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Internet of Things (IoT) and Self-Driven Cars Driving the Autonomous Vehicle Revolution

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Abstract: As technology continues to evolve, so do business operations, necessitating adaptation to these changes. One significant technological advancement lies in the realm of mobility, where there is a potential shift from manual-driving cars to fully self-driving technology-embedded cars. While self-driven cars hold promise for the future of transportation, realizing this potential requires a thorough review of infrastructure, policies, and other pertinent aspects. This research paper aims to assess the potential challenges and stakeholder management in the context of autonomous cars. It also discusses examples of IoT components and identifies companies involved in IoT technology. While it may be premature to determine the success of autonomous cars, with time, the landscape will become clearer. Future research can focus on identifying viable solutions and exploring environmental factors influencing the adoption of autonomous vehicles.

Keywords: Internet of Things (IoT), Self- Driven Cars, Autonomous Cars, Internet, Stakeholders

Introduction

The Internet of Things, commonly referred to as IoT, is a system in which physical objects are connected to computing devices such as sensors, software, and technology, enabling the

exchange of information without human intervention. The presence of the internet is essential for facilitating this data transfer. IoT is prevalent in various aspects of our lives, providing real-time updates on the status of vehicles, tools, or device health.

For instance, sensors embedded in machinery at construction sites can help identify action plans and optimize productivity. Similarly, at airports, push buttons allow passengers to provide feedback, which is collected and utilized to enhance passenger satisfaction by addressing any identified gaps.

An exemplary application of IoT can be observed in the Zity vehicle fleet, where real-time telemetry data enables two-way communication with drivers to prevent accidents and mitigate harsh driving behaviors. By analyzing this data, decision-makers can make informed choices, aiming to reduce accident rates.

Autonomous Vehicle

While the configuration of self-driving cars may vary among manufacturers, there are common elements shared across all autonomous vehicles. These include a suite of radar lasers and

high-powered cameras that continuously monitor the car's surroundings. Through these sensors, autonomous cars gather information about the environment and adjust their behavior accordingly.

Radar sensors detect nearby vehicles, while video cameras identify traffic lights, road signs, and pedestrians. Ultrasonic sensors mounted on the wheels enable obstacle detection, particularly during parking maneuvers. The data collected by these sensors is processed by the car's software, which then determines the vehicle's path and issues instructions to the steering, acceleration, and braking systems.

One of the defining features of IoT-embedded vehicles is their ability to sense and adapt to their surroundings, ensuring compliance with traffic regulations and avoiding obstacles. In essence, autonomous cars possess the capability to navigate their environment and operate without human intervention.

Autonomous vehicles are designed to be capable of traveling to any destination, similar to traditional cars, and the absence of a human driver is not a hindrance to their functionality. Through advanced sensor technology and intelligent software systems, self-driving cars are poised to redefine the future of transportation.

Objective

This research paper aims to discuss the potential challenges of self-driven cars and the stakeholders who will get directly influenced by the introduction of self-driving vehicles. For conducting the research literature review has been done. The researcher begins the study by referring to IoT technology, Autonomous Cars, Self- Driven cars research papers, articles, and blogs. The articles and research papers explicitly referred to the area of self-driven and IoT.

Literature Review

According to the “Autonomous Vehicles: theoretical and practical challenges” study done by Margarita Martinez Diaz et al., the existing infrastructure in the context of autonomous driving was reviewed, and suggestions were presented. The suggestions comprised the advancement and approaches required for managing the traffic when autonomous or self-driving cars are plying on the roads. They have also presented a framework for conducting future research (Martínez-Díaz & Soriguera, 2018).

According to “IoT in Automotive Industry: Connecting Cars” by Avital, a model has been proposed which will be conducive to the environment and will result in less energy consumption. An autonomous car, because of IoT and sensors, can reach the destination with less fuel by optimizing

fuel efficiency. The paper has also discussed that more advanced traffic control systems will be required to properly manage autonomous vehicles on the road (Cohen et al., 2016).

According to “Autonomous Vehicles: The Future of Automobiles” by M V Rajasekhar et al., the introduction of autonomous vehicles will probably come with obstacles. The paper further presents a comparative study between the Indian market and other markets regarding the introduction of autonomous vehicles. The acceptance of autonomous vehicles in the Indian market has also been discussed (Rajasekhar & Jaswal, 2015).

According to “Autonomous Cars: Research Results, Issues, and Future Challenges” by Rasheed Hussain et al., a significant shift will be happened in mobility and hence decided to research viable solutions, which can be a win-win situation for stakeholders in the autonomous car industry. The paper concludes by proposing various cost-effective, safe solutions that designers, policymakers, and car manufacturers can use to make the self-driven car future (Hussain & Zeadally, 2019).

According to “Self-Driving Cars” by Mike Daily et al., the paper explored the different aspects of autonomous cars, including the policies of the government which can influence the mobility of autonomous vehicles. The authors also discussed cloud-based infrastructure, which can play an integral role in the successful operation of self-driven cars (Daily et al., 2017).

Challenges with Autonomous Cars

The literature review concludes that though autonomous cars are the future, extensive work is required to overcome the challenging situation that this shift from manual to automatic will pose. This section will discuss the technological, legislative, environmental, and philosophical challenges in front of autonomous cars (Rosenzweig, 2021).

Passenger's Psychology- Passengers may be apprehensive about travelling without human involvement. Humans tend to believe that machinery can stop working at any point in time, which would be difficult for them to manage in the unavailability of human drivers. Passengers may also face issues with operating autonomous cars (Rosenzweig, 2021).

Management of Traffic- If many autonomous cars are on the road, there is a strong possibility of signals interfering with each other hence the makers need to understand if the bandwidth is available to support the mass operation of autonomous cars (Rosenzweig, 2021).

Dropping at the Right Location- One major issue travelling in autonomous cars is that the passenger cannot tell the machine about the exact location. With a human, one can always speak or inform the person to drop at the exact location (Rosenzweig, 2021).

Passengers Overcrowdings- Machines may not be able to recognize the overcrowding inside the car. Hence won't be able to share instructions with passengers as overcrowding is a violation of the law (Rosenzweig, 2021).

Vandalism- It is difficult to judge if the passengers travelling in the car are not careless. The passengers can damage the vehicle. If a driver is present in the car, then they can restrict these kinds of activities; however, in the absence of a human driver, this behaviour can go unchecked. This can lead to high maintenance costs (Rosenzweig, 2021).

Stakeholders and Autonomous Cars

Since mobility is transforming, a robust framework will be required to run self-driving cars efficiently. The priority areas where more attention is required are safety features, ethical concerns, and privacy; however, the effect of autonomous vehicles on tech stakeholders, which are associated with the development of these cars, government, insurance companies, city planners, parking lots, and tech and communications companies, can't be ignored. These players should also be considered before arriving at any decision in the context of the development and operation of autonomous cars

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IoT Companies and Autonomous Cars

Argo AI is in the development of a fully integrated self-driving system. They develop software and sensors, which include LIDAR, light detection, radar and cameras. This company is working on two major challenges by using machine learning algorithms. The name of this research is “Carnegie Mellon University Argo AI Center for Autonomous Vehicle Research (Singh & Saini, 2021).

Discussion and Conclusion

To conclude this research paper, it is substantial to know that the foundation of autonomous cars is the availability of the Internet and IoT technology. These cars are more like machines which have so many IOT components (sensors, actuators, machine learning systems, algorithms to execute software) embedded in them. These cars use navigation systems which are based on global positioning systems and geographic information systems. High-Definition map, a type of electronic map, is used in self-driving cars. Path planning is another technology which is used by matching the map, which determines the exact location of the vehicle. Apart from IoT, equal importance needs to be given to stakeholders as they will get impacted by the introduction of autonomous cars and can support informed decision-making.

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