

THE LINK BETWEEN THE ADOPTION OF SELF-DRIVING CARS AND THE 5G NETWORK

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Abstract: Automated vehicle acceptance is needed to improve road safety, reduce congestion, reduce pollution and meet a number of higher-level objectives. The 5G mesh will not only have a major impact on the development of self-driving cars, but will also provide an opportunity to explore the adoption of AVs through the adoption of the 5G mesh. Perceptual compatibility, personal innovation, safety, curiosity, environmental awareness are all factors that previous research has shown to be critical to the adoption of self-driving vehicles. This paper reviews the research that has also contributed significantly to the adoption of 5G, such as speed, data transfer, simplicity.

Key Words: 5G, self-driving cars, adoption, speed, reliability, data transfer

1. INTRODUCTION

5G is a type of service that is innovative, ultra-reliable, has low latency, can be used with new applications and enables new resources for users. 5G is creating faster downloads, more applications and the ability to browse websites faster, in line with users' preferences and usage, making 5G adoption mass. Fast data transfer, simplicity, and usability have led to high adoption [1].

The 5G network will have a major impact on the development of self-driving cars, making them faster, smarter and safer. However, safety remains the most important issue, I believe road traffic will become more predictable, but the physical safety of drivers and pedestrians depends on the software's perception and reaction time. Specialised microchips allow vehicles to communicate not only with their infrastructure environment, but also with the driver, with other vehicles, with the network, which enables cloud-based data transfer.

2. ADOPTING SELF-DIRECTION

Perceived compatibility with self-direction is based on how the technology could fit with the respondent's existing values, needs and experiences. Perceived compatibility and personal innovation have a positive impact on behavioural intention. Malaysian respondents believe that self-driving technology could fit into their daily lifestyles, replacing the traditional vehicle as a transport option. The research also confirms that younger and more tech-savvy people are more interested in AV technology. In order to gain trust as a factor that directly influences behavioural intention, information on the safety and reliability of AV technology should be readily available [2].

Another study looked at consumer attitudes towards the introduction of 5G mobile internet technology. Our proposed technology adoption model integrated four new variables: environmental awareness, curiosity, perceived functional value and perceived value. This is an invaluable addition to the existing literature [3].

To the extent that we can also look at the adoption of self-driving cars as 5G, i.e. as a type of service that is innovative, reliable, has low latency, can be used in combination with new applications and enables new resources for users, its adoption would be influenced by similar factors as 5G.

Based on research to date, perceived compatibility - the value, need and experience of the respondent - personal innovation; environmental awareness; curiosity; and the study of perceived values could be of paramount importance for AV.

Research in Iran suggests that 5G technology should be designed to provide reliable and supportive services. As a result, it can gain the trust and focus of potential users, as well as increase public engagement and optimise the deployment of such technologies, thereby maximising the benefits to the public [4].

In the case of self-driving cars, the supporting services are the driving assistance systems. Several recent technological advances have contributed significantly to the development of advanced driver assistance systems (ADAS) and thus to the boom of self-driving cars. Human involvement remains vital, but a number of studies are already exploring how VR technology can be used to provide remote assistance for self-driving in seconds in critical situations, such as tailgating on a motorway [5].

3. PERCEIVED COMPATIBILITY, SAFETY, CURIOSITY, ENVIRONMENTAL AWARENESS

The service developed based on autonomous driving should also fit in with current mobility patterns, as compatibility remains an important factor as a system characteristic. At the societal level, practitioners need to ensure a positive perception of the usefulness of autonomous driving, as this may influence people's own perception of the usefulness of autonomous driving. An autonomous vehicle is a type of typically complex artificial intelligence system. In a 2018 study, it is argued that autonomous driving should have selective attention and self-learning capabilities, with a prerequisite mechanism of memorisation, inference and experience updating that allows it to cope with traffic scenarios, high noise and randomness.

In addition, the process of understanding traffic scenes requires a system that matches the human driver's attention, reasoning, learning and decision-making mechanisms [6].

Already in 2014, research findings have confirmed the importance of "how" and "why" in relation to self-driving functions. Understanding how to operate resulted in the safest driving performance, but increased negative feelings in drivers. These results suggest that to improve overall safety, automakers need to not only design vehicles, but also explain the how and why of autonomous actions to drivers [7].

Looking at environmental consciousness from the perspective of car-sharing practices, it has been found that concerns about environmental issues such as overconsumption, food and energy waste underlie sharing practices (Gansky, 2010). In the latter case, ecological and social sustainability motives are usually among the most important determinants of collaborative consumption [8].

4. SPEED, DATA TRANSFER, SIMPLICITY

Navigation in self-driving cars requires very precise localisation covering large areas and long distances.

Moreover, they need to do this at a faster speed than conventional mobile robots [9].

The architecture of a self-driving car autonomy system is typically divided into a detection system and a decision-making system. The detection system is usually divided into a number of subsystems responsible for tasks such as localisation of the self-driving car, static obstacle detection, moving obstacle detection and tracking, road mapping, traffic signal detection and recognition.

The decision-making system is also usually divided into a number of subsystems responsible for tasks such as route planning, behaviour selection, motion planning and control [10].

Convolutional neural networks (CNN) are used to speed up data transfer by mapping raw pixels from a single front-facing camera directly to steering commands. This end-to-end approach has proven surprisingly robust. With minimal data from humans, the system learns how to drive in traffic on local roads with or without lane markings, as well as on highways [11-20].

It also works in areas where visual guidance is not clear, such as when parking, in parking lots and on unpaved roads. The system automatically learns the internal representations of the necessary processing steps, such as the recognition of useful road features using the human steering angle as a training signal.

The simplicity of self-driving cars is linked to the standardisation of safety guarantees, i.e. the minimum requirements that all self-driving cars must meet and how these requirements can be verified. This 2017 paper proposes a mathematical model for guaranteeing safety, which we call Responsibility Sensitive Safety (RSS), and describes the design of a system that adheres to insurance requirements and is scalable to millions of cars [21-27].

Simplicity can also be seen in another light, as one of the advantages of AVs is that they can optimise daytime parking, freeing up space in the city centre for other uses. They also reduce the cost per kilometre of travel. Greater access to AVs increases worker welfare, traffic, travel distances and the size of the city.

Simplicity of using a particular mode of transport was also investigated in a survey in Germany and 6 main motives were identified: convenience, travel process, simplicity, accessibility and availability, travel time, cost and flexibility. The research shows that the time factor is a central criterion in shaping acceptance.

Other research is trying to contribute to simplicity and speed by going beyond 5G to a communications network that helps vehicle owners and customers communicate with low latency, high throughput and high availability. The different performance parameters considered are network latency, throughput and vehicle owner profit. The performance results show that the proposed scheme is efficient and beneficial for both vehicle owners and customers in terms of low latency, high throughput and profit.

5. DISCUSSION

To help users understand how AVs work, what systems are responsible for the safety of pedestrians and vehicle users, and what other benefits they offer, car manufacturers need to place much more emphasis on reliability information, compatibility with environmental and other values

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