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MÜXTƏLİF SƏNAYE SAHƏLƏRİNDƏ PİLOTSUZ NƏQLİYYAT VASİTƏLƏRİNİN ƏHƏMİYYƏTİNƏ VƏ PİLOTSUZ AVTOMOBİLLƏRDƏ SÜNİ İNTELLEKTİN MÖVCUD VƏZİYYƏTİNƏ ÜMUMİ BAXIŞ

Xülasə

Avtonom nəqliyyat vasitələri (AV) və ya özünü idarə edən avtomobillər kimi də tanınan pilotsuz nəqliyyat vasitələri, çoxsaylı üstünlükləri və imkanları sayəsində müxtəlif sənaye sektorlarında inqilab etmək potensialına malikdir.

Pilotsuz nəqliyyat vasitələri yeraltı mədənlər, dərin çuxurlar və ya yüksək çirklənmə səviyyəsi olan ərazilər kimi insan operatorları üçün çətin və ya təhlükəli ola biləcək ərazilərə daxil ola bilər. Avtonom nəqliyyat vasitələri fasilələrə ehtiyac olmadan işləyə bilər ki, bu da mədən və tikintidə əməliyyat səmərəliliyinin və məhsuldarlığın artmasına səbəb olur. Əməliyyatları optimallaşdırmaq və resurs istehlakını azaltmaqla, pilotsuz nəqliyyat vasitələri daha davamlı və ekoloji cəhətdən təmiz mədən və tikinti təcrübələrinə töhfə verə bilər. Çoxlu üstünlüklərə baxmayaraq, pilotsuz nəqliyyat vasitələrinin mədənçıxarma və tikintiyə inteqrasiyası diqqətli planlaşdırma, mövcud iş axınları ilə inteqrasiya və bu sənayelərin unikal problemlərini həll etmək üçün texnologiyanın kifayət qədər möhkəm olmasını tələb edir. Bununla belə, texnologiya irəliləməyə və qəbul olunmağa davam etdikcə, sürücüsüz avtomobillərin istifadəsi bu sənayeləri dəyişdirərək, onların əməliyyatlarında təhlükəsizlik və səmərəliliyi artıraraq daha geniş yayılacaq.

Açar sözlər: *pilotsuz nəqliyyat vasitələri, avtonom, Süni intellekt, təchizat zənciri, Qabaqcıl Sürücüyə Yardım Sistemləri, avtomatlaşdırma, sensor sistemləri*

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An overview of the importance of unmanned vehicles in various industries and the current state of artificial intelligence in unmanned vehicles

Abstract

Unmanned vehicles, also known as autonomous vehicles (AVs) or self-driving cars, have the potential to revolutionize various industrial sectors due to their numerous advantages and capabilities.

Unmanned vehicles can enter areas that would be difficult or dangerous for human operators, such as underground mines, deep pits, or areas with high levels of pollution. Autonomous vehicles can operate continuously without the need for interruptions, leading to increased operational efficiency and productivity in mining and construction. By optimizing operations and reducing resource consumption, unmanned vehicles can contribute to more sustainable and environmentally friendly mining and construction practices. Despite the many benefits, integrating unmanned vehicles into mining and construction requires careful planning, integration with existing workflows, and ensuring the technology is robust enough to address these industries' unique challenges. However, as the technology continues to advance and gain acceptance, the use of driverless cars will become more widespread, transforming these industries and increasing safety and efficiency in their operations.

Keywords: *unmanned vehicles, autonomous, Artificial Intelligence, supply chain, Advanced Driver Assistance Systems, automation, sensor systems*

Introduction

Self-driving cars can be used in transportation and logistics to efficiently transport goods and people without the need for a human driver. This can lead to reduced delivery times, reduced transportation costs, and increased supply chain efficiency. Undoubtedly, driverless cars have the potential to revolutionize transportation and logistics in several ways, bringing significant benefits to both businesses and consumers. Some of the key benefits of using autonomous vehicles in this sector are (Armbrust, Griffith, Joseph, 2006: 52):

• Increased Efficiency - Driverless vehicles can operate 24/7 without the need for rest breaks or shift changes, resulting in continuous and efficient transportation of goods and people. This increased efficiency can lead to faster delivery times and reduced passenger wait times.

• Cost savings - Eliminating the need for human drivers can lead to significant cost savings for transportation and logistics companies. Human labor is a significant cost in the industry, and autonomous vehicles can help reduce these costs in the long run.

• Improved Safety - Autonomous vehicles are equipped with advanced sensors and artificial intelligence algorithms that can detect and react to their surroundings more effectively than human drivers. This can reduce the likelihood of accidents and improve overall road safety.

• Optimal routing and navigation - Unmanned vehicles can be integrated with sophisticated routing algorithms that can optimize delivery routes, ensuring that goods are transported in the most efficient and cost-effective manner.

• Improved Inventory Management - With real-time tracking and data analytics, businesses can gain better insights into their supply chains, allowing them to more effectively manage inventory and reduce waste.

• Last-Mile Delivery - Autonomous vehicles can be particularly useful in last-mile delivery where goods are transported from distribution centers to their final destination. This can significantly speed up delivery times and increase customer satisfaction.

• Integration with Warehouse Technology - Autonomous vehicles can seamlessly integrate with automated warehouse and loading systems, streamlining the entire supply chain process from start to finish.

• Smooth and efficient operation of driverless cars can help reduce congestion by optimizing traffic flow and reducing the number of vehicles on the road.

Although there are still challenges to overcome, such as regulatory frameworks, public acceptance, and technical improvements, the integration of unmanned vehicles into transportation and logistics has the potential to revolutionize the industry and lead to positive changes in the transportation of goods and people around the world (Babcock, 2020: 352).

Autonomous buses and shuttles can improve public transport services by providing safe, reliable and affordable mobility solutions. They can help reduce congestion and improve accessibility to public transportation options. Indeed, autonomous buses and shuttles have the potential to transform public transportation and solve various problems faced by traditional transit systems. Here are some ways that public transport services can be improved (Berber, 2020: 124):

• Enhanced Safety - Autonomous buses and shuttles are equipped with advanced sensor systems and artificial intelligence algorithms that can detect and react to their surroundings more effectively than human drivers. This enhanced safety can reduce the number of accidents and increase passenger confidence in using public transport.

• Increased Reliability - With autonomous vehicles, public transportation schedules can be more accurate and reliable. These vehicles can follow predetermined routes and times with minimal deviations, leading to better adherence to schedules and reduced passenger waiting times.

• Cost effectiveness - While the initial investment in autonomous technology can be significant, in the long run autonomous buses and shuttles can lead to cost savings. They eliminate the need to

pay drivers, reduce maintenance costs through predictive maintenance and optimize fuel consumption.

• Reduced Congestion - Autonomous buses and shuttles can be programmed to follow optimal routes, helping to reduce congestion and promote smoother traffic flow in urban areas.

• Improved Accessibility - Autonomous buses and shuttles can improve accessibility to public transportation for people with disabilities or reduced mobility. These vehicles can be designed with features that meet different accessibility needs, making public transportation more inclusive.

• Extended operating hours - Unlike traditional public transportation systems with fixed operating hours, autonomous buses and shuttles can operate 24/7, providing around-the-clock service in high-demand areas or during peak hours.

• Dynamic Routing - Autonomous buses can use real-time data and predictive analytics to adjust their routes based on demand patterns, providing more efficient use of resources and service that responds to changing passenger needs.

• Integration with Multi-Modal Transport - Autonomous buses and shuttles can seamlessly integrate with other modes of transport such as trains, trams and ride-sharing services to create a comprehensive and interconnected public transport network.

• Emissions reduction - The use of electric or hybrid autonomous buses and coaches can contribute to the reduction of greenhouse gas emissions and lead to a more environmentally friendly public transport system.

• Data-driven insights - Public transportation agencies can gather valuable information such as passenger flow, usage patterns, and road conditions from autonomous buses and shuttles to optimize service planning and improve overall system efficiency.

While the deployment of autonomous buses and coaches in public transportation brings many advantages, it also poses some challenges. These include ensuring robust cybersecurity, addressing public concerns about safety and privacy, and developing regulations and policies governing the use of autonomous vehicles in public spaces. However, with careful planning and innovation, autonomous public transport has the potential to transform urban mobility and offer improved services to commuters and residents alike (Çağan, 2020: 273).

Unmanned vehicles can be used in the mining and construction industries for tasks in hazardous environments or areas with difficult human access. They can improve security and optimize operations. Driverless vehicles, especially autonomous vehicles, have significant potential to transform the mining and construction industries. Mining and construction environments are often dangerous due to factors such as unstable terrain, toxic gases, and heavy machinery. By using driverless cars, companies can reduce the risk to human workers by delegating dangerous tasks to autonomous vehicles, ultimately leading to improved safety outcomes. Unmanned vehicles can be controlled remotely, allowing operators to control and monitor equipment from a safe distance. This capability is particularly useful in situations where direct human intervention is risky or impossible (Todaro, Smith, 2018: 115).

Overall, unmanned vehicles have the potential to transform various industrial sectors by improving efficiency, safety, and sustainability while changing the way people and goods are transported in the future. However, it is important to address technical, regulatory, and ethical challenges to ensure the safe and responsible deployment of autonomous vehicles in these sectors.

Conclusion

The development and implementation of higher levels of automation face significant technical, regulatory, and societal challenges, but progress in ADAS systems is paving the way for continued advancements in autonomous driving. As technology advances and artificial intelligence algorithms become more sophisticated, the dream of fully autonomous vehicles may become a reality in the future (Gogoll, Müller, 2016: 693).

Numerous companies, including traditional automakers, tech giants, and startups, are actively developing and testing autonomous vehicles. They conduct extensive testing on public roads to

collect data, improve AI algorithms and improve safety. Indeed, the development and testing of autonomous vehicles involves a wide range of companies, each contributing to the advancement of technology and pushing the boundaries of self-driving capabilities. The autonomous vehicle space attracts a variety of players, including traditional automakers, technology companies, startups, and research institutes. Established automakers recognize the potential of autonomous technology and are investing in research and development to stay competitive. Meanwhile, tech giants and startups see an opportunity to disrupt the transportation industry and offer new mobility solutions.

Companies conduct extensive real-world testing on public roads to collect data and evaluate the performance of autonomous vehicles in various driving conditions. These tests help validate AI algorithms and sensor systems, and identify areas for improvement. In addition to real-world tests, simulation-based tests are also widely used. Simulation allows companies to recreate complex scenarios that may be difficult to encounter during physical testing. It also allows companies to perform more iterations and evaluate different scenarios efficiently (Mohsan, Othman, Alsharif, 2023: 5).

Autonomous vehicles generate large amounts of data from sensors, cameras, and other on-board systems. This data is crucial for training AI algorithms and improving the car's decision-making capabilities. Companies take care to securely collect, store, and analyze this data. Companies are working closely with regulatory authorities to ensure compliance with safety standards and address legal and ethical considerations related to autonomous vehicles. Governments and agencies play an important role in shaping the development and implementation of autonomous technology (Wiakała, 2019: 2743).

Safety is paramount in the development of autonomous vehicles. Companies implement redundant systems and fail-safe mechanisms to ensure that the vehicle can handle unexpected situations and minimize risks to passengers and pedestrians.

In general, the development and testing of autonomous vehicles involves engineering, artificial intelligence, sensor technology, data science, and more. involves a multidisciplinary approach that brings together their experiences. As technology advances, autonomous vehicles have the potential to make transportation safer, more efficient, and accessible to a wider population.

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