

Autonomous Vehicles Difficulties and Challenges

1. Summary of each article (including methodology, advantages, and key finding)

1.1 Autonomous vehicles: challenges, opportunities, and future implications for transportation policies:

This article explores the Autonomous vehicles (AV) Technologies in general, and the challenges, opportunities, and future implications in particular. The article presents how AV technologies can decrease the transportation cost and increase accessibility to low-income households and persons with mobility issue. The cost decrease can get as low as 2000\$ and up to 4000\$ when crash costs are counted. The articles acknowledge the gap in communication over cars infrastructure and routing behaviour and the obvious fact of how AV is still in infancy stage with a path full of problems and several challenges, although the biggest challenge remains to be the perception of the environment. Using the Braess example, centrally dispatching, a fleet of vehicles (the AVs in this case) following the system-optimal pattern can indeed improve overall traffic flow. In theory, the improvements may be as high as 2.15 times, which is astonishing. This article provides a methodological framework to concurrently model AVs navigation as a SO traffic pattern with UE traffic patterns of conventional vehicles (non-AVs). Numerical applications using methods such as Variational Inequality, Complementarity, or fixed point are worthy of far more investigation. At the same time, providing an agent-based micro-simulation formulation for the integration of AVs and non-AVs following the SO and UE principles should be the subject of further studies. Such agent-based modelling can then be utilized in real-time traffic management.

1.2 Current challenges in autonomous driving:

The paper investigates the different level of driving automatization and its effects on the environment and safety with insights of how important are the regulations and moral aspects of these technologies that are taking quantum steps into the future, minimizing driver's role in driving their vehicle to being excluded. The article presents difficulties such as faster decisions making, driving habits that can reduce environment pollution, and the gap between current regulation and the self-driving technology. The articles expect significant number of autonomous vehicles (AV) by 2030 without an idea of how they'll handle unexpected and extreme occasions, for which development are divided between solely relying on sensors and improvement on infrastructure to help decision making. The article highlights the importance of mechatronic in AV indispensable and integral it is to the AV industry. The article stresses on the reasonable expectation of AV surpassing current vehicle.

1.3 The autonomous car—a blessing or a curse for the future of low carbon mobility? An exploration of likely vs. desirable outcome:

In light of the autonomous vehicles (AV) phenomenon that started to take place in Europe and all over the world, the article addresses the large focus by researchers and development on the ‘autonomous’ rather than the ‘car’ element. Not neglecting the opportunities and improve mobility system there are high risks of high cost and high carbon emissions as well. By the use of elements such as Low Carbon Mobility (LCM), this article aims to find the gap between the desirable and the likely outcome in developing AV and how it would be possible to reduce it. The article emphasizes on the how AV can be a blessing by taking into account the social change and global empirical evidence with forecasts in technology development of AV. The article provides a comprehensive view of the importance of taking in consideration low carbon mobility when with overwhelming excitement in the development of AV.

1.4 Autonomous cars: Recent developments, challenges, and possible solutions

With the current development pushing of internal combustion engines cars, the article stresses that AV are still taking a very slow steps into the bigger picture, with all of the large amount of resources spent in the very beneficial AV development, the technology is still in gathering space. While the future of the technology is very ambitious, difficulties in technical, non-technical and legal challenges must be overcome to achieve the astonishing future. The article acknowledges the fact that with all the phenomenal progress already been made in AV development, it is still not possible to definite a year in which AV will be fully available to public.

1.5 Exploration of issues, challenges and latest developments in autonomous cars

The article at first emphasizes on the major latest growth in autonomous (AV industry following the development in computing, communicating and other technologies, which made many car manufacturer spend huge resources in developing AV to prepare for the near future. However, challenges from security and privacy to consumer satisfaction and real-time implementation are hindering element to achieve this goal. This article provides comprehensive overview of the latest developments in AV and addresses the challenges to the progress of AV implementation. This article highlights the researches needed to be focused on such as computer vision using deep learning, decision-making using machine learning, navigation, planning, control, perception, blockchain technology, cloud infrastructure integration, A number of real-life tests that have been conducted. Furthermore, the article discussed essential technologies in AV such as AI decision-making-based path planning, layered architectures, cyber threat protection mechanism, and the use of blockchain for transaction. The article concludes that many areas and aspect are yet to be researched in AV to obtain the needs of the current AV era.

1.6 Autonomous Car: Current Issues, Challenges and Solution: A Review

The article starts with highlighting the fact that from 1920 until the present day, autonomous vehicles (AV) has been proven to be in high demand in all areas especially in military-based technology offering advantages that were realized through researches and development in AV. This paper presents review on challenges such as human behaviour and liabilities, in which companies like Google and Mazda were able to provide successful solutions in some areas. The article outlined that until such challenges are solved fully AV will not see the light of day, but with current development discussed they have a predictable future. Academic researches on the potential effects of AV discussed thoroughly in this article which proved lower costs compared to the alternative automobile, with keeping in mind the challenges that must be overcome beforehand. The article highlighted and examined historical challenges and compared it to existing achievements with an insight to the future prediction on AV technologies.

2. Articles Table

Article Title	Authors	Publication Year	Limitation
Autonomous vehicles: challenges, opportunities, and future implications for transportation policies	SA Bagloee, M Tavana, M Asadi, and T Oliver	2016	• Less focus on the safety aspect of AV. • More statistical data required to support the article argument.
Current challenges in autonomous driving	I Barabás, A Todoruț, N Cordoș, and A Molea	2017	• The article doesn't include Hybrid AV. • Exaggerated criticize on the regulation challenges, with less focus on the AV industries themselves.
The autonomous car—a blessing or a curse for the future of low carbon mobility? An exploration of likely vs. desirable outcome	Nikolas Thomopoulos ¹ , and Moshe Givoni	2015	• The article should've explained the cost related in low carbon mobility, and how to overcome that
Autonomous cars: Recent developments, challenges, and possible solutions	Sehajbir Singh, and Baljit Singh Saini	2021	• The article is showing significant underestimation of the current development of AV.
Exploration of issues, challenges and latest developments in autonomous cars	B. Padmaja, CH. V. K. N. S. N. Moorthy, N. Venkateswarulu, and Myneni Madhu Bala	2023	• The articles cover wide areas in AV development, but still missing coverage on important areas such as hardware and precautions effective decision making in AV and user experience.
Autonomous Car: Current Issues, Challenges and Solution: A Review	RGS Deemantha, and B Hettige	2023	• Not enough data and evidence discussed to support the article review.