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A Survey on Automated Highway System

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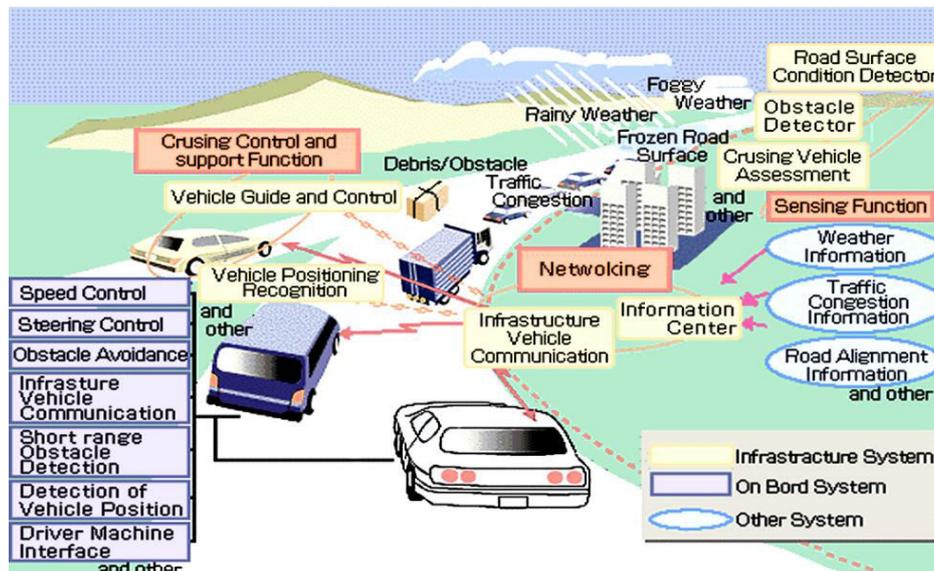
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ABSTRACT: The economics of roadways, and their variability in demand, favour the construction of multi-layered and inter-connected networks. Different network layers are designed to different standards and perform somewhat different functions, though all provide the common function of mobility for a reasonably homogeneous class of vehicles. Yet interfaces have been constructed to provide a smooth transition between network layers, with little delay and inconvenience to travellers. This project has investigated interfaces between an automated highway network layer and city streets. Research has indicated that automated vehicle control technology might offer major improvements in the safety and efficiency of existing highways. Congress directed the demonstration of a fully automated vehicle-highway system by 1997. NAHSC's (National Automated Highway System Consortium) goals are to demonstrate AHS(Automated Highway System) technical feasibility by 1997; conduct research of critical enabling technologies, and select and prototype an AHS design for operational test.

KEYWORDS: Vehicle Platooning, Automatic Vehicle Transmission, Lane Changing Mechanism, Transportation, intelligent vehicles

I. INTRODUCTION

Traffic congestion is an ever-increasing problem on the highways in rural cities or urban cities. The effect of this increased highway traffic includes lost productivity due to travel delays, increasing frequency and severity of accidents, and risk to public health due to an increase in pollution. The goal of an AHS is to significantly increase safety and highway capacity without having to build new roads, just by adding intelligence to both vehicles and roads. In this system, the human driver will not control the vehicle but the system will control and adjust the vehicle according to it. AHS involves designing an Automated vehicle and highway system to increase mobility, On-time performance, increase efficiency, decrease pollution to achieve the desired performance and safety.





The idea of automated driving dates back more than 50 years when General Motors (GM) presented a vision of “driverless” vehicles moving under automated control at the 1939 World’s Fairs in New York. In the late 1950s, research by industrial organizations conceptualized automated vehicles controlled by mechanical systems and radio controls. Automated highway system (AHS) concepts define a new relationship between vehicles and the highway infrastructure in which vehicles moving on lanes limited access roadway on which specially equipped vehicles are operated under completely automatic control. Automated highway system uses technologies during which driver lose full control of the vehicle for gaining the additional benefit of safety and efficiency. Routes are set manually by the driver and all trip decisions are made by the vehicles automatically. Operations like steering and braking control are done automatically to supply safer and more convenient travel to the driver. Automated highway system uses obstacle-detection and head-on collision technologies for the safe flow of vehicles on the highway. Other technologies are used to recognize the external infrastructure conditions and provide highway cooperation to coordinate with the vehicle movement.

II. METHODOLOGY

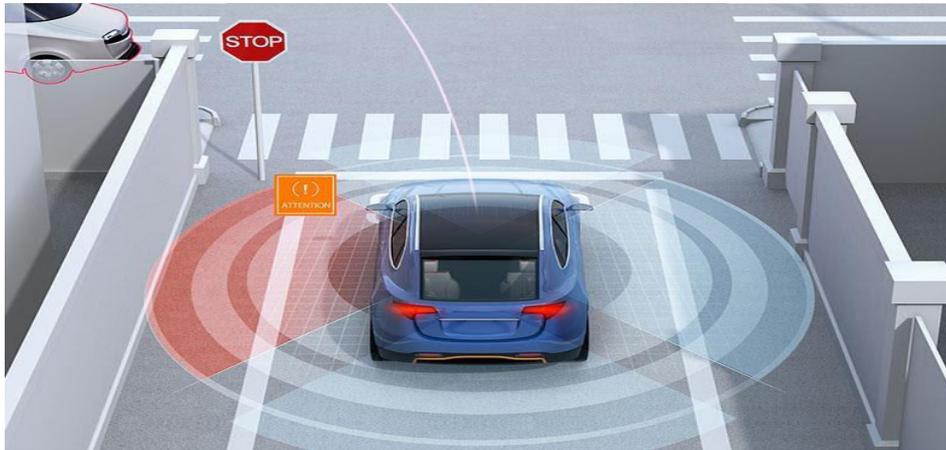
A driver electing to use such an automated highway might first pass through a validation lane, similar to today's high-occupancy-vehicle (HOV) or carpooling lanes. The system would then determine if the car will function correctly in an automated mode, establish its destination, and deduct any tolls from the driver's credit account. Improperly operating vehicles would be diverted to manual lanes. The driver would then steer into a merging area, and the car would be guided through a gate onto an automated lane. An automatic control system would coordinate the movement of newly entering and existing traffic. Once traveling in automated mode, the driver could relax until the turnoff. The reverse process would take the vehicle off the highway. At this point, the system would need to check whether the driver could retake control, then take appropriate action if the driver were asleep, sick, or even dead. The alternative to this kind of dedicated lane system is a mixed traffic system, in which automated and non-automated vehicles would share the roadway. This approach requires more-extensive modifications to the highway infrastructure but would provide the biggest payoff in terms of capacity increase.

III. OBJECTIVE

Automated highway system’s ambitious goals can be achieved by: Developing advanced concepts for advanced road vehicles for passengers and goods. Most of the earlier projects addressed isolated aspects of the mobility problems of cities, whereas automated highway system focuses on the overall urban transportation problem. Introducing new tools for managing urban transport. automated highway system will develop tools that can help cities to cross the thresholds that are preventing them from introducing innovative systems.

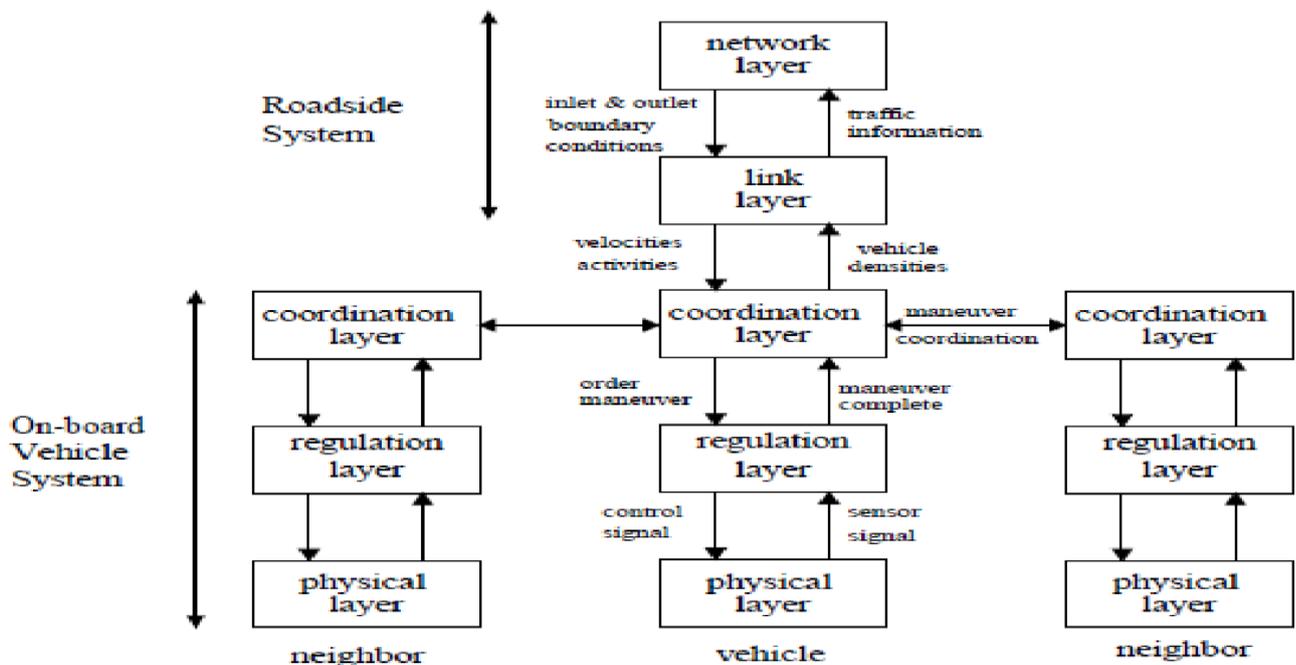
Developing advanced concepts for advanced road vehicles for passengers and goods. Most of the earlier projects addressed isolated aspects of the mobility problems of cities, whereas the Automated Highway System focuses on the overall urban transportation problem. Introducing new tools for managing urban transport. AUTOMATED HIGHWAY SYSTEM ??will develop tools that can help cities to cross the thresholds that are preventing them from introducing innovative systems. For instance, the absence of certification procedures and the lack of suitable business models will be addressed. Taking away barriers that are in the way of the large-scale introduction of automated systems. Some of these barriers are technological, some are of a legal or administrative nature: for example, the legal requirement for vehicles using public roads where the driver is responsible for the vehicle at all times, which effectively prohibits driverless vehicles from using public roads.

- To improve safety by significantly reducing
 - a) Fatalities
 - b) Personal Injuries
 - c) Anxiety and Stress of Driving
- Improve Accessibility and Mobility
- To Reduce Environmental impact



IV. SCOPE

The reliable intelligent driver assistance systems and safety warning systems are still a long way to go. However, like computing power, sensing capabilities, and wireless connectivity for vehicles rapidly increase, the concept of assisted driving and proactive safety warning is speeding towards reality. As technology improves, a vehicle will become just a computer with tires. As now new vehicles are already giving assisted driver system as it will proceed further the automated highway is not far away. As it does not require building any new roads so the cost required is also much lesser and more affordable. Driving on roads will be just like surfing the Web there will be traffic congestion but no injuries or fatalities. Advanced driver assistant systems and new sensing technologies can be highly beneficial, along with a large body of work on automated vehicles. These findings suggest that the research into autonomous vehicles within the ITS field is a short-term reality and a promising research area and these results constitute the starting point for future development.



V. GOALS

1. Improve safety by significantly reducing:
 - i. Fatalities.
 - ii. Personal Injury.
 - iii. Pain and Suffering.

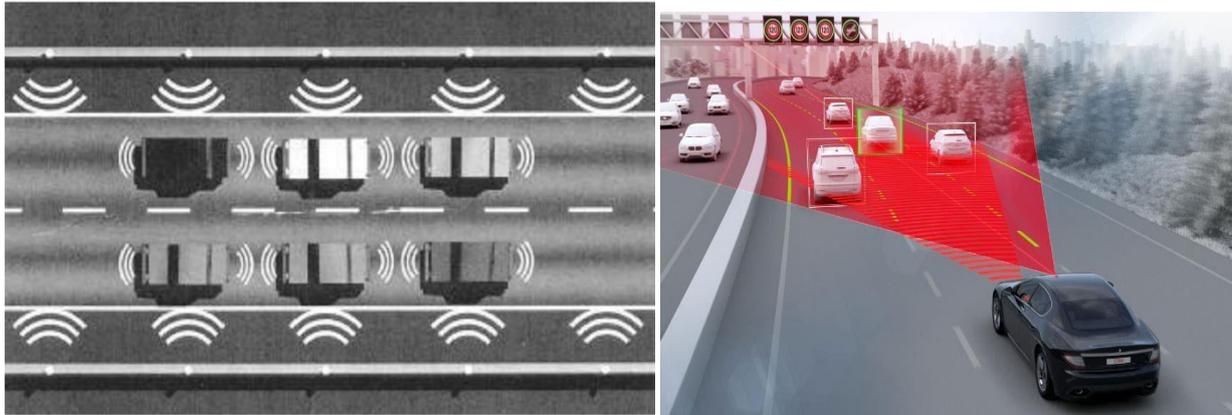
- iv. Anxiety and Stress of Driving.
2. Save money and optimize investment by:
 - i. Maximizing efficiency of the existing infrastructure investment.
 - ii. Integrating other ITS services and architecture to achieve smooth traffic flow.
 - iii. Using available and near-term applied technology to avoid costs of conventional highway build-out.
 - iv. Developing affordable equipment, vehicles, infrastructure, operations, maintenance, and user fees.
 - v. Closing the gap on predicted infrastructure needs.
 - vi. Reducing fuel consumption and costs, maintenance, wear-and-tear, labor costs, insurance costs, and property damage.
3. Improve accessibility and mobility by:
 - i. Improving public transportation service, increasing customer access, and expanding service levels, resulting in increased revenue, reduced costs, and reduced accidents.
 - ii. Achieving a smooth traffic flow, reducing delays, travel times, travel time variability, and driver stress.
 - iii. Making driving more accessible to less able drivers.
4. Improve environmental efficiencies by:
 - i. Reducing emissions per vehicle-mile travelled.
 - ii. Providing a solid base for reliable, lower-cost transit.
 - iii. Providing an efficient base for electric-powered vehicles and alternative fuel vehicles.



VI. BENEFITS AND LIMITATIONS

- Some primary benefits from the Infrastructure Supported Concept are:
 - Minimization of vehicle cost and complexity.
 - Maximized safety by protecting automated vehicles from crashes caused by manual vehicles and obstacles.
 - Significant throughput increases.
 - Better local control of system demand and congestion patterns.
 - Greater system-wide reliability.
 - Reduced emissions by smoother acceleration and deceleration patterns.
 - Efficient response to system failures to minimize system-wide delays.
 - This is largely accomplished with infrastructure support system-wide traffic control distinguishing feature of this AHS concept.
- Potential limitations are that in its implementation – and to most fully realize its primary

- a) benefits – it is assumed that all automated traffic is on dedicated lanes. However, within the dedicated, there are several site-specific civil infrastructure decisions, some of which may require additional highway improvements, such as Single or multiple lanes.
- b) Dedicated or transition lane entry and exit



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