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Comprehensive Review on Automated Highway System A Case Study of Amravati-Nagpur Highway

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Abstract - This is the final report for MOU 386 and Task Order 4216, "AHS/Street Interface, Capacity Concentration Effects on System Performance". The report examines how highway design affects the operational performance of automated highways with respect to accommodating entry and exit traffic. A summary of findings is provided for previous work from PATH Working Paper 2000-26 and PATH Research Reports 2001-37 and 2002-07. These reports examined vehicle sorting processes for highway entrances and examined the location and separation of entrances and exits. In addition to these summaries, this report provides analyzes for highway vehicle sorting, highway platooning, and the physical design of entrances and exits.

Keywords: Automated highways, Layout, Entry/Exit, Road interface.

INTRODUCTION

The The idea of automated driving dates back to almost 50 years ago when General Motors (GM) presented a vision of ―driverless‖ vehicles under automated control at the 1939 World fairs in New York. In the 1950's research by industrial organizations conceptualized automated vehicles controlled by mechanical systems and radio controls. After the first appearance of the computers in the 1960's, researchers began to consider the potential use of computers to provide lateral and longitudinal control and traffic management. The fully automated highway concept was initially examined by GM with sponsorship from the US department of Transportation (DOT) in the late1970's. During these times, focus was laid on automated vehicles on a highway as computers were not powerful enough to consider a complete fully automated highway system.

Advances in the computing technologies, micro-electronics and sensors in the 1980's provoked commercial interest in the technologies that might enhance driver capability and perception and both private and public researchers examined partially automated products and services. Among others, the University of California Partners in Advanced Transport and Highways (PATH) has carried out significant research and development in the field of highway automation since the 1980's. As various transportation technologies emerged that could assist driving on one hand and also traffic efficiency on the other, interest in fully automated driving or integrated auto-highway technologies grew once again.

With the passage of the 1991 Intermodal Surface Transport Efficiency Act (ISTEA), efforts were on early prototype development and testing of fully automated vehicles and highways. This act prompted the US DOT to develop the National Automated Highway System Research Programme (NAHSRP), whose goal was to develop specifications for a fully

automated highway system concept that would support and stimulate the improvement of vehicle and highway technologies.

In 1994, the US Department of Transportation launched the National Highway System Consortium (NAHSC). The consortium consisted of nine major categories of organization including academia, federal, state, regional and local government besides representatives from vehicle, highway, electronics and communications industries. The consortium believed in expanding the program's expertise and resources, and maintained that the collaborative approach among the stakeholders would be critical in building the common interest that would be required in the early development and deployment of fully automated highway systems. Research continues to this day though it is largely sketchy owing to the withdrawal of the financial support for the National Automated Highway Systems Research Programme (NAHSRP) by the US Department of Transportation in the year 1997.

Many studies conducted by the National Automated Highway Systems Consortium (NAHSC) continue in partial way with a couple of federal programmes like the Intelligent Vehicle Initiative (IVI) with more focus on a nearer-term horizon.

Objectives

• Introduce new tools for urban traffic management. The automated highway system will develop tools that can help cities overcome the thresholds that prevent them from implementing innovative systems.

• Studies will be conducted to demonstrate that an automated transportation system is not only feasible, but will also contribute to a sustainable solution to urban mobility problems, now and in the future.

• To study the effect of traffic volume, capacity, road element and surface characteristics on highway accident rates.

• To study defects on the highway and the annual and monthly accident rate on the selected highway.

• Research and document an automated highway system with driver and passenger safety systems on the roads.

• Reliable intelligent driver assistance systems and safety warning systems still have a long way to go.

• To study the elimination of more than ninety percent of traffic accidents caused by human errors such as misjudgment and inattention.

1. LITERATURE REVIEW

• Maurizio Bruglier (2015) : - Designed a real-time mobility information system to manage unexpected events, delays and service interruptions in urban public transport. Show city traffic based on a long-term graph that takes into account the connections between all the ride stops offered during the day.

• Agostino Nuzzoloa (2014): - Describes the theoretical and operational aspects of the Advanced Traveler Advisory Tool (ATAT). Real-time data can provide users with personalized information. It is based on a route choice modeling framework that can provide route alternatives based on individual travel preferences defined by a learning process.

• Kuo and Chen (2008): - describe the multimodal transportation problem as a multi-criteria decision making (MCDM) process. They propose a hybrid MCDM that combines a feed-forward artificial neural network (ANN) and a fuzzy analysis hierarchy process (FAHP).

• Praveen Kumar (2005): - Exploring the implementation of GIS along with other advanced computer communication technologies. - Implementation in passenger information systems enables prominent distribution of information about fixed route facilities such as offices, educational institutions and medical facilities. Tourist attractions, etc

• Baublys (2002):- found that traffic management and the development of a proven national transport system can reveal a number of new qualitative ideas that can inherently increase transport. Productivity and realization of large untapped reserves of economic and technological advances.

• JK Hedrick (1994):- Focused on interactions between different layers of system architecture and control issues related to entry/exit, merging and lane changing manoeuvres. Additionally, there is ongoing research into alternative sensors and vehicle actuators.

5. CONCLUSION

- Automated road systems will bring significant benefits to transportation in terms of safety, efficiency, affordability and ease of use and environment to meet development goals.
- One of the key features of the control design architecture is the separation of different control functions into separate layers with well-defined interfaces.
- Each layer is designed using its own model according to the function it is responsible for.
- Models at different layers differ not only in their formal structure (from differential equations to state machines to static graphs), but also in terms of the entities involved.
- AHS is a complex and large-scale control system whose design requires advances in sensor, actuator and communication technology (not discussed here) and control system synthesis and analysis techniques.
- The fact that these technologies are ready for successful use in AHS projects is an indication of the technology of the day.
- That being said, the reason many federal programs such as the National Autonomous Highway Systems Research Program (NAHSRP) have failed is because they were caught up in technological optimism.
- Several studies on AHS have shown that there are no technical or non-technical problems. However, the legal, institutional and social challenges are as important as the technical ones. In addition, these institutional and social problems are closely related to people's perceptions, actions and agreements and social changes based on it, so they cannot be solved overnight.

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