring major congestion and collisions. The out- comes of the studies are used to compare practical conditions of the route before and after improving an intersection or a route and optimizing the controlling parameters. These studies should be carried out in usual and typical conditions without considering any type of congestion route.

III. RESULTS AND DISCUSSION

There is today's need to reduce congestion in metropolitan areas. ATMS can effective system for reducing congestions and collision on study route. The capacity of intersection and routes can be improvised. As technology plays a major role in ATMS, it has to be reliable and should leave no chance for error. For that, more and more technology providers should come forward with innovative and cost effective technologies and proper applications of it. Consideration of the Indian Climatic conditions, road conditions, etc. should be taken into account. Transportation management centre data gathering, decision making, and communication functions have been performed manually.

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