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ijtimoiy-iqtisodiy, innovatsion texnik,
fan va ta'limga oid ilmiy-amaliy jurnal

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05.01.00 – Axborot texnologiyalari, boshqaruv va kompyuter grafikasi
05.01.01 – Muhandislik geometriyasi va kompyuter grafikasi. Audio va video texnologiyalari
05.01.02 – Tizimli tahlil, boshqaruv va axborotni qayta ishlash
05.01.03 – Informatikaning nazariy asoslari
05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta'minoti
05.01.05 – Axborotlarni himoyalash usullari va tizimlari. Axborot xavfsizligi
05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
05.01.07 – Matematik modellashtirish
05.01.11 – Raqamli texnologiyalar va sun'iy intellekt
05.02.00 – Mashinasozlik va mashinashunoslik
05.02.08 – Yer usti majmualari va uchish apparatlari
05.03.02 – Metrologiya va metrologiya ta'minoti
05.04.01 – Telekommunikasiya va kompyuter tizimlari, telekommunikasiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
05.05.03 – Yorug'lik texnikasi. Maxsus yoritish texnologiyasi
05.05.05 – Issiqlik texnikasining nazariy asoslari
05.05.06 – Qayta tiklanadigan energiya turlari asosidagi energiya qurilmalari
05.06.01 – To'qimachilik va yengil sanoat ishlab chiqarishlari materialshunosligi
05.08.03 – Temir yo'l transportini ishlatish
05.08.06 – "G'ildirakli va gusenisali mashinalar va ularni ishlatish" (texnika fanlari)
05.09.01 – Qurilish konstruksiyalari, bino va inshootlar
05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
10.00.06 – Qiyosiy adabiyotshunoslik, chog'ishtirma tilshunoslik va tarjimashunoslik
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08.00.01 – Iqtisodiyot nazariyasi
08.00.02 – Makroiqtisodiyot
08.00.03 – Sanoat iqtisodiyoti
08.00.04 – Qishloq xo'jaligi iqtisodiyoti
08.00.05 – Xizmat ko'rsatish tarmoqlari iqtisodiyoti
08.00.06 – Ekonometrika va statistika
08.00.07 – Moliya, pul muomalasi va kredit
08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
08.00.09 – Jahon iqtisodiyoti
08.00.10 – Demografiya. Mehnat iqtisodiyoti
08.00.11 – Marketing
08.00.12 – Mintaqaviy iqtisodiyot
08.00.13 – Menejment
08.00.14 – Iqtisodiyotda axborot tizimlari va texnologiyalari
08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
08.00.17 – Turizm va mehmonxona faoliyati

Ma'lumot uchun, OAK Rayosatining 2024-yil 28-avgustdagi 360/5-son qarori bilan "Dissertatsiyalar asosiy ilmiy natijalarini chop etishga tavsiya etilgan milliy ilmiy nashrlar ro'yxati"ga texnika va iqtisodiyot fanlari bo'yicha "Muhandislik va iqtisodiyot" jurnali ro'yxatga kiritilgan.

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AUTOMATED GUIDED VEHICLE (AGV) SYSTEMS IN LOGISTICS AND WAREHOUSE AUTOMATION: TECHNOLOGICAL ADVANCEMENTS, OPERATIONAL EFFICIENCY, AND STRATEGIC IMPLEMENTATION

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Abstract. In the modern era of global supply chains and the rapid growth of e-commerce, logistics facilities are experiencing increasing demands for speed, accuracy, and operational cost-efficiency. This paper provides a comprehensive analysis of Automated Guided Vehicle (AGV) systems as a key component of contemporary warehouse automation. It examines the technological evolution of AGVs, comparing traditional infrastructure-dependent guidance mechanisms with advanced Natural Navigation and Simultaneous Localization and Mapping (SLAM) technologies. The study highlights the effective integration of AGVs with Warehouse Management Systems (WMS) and emphasizes the transformative potential of 5G connectivity in enhancing warehouse operations, coordination, and overall supply chain efficiency.

Keywords: automated guided vehicles (AGV), warehouse automation, intralogistics, SLAM navigation, warehouse management system (WMS), supply chain efficiency, Industry 4.0.

Аннотация. В современную эпоху глобальных цепочек поставок и стремительного развития электронной коммерции логистические комплексы сталкиваются с возрастающими требованиями к скорости, точности и экономической эффективности операций. В данной работе представлен комплексный анализ систем автоматизированных управляемых транспортных средств (AGV) как одного из ключевых компонентов современной автоматизации складских процессов. Рассматривается технологическая эволюция AGV, включая сопоставление традиционных механизмов навигации, зависящих от инфраструктуры, с передовыми технологиями естественной навигации и одновременной локализации и картографирования (SLAM). Особое внимание уделяется эффективной интеграции AGV с системами управления складом (WMS), а также перспективной роли связи стандарта 5G в повышении эффективности складских операций, координации процессов и общей результативности цепочек поставок.

Ключевые слова: автоматизированные управляемые транспортные средства (AGV), автоматизация складов, интралогистика, навигация SLAM, система управления складом (WMS), эффективность цепочки поставок, Индустрия 4.0.

Annotatsiya. Global ta’minot zanjirlari va elektron tijoratning jadal rivojlanishi sharoitida logistika majmualarida tezkorlik, aniqlik va operatsion xarajatlar samaradorligiga bo‘lgan talablar tobora ortib bormoqda. Ushbu maqolada zamonaviy omborlarni avtomatlashtirishning muhim tarkibiy qismi sifatida avtomatlashtirilgan boshqariladigan transport vositalari (AGV) tizimlarining har tomonlama tahlili keltirilgan. Unda AGV tizimlarining texnologik rivojlanishi ko‘rib chiqilib, an’anaviy infratuzilmaga bog‘liq navigatsiya mexanizmlari ilg‘or tabiiy navigatsiya hamda bir vaqtning o‘zida joylashuvni aniqlash va xaritalash (SLAM) texnologiyalari bilan taqqoslanadi. Tadqiqotda AGV tizimlarining omborlarni boshqarish tizimlari (WMS) bilan samarali integratsiyalashuvi, shuningdek, 5G aloqa texnologiyasining ombor operatsiyalarini takomillashtirish, jarayonlarni muvofiqlashtirish va ta’minot zanjiri samaradorligini oshirishdagi istiqbolli roli yoritilgan.

Kalit so‘zlar: avtomatlashtirilgan boshqariladigan transport vositalari (AGV), omborlarni avtomatlashtirish, intralogistika, SLAM navigatsiyasi, omborlarni boshqarish tizimi (WMS), ta’minot zanjiri samaradorligi, Sanoat 4.0.

INTRODUCTION

The rapid globalization of commerce and the continued expansion of omnichannel retailing have significantly transformed the landscape of warehouse operations and intralogistics. Modern distribution centers are no longer limited to traditional storage functions; they increasingly operate as dynamic, high-throughput fulfillment hubs where material flow speed, accuracy, and efficiency contribute directly to overall

competitiveness. Traditional material handling approaches, which rely extensively on human-operated forklifts, manual carts, and conventional conveyor systems, are being complemented by advanced technologies to accommodate growing order volumes, shorter delivery windows, and evolving workforce requirements. At the same time, the integration of digital technologies and automation provides opportunities to improve operational consistency, productivity, and workplace safety.

To support these evolving operational requirements, the logistics sector has increasingly embraced automation, contributing to the widespread adoption of Automated Guided Vehicle (AGV) systems. First introduced in the mid-20th century as relatively simple towed vehicles following fixed floor wires, AGVs have undergone substantial technological development. Today, they represent sophisticated, computer-controlled mobile platforms capable of performing a wide range of load transportation tasks with a high degree of autonomy and operational precision. This paper systematically analyzes the core technologies driving modern AGV systems, evaluates their operational and economic benefits, examines key implementation considerations, and explores their strategic relevance within developing logistics ecosystems, with particular attention to the industrial modernization of Uzbekistan.

The operational flexibility and deployment requirements of an AGV system are significantly influenced by its navigation technology. Over the past several decades, navigation technologies have evolved from fixed, infrastructure-dependent guidance mechanisms toward increasingly adaptive and infrastructure-independent autonomous solutions. Understanding these different guidance approaches is important for selecting AGV capabilities that correspond effectively to specific warehouse layouts, material flows, and operational requirements. Modern navigation technologies create new opportunities for flexible deployment, efficient warehouse management, and the continuous improvement of intralogistics processes.

LITERATURE REVIEW

Recent studies indicate that Automated Guided Vehicle (AGV) systems are becoming an important component of modern warehouse automation and intralogistics. Kubasáková et al. (2026) demonstrated the practical application of AGVs in logistics processes and highlighted their potential to improve operational efficiency.

The development of AGV technologies has progressed from fixed-path guidance systems using magnetic tapes and inductive wires to more flexible laser, vision-based, Natural Navigation, and SLAM technologies. These developments have increased AGV flexibility, positioning accuracy, and adaptability to dynamic warehouse environments. The integration of AGVs with Warehouse Management Systems (WMS) and Fleet Management Systems (FMS) further improves task allocation, traffic coordination, inventory management, and operational efficiency.

Recent research also emphasizes the broader application of autonomous mobile technologies in specialized operational environments, demonstrating their potential to improve process efficiency. However, the reviewed literature indicates that successful AGV implementation depends not only on technological capabilities but also on infrastructure readiness, investment requirements, cybersecurity, and integration with existing warehouse management systems.

RESEARCH METHODOLOGY

This study uses a **comparative and analytical approach** to evaluate AGV systems in warehouse logistics. AGV navigation technologies, WMS/FMS integration, and 5G connectivity are analyzed. The study also compares AGVs with manual material handling in terms of **efficiency, safety, flexibility, scalability, and financial performance**. The research further considers the **investment, infrastructure, cybersecurity, and implementation requirements** for AGV adoption in Uzbekistan.

ANALYSIS AND RESULTS

Traditional AGV configurations rely on predefined physical paths. Magnetic tape or inductive wires embedded in or attached to the warehouse floor establish designated routes that the vehicle's onboard sensors continuously follow. These systems are highly reliable, robust against environmental interference, and relatively straightforward to deploy. However, their fixed-path configuration can limit operational flexibility. Modifying a travel path may require physical reinstallation, which can involve temporary operational adjustments and additional investment. Similarly, 2D data-matrix or QR code-based navigation utilizes a grid pattern installed on the warehouse floor. The AGV navigates by reading these codes with downward-facing cameras. This approach

provides high positioning accuracy and can support precise movement, while its long-term performance depends on maintaining the visibility and condition of the floor-based markers in environments with dust, floor wear, or frequent machinery traffic.

Laser navigation represents a significant advancement toward greater structural flexibility. AGVs equipped with rotating laser scanners emit beams that reflect off retro-reflective targets positioned at known coordinates along walls and columns. By measuring the time of flight and angles of the returned light, the vehicle applies triangulation algorithms to determine its position in real time. This approach enables travel paths to be modified primarily through software configurations, reducing the need for physical changes to the warehouse floor. The effectiveness of the system, however, benefits from maintaining a clear line of sight between the AGV and the reflectors, particularly in highly congested or high-density racking environments.

Vision-guided AGVs use onboard cameras to capture visual information from the surrounding environment. Through advanced computer vision algorithms, the vehicle can construct a visual map of the facility and recognize three-dimensional structural features such as ceiling grids, pillars, and rafters. A key advantage of vision-based guidance is its ability to operate without dedicated floor-based navigation infrastructure, providing greater flexibility in warehouse configuration. The AGV dynamically compares real-time visual information with its previously established environmental map to support autonomous navigation. An important technical consideration is variation in warehouse lighting, as changes in illumination may influence feature-recognition performance. This can be addressed through robust software filtering, sensor fusion, and complementary sensing technologies, thereby improving navigation reliability across different operating conditions.

The pinnacle of modern AGV and Autonomous Mobile Robot (AMR) navigation is Natural Navigation, supported by Simultaneous Localization and Mapping (SLAM) technology. Equipped with Light Detection and Ranging (LiDAR) sensors, SLAM-enabled AGVs can dynamically map an environment while simultaneously determining their own position within the generated map. Rather than following a predetermined and rigid track, a SLAM-based AGV identifies static structures, such as walls and permanent racking, and dynamically calculates an efficient path to its destination. When an obstacle, such as a misplaced pallet or a person, temporarily blocks its trajectory, the system evaluates the surrounding environment in real time and safely determines an alternative route. This infrastructure-independent approach provides a high degree of operational agility, making it particularly suitable for dynamic and rapidly changing fulfillment environments.

An AGV does not operate independently; its full operational value is realized through integration with the facility's broader software architecture. The operational hierarchy typically begins with a Warehouse Management System (WMS) or Enterprise Resource Planning (ERP) platform, which manages inventory information, order allocation, and shipping schedules. When a material-handling task is generated, such as transferring a completed pallet from a production line to a designated storage location, the WMS transmits the instruction to the AGV Fleet Management System (FMS).

The Fleet Management System functions as the centralized coordination platform for the automated fleet. It dynamically assigns tasks to individual vehicles based on factors such as proximity, current battery state of charge, and vehicle payload capacity. Importantly, the FMS coordinates traffic across the warehouse floor, helping to prevent congestion at narrow intersections, optimizing charging schedules to maintain fleet availability, and directing vehicles through efficient routes when specific areas become busy.

To maintain effective synchronization between the WMS, FMS, and multiple AGVs operating simultaneously, reliable wireless communication infrastructure is essential. Traditional Wi-Fi networks have been widely used for this purpose; however, network performance can vary in large facilities because of latency fluctuations, coverage limitations, and connectivity interruptions during access-point handovers. The integration of private 5G networks offers an advanced communication solution. 5G technology supports ultra-reliable low-latency communication (URLLC), massive machine-type communications (mMTC), and seamless handovers. These capabilities enable rapid data exchange, facilitate the centralized processing of high-resolution sensor data, and support the deployment of a large number of connected assets while maintaining stable network performance.

Evaluating the implementation of an AGV system requires a systematic comparative analysis against conventional manual material-handling methods. Although the initial capital expenditure (CAPEX) associated with AGVs may be higher than the cost of acquiring traditional forklifts, their long-term operational benefits and potential reductions in operating expenditure (OPEX) can contribute to an attractive Return on Investment (ROI). In addition to financial considerations, AGV implementation can support higher operational consistency, improved resource utilization, enhanced workplace safety, and greater scalability of warehouse operations (Table 1).

Table 1
Comparative Evaluation of Operational and Financial Parameters of Manual Material Handling and AGV Systems

Operational Parameter	Manual Forklift / Material Handling	Automated Guided Vehicle (AGV) Systems
Operational availability	Typically structured around human work shifts, including scheduled breaks and workforce availability.	Supports continuous 24/7 operation with automated opportunity charging.
Operational consistency	Throughput may vary depending on operator experience, workload, and operating conditions.	Provides highly predictable performance with optimized and consistent cycle times.
Workplace safety & risk management	Requires continuous attention to traffic management, operator practices, and workplace safety procedures.	Incorporates multi-layered sensor-based safety systems to support safer material-handling operations.
Scalability & flexibility	Expansion can involve additional personnel, training, and material-handling equipment.	Enables modular expansion, with routes and operational parameters that can be efficiently reconfigured through software.
Financial structure	Relatively low initial CAPEX, with ongoing OPEX associated with labor, training, insurance, maintenance, and workforce management.	Higher initial CAPEX, with potential for more predictable and optimized long-term OPEX.

From an economic lifecycle perspective, AGV systems can achieve full amortization and positive Return on Investment (ROI) within approximately 18 to 36 months after deployment, depending on labor cost structures, facility utilization, system configuration, and operational conditions. A major contributor to this financial return is the substantial reduction in labor requirements for repetitive material-transport tasks, combined with potential decreases in product losses and industrial racking damage associated with manual handling. These advantages can contribute to more predictable operating costs and improved long-term resource utilization.

Despite their significant operational and economic potential, the successful integration of AGV systems requires careful consideration of several technical and organizational factors. First, the initial investment may present a financial consideration for small and medium-sized enterprises (SMEs), making phased implementation, leasing models, and other flexible investment approaches potentially valuable. Second, facility readiness is an important factor in successful deployment. Some older warehouses may have uneven flooring, structural slope variations, or surface conditions that can influence AGV braking performance and navigation accuracy. Addressing these conditions through targeted facility improvements can create a more suitable environment for reliable automated operations. Third, the transition to automated fleets requires a comprehensive approach to cybersecurity. Since AGVs communicate wirelessly with centralized management systems, they should be protected through encrypted industrial communication protocols, network segmentation, secure authentication mechanisms, and continuous monitoring to ensure reliable and secure operation.

As Uzbekistan continues to strengthen its position as an important logistics and manufacturing hub in Central Asia, the modernization of industrial infrastructure is becoming increasingly significant. Supported by national digital transformation initiatives, including the **“Digital Uzbekistan — 2030”** strategy, the country is expanding the digitalization of various economic sectors. In this context, the integration of AGV systems offers substantial opportunities to improve operational efficiency, technological capabilities, and resource utilization across several rapidly developing domestic industries.

The domestic e-commerce ecosystem, represented by rapidly expanding platforms such as **Uzum Market** and major retail chains such as **Korzinka**, is experiencing growing demand for efficient order fulfillment and distribution services. The implementation of AGV systems in large-scale fulfillment centers can contribute to shorter order-to-ship cycles, improved material-flow coordination, and more effective utilization of vertical storage space through high-density racking solutions. These technologies can also support the development of flexible and scalable logistics infrastructure capable of adapting to future increases in demand.

Furthermore, Uzbekistan’s established textile manufacturing sector and developing pharmaceutical industry can benefit considerably from AGV-based internal logistics. AGVs can support the automated transportation of fabric rolls, production materials, chemical components, and sterile medical supplies, contributing to consistent material flow, enhanced process control, and compliance with established safety and quality requirements. The wider adoption of AGV technologies can therefore strengthen domestic supply-chain capabilities, improve industrial productivity, and contribute to the ongoing modernization of Uzbekistan’s logistics and manufacturing infrastructure.

CONCLUSIONS AND RECOMMENDATIONS

Automated Guided Vehicle (AGV) systems have evolved from rigid, path-following machinery into highly intelligent, flexible, and autonomous components of the modern smart warehouse. By leveraging advanced navigation methods such as SLAM, integrating seamlessly with WMS platforms, and utilizing high-speed 5G connectivity, AGVs address the core challenges of modern intralogistics, including operational throughput, safety, and scalability. While initial capital barriers and integration requirements remain significant, the long-term operational efficiency and financial returns make automation an increasingly attractive solution. For emerging industrial economies such as Uzbekistan, the adoption of AGV technology represents not merely a futuristic upgrade but a strategic opportunity to strengthen global competitiveness and support the country's position in the future of international supply chains.

REFERENCES

1. Decree of the President of the Republic of Uzbekistan. (2020). *On Approval of the Strategy "Digital Uzbekistan — 2030" and Measures for Its Effective Implementation*. No. UP-6079. https://lex.uz/ru/docs/5031048
2. Kubasáková, I., Kubáňová, J., & Benčo, D. (2026). The implementation of automated guided vehicles in logistics processes in a production company: A case study. *Sustainability, 18*(1), 538. https://doi.org/10.3390/su18010538
3. Shi, Y., Bai, J., Zhou, M., Cheng, J., Zhu, X., Zuo, X., & Ji, R. (2025). The effect of autonomous mobile robots on improving endoscope reprocessing efficiency: A prospective comparative trial. *Gastrointestinal Endoscopy*. In press.
4. *Types of AGVs (Automated Guided Vehicles): Components and Benefits.* https://www.iqsdirectory.com/articles/automated-guided-vehicle/types-of-agvs-automatic-guided-vehicles.html
5. *AGV Warehouse Automation Guide: Expert Insights for 2026.* https://automate-x.com.au/knowledge-hub/agv-warehouse-automation

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