IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 7, April 2025
Impact Factor: 7.67

Automatic Vehicle Speed Control System

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Abstract: *Due to the emergence of new technologies over the past decade, vehicle speed assistance systems in intelligent transportation systems have frequently been discussed. Up to now, a systematic literature review has not been presented to discover and evaluate the different vehicle speed assistance approaches for on-road vehicles in intelligent transportation systems. To overcome this issue, this research identified peer-reviewed articles published in the most well-known libraries from 2011 to 2020. 79 primary studies were then projected and a systematic analysis of the selected literature was conducted. The findings show different driving goals, namely eco-driving, safety, comfort, travel time improvement as well as the high-level objectives addressed by vehicle speed assistance systems. The analytical discussions are provided to show different perspectives, properties and limitations of the existing solutions. This analysis allows to provide future challenges and directions in this field of research.*

Keywords: vehicle speed assistance

I. INTRODUCTION

Vehicles have always been a part of human life, and the population has a direct effect on the increase in vehicles, which ultimately affects the environment in terms of pollution and safety. A recent investigation of the total number of on-road vehicles conducted by [1] indicated that there were over 1 billion vehicles all over the world in 2010. It has been estimated that over 2 billion passenger cars travel the streets and roads of the world today, and the number of vehicles is expected to double by 2050 [2], demanding the capacity much beyond the present level of roadways. As the demand increases beyond the capacity, there is a necessity to overcome the negative impacts of the increasing number of on-road vehicles, namely congestion, pollution, and accidents, ultimately affecting society's social, economic, and environmental aspects of lives. In this regard, intelligent speed assistance systems have shown many advantages in decreasing the aforementioned adverse transportation effects

Contribution and layout

This SLR is supplementary to existing studies and provides the following contributions for those who are interested in ITS and especially vehicle speed assistance in the fields of transportation and computer science to further their work: · We identified 79 primary studies considering vehicle speed assistance in ITS up to early September 2020. Other researchers can use this list of studies to base their work on in this specific field. · Next, we chose 50 primary studies that satisfy the criteria we have set for quality assessment phase. These studies can present rich data for comparative examination against similar research. · We then reviewed the data within 50 studies comprehensively and extracted the data to reveal ideas and concerns related to vehicle speed assistance systems. · We present a meta-analysis of vehicle speed assistance's methods and objectives to improve intelligent transportation systems and emerging technologies in this context. · We express the limitations and produce guidelines to support further investigation in this area.

Inclusion and exclusion criteria

The studies that are to be included in this SLR must present a computerised approach in order to advise the speed of passenger cars and provide analytical results considering applications and objectives. They must have been published in peer-reviewed journals as described in 2.1 and written in English language. Additionally, the papers that focused on law enforcement and road restriction based speed management, such as bumps, were omitted

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High-level objectives perspective

There are several high-level objectives that vehicle speed assistance systems try to achieve. For example, concerning the optimising the traffic flow at signalised intersections using CV technology for vehicular communications, GLOSA is one application that uses timely and accurate traffic information to advise an appropriate speed to drivers, which allows them to pass the intersection by fewer number of stops. Furthermore, many recent vehicle speed assistance systems aim to harmonise traffic and smoothen traffic flow at highways. In the following section, we will provide a comprehensive analysis of recent research according to the presented taxonomy

Special-infrastructure less approaches

Although connected and autonomous vehicles can communicate with each other and road-side infrastructures, to overcome the lack of these infrastructures in developing countries, providing solutions that use cellular networks and smartphones [72, 73] for recommending appropriate speed to individual drivers needs further investigation.

Inclusion of driver preferences

By studying the literature, we have observed that addressing multiple goals or sub-goals is a crucial issue. There is a need to propose a speed recommendation model for legacy and nonconnected vehicles that considers safety and any other secondary goal (possibly conflicting) selected by individual drivers. Hence, providing speed recommendation services based on individual driver goals (e.g. safety and eco) can contribute to more compliance and driver-satisfactory with having safety as a primary driving goal.

II. CONCLUSION

In the ITS context, intelligent speed advisory/assistance for onroad passenger vehicles has been a research subject for a long time. This research has analysed recent studies on intelligent speed assistance approaches that overcome adverse environmental and road safety problems. Furthermore, it is interesting to summarise these techniques and analysis of the outcomes and objectives achieved. By doing this research, an inclusive comprehension of the vehicle speed assistance systems, the open issues of this field, related challenges, and future directions were obtained. This study presented a systematic review of 355 papers published between 2011 and 2020. Eventually, this paper has analysed 50 papers that had passed quality assessment process focusing on vehicle speed assistance systems. The statistics number of research papers by year in this research field illustrates an increasing trend from 2014 to 2019, expecting more research to be carried in 2020–2021

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DOI: 10.48175/568

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