THE ROLE OF ARTIFICIAL INTELLIGENCE IN TRAFFIC FLOW MANAGEMENT

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Abstract
This paper explores the role of Artificial Intelligence (AI) in optimizing traffic flow management within urban environments. It examines how AI technologies, including machine learning, computer vision, and predictive analytics, contribute to real-time traffic monitoring, congestion reduction, and adaptive signal control systems. The study highlights the integration of AI with smart city infrastructure to enhance efficiency, safety, and environmental sustainability. Case studies and current implementations are analyzed to demonstrate AI's effectiveness in reducing delays and improving traffic conditions. The annotation emphasizes the transformative potential of AI in reshaping traffic systems and supporting the development of intelligent transportation networks.

Introduction. The current period is characterized by the rapid development of cities, the improvement of improvement works and the sharp increase in the number of city residents. In such conditions, provision of high-quality transport services to city residents requires further development of city passenger transport, development of new and more efficient ways of transportation [1]. The organization of road transport in the city transport network has its own characteristics. It should be noted that the main complexity of the management of passenger transportation processes in cities is the uncertainties in the formation of transportation flows [2,3]. The impact of most factors affecting the size of the passenger flow is changing over time and has a probabilistic character.

Result and discussion. The multi-phase study was based on individual in-depth interviews with 50 senior local passenger transport operators, government officials, lobbyists and experts from New Zealand and around the world; and four validation workshops with 28 sector stakeholders [4]. The data was analysed using mostly pre-determined themes from which four scenarios were constructed and then validated. The implications are that the local passenger transport system is about to transition to a system of 'shared mobility; public transport will need to evolve to stay relevant but will remain important in any scenario; and the role of Government will be vital in overseeing the transition to the shared mobility era. These lessons are now being used to inform transport and broader policy decisions across New Zealand [5]. Overall, the study is the first to apply such a global and qualitatively rich dataset to view the long-term future local passenger transport system as a whole [6].

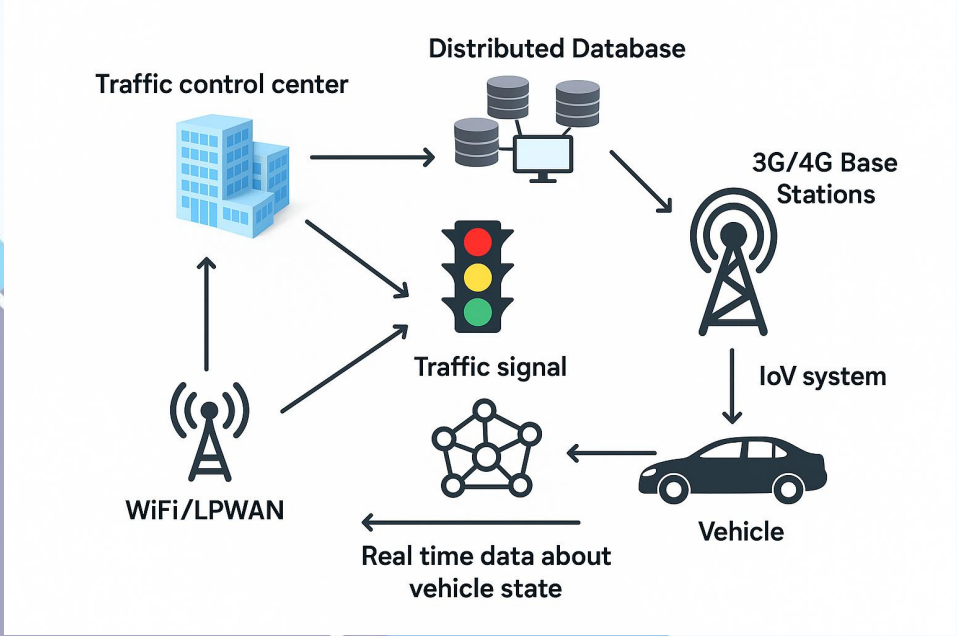


Fig 1. AI in Traffic Management

Much has been written about the accelerating pace of societal and technological change, but, until recently, such statements have not typically been applied to the public transport sector. Indeed, the operational concept underlying

the bus for instance (i.e. large vehicles on fixed routes and operating on fixed timetables) has not fundamentally changed as a concept since its introduction almost 200 years ago.

The formation of passenger flows is also influenced by the time of day, days of the week and seasons of the year.

Although there are currently many methods of monitoring and analyzing passenger flows, the following two disadvantages are common to all of them:

1) the study of passenger flows is carried out in a certain area of the city at a certain time interval, however, the results obtained in this case are generalized to the whole city and used for all time intervals;

2) the studied situation belongs to the past, but its results are used for future solutions. In other words, the studied passenger flow is the result of the actual fulfillment of the demand for transport in the past, and the expected flow in the future may be different from it;

3) the study and analysis of flows is a very labor-intensive activity (thousands of man-hours), which requires very large costs. The problem can be solved through mathematical models that reflect the connection between the volume of transportation expected in the future and the factors that cause the movement of the city's population[18,19,20,21,22]. It is important to take into account the factors of the following three groups that shape the transport mobility of the population when determining the future sizes of passenger flows (Figure 1):

Based on the performance of the above steps, the necessary levels of the indicators of passenger transportation service impact on traffic safety will be determined.

The following can be indicated as such indicators:

1) walking distance to the stops of the passenger transport route;

2) operational qualities of the passenger transport vehicle (capacity, ease of walking, etc.).

Regardless of the ownership of the buses, they mainly run on predetermined routes and provide transport services to the population.

The concept of route is important in setting and solving issues of organizing and managing passenger transportation processes. In short, it is necessary to implement the political and social goals of the strategic logistics management model of passenger transport processes in the city. The analysis shows that the importance of transport in the private sector is increasing day by day. The main reason for this is the creation of various forms of private ownership, the adoption of laws and decisions on the development and protection of small and medium-sized businesses, and the creation of conditions for free competition between them and their protection by law.

The transport system is about to transition to a system of 'shared mobility'. Three of the four scenarios envisage futures where private car ownership has dramatically fallen because alternatives have developed that people find more attractive. So, in 'Shared Shuttles', increasing urban density makes it easier for many people to access work, education, recreation, and friends or

Overall, this work is original because it is the first study to take such a broad view of the long-term future passenger transport system whilst using such a qualitatively rich and globally diverse set of interview and workshop data. Specifically, the study draws on 50 in-depth interviews with practitioners from New Zealand and from around the world, the results of which were then validated at four workshops which were attended by 28 practitioners in total. Finally, it is significant in that it

Research data for this article

Due to the fact that the questions asked in this study were intended primarily for a Government study, survey interviewees were assured raw data would remain confidential and would not be shared.

REFERENCES

1. P. Bansal et al. Forecasting Americans' long-term adoption of connected and autonomous vehicle technologies Transport. Res. Pol. Pract. (2017)
2. O.Y. Edelenbosch et al. Comparing projections of industrial energy demand and greenhouse gas emissions in long-term energy models Energy (2017)
3. P. V. Inbanaathan и др., «Comprehensive study on using hydrogen-gasoline-ethanol blends as flexible fuels in an existing variable speed SI engine», Int. J. Hydrog. Energy, т. 48, вып. 99, сс. 39531–39552, дек. 2023, doi: 10.1016/j.ijhydene.2023.03.107.
4. F. Salek, M. Babaie, S. V. Hosseini, и O. A. Bég, «Multi-objective optimization of the engine performance and emissions for a hydrogen/gasoline dual-fuel engine equipped with the port water injection system», Int. J. Hydrog. Energy, т. 46, вып. 17, сс. 10535–10547, мар. 2021, doi: 10.1016/j.ijhydene.2020.12.139.
5. M. Pyrc, M. Gruca, W. Tutak, и A. Jamrozik, «Assessment of the co-combustion process of ammonia with hydrogen in a research VCR piston engine», Int. J. Hydrog. Energy, т. 48, вып. 7, сс. 2821–2834, янв. 2023, doi: 10.1016/j.ijhydene.2022.10.152.