USE OF INFORMATION TECHNOLOGIES IN PASSENGER TRANSPORTATION PROCESSES IN TRANSPORT SYSTEMS

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Annotatsiya: Ushbu maqolada shahar transport tizimlarini rivojlantirish va ularni zamonaviy axborot texnologiyalari bilan uyg‘unlashtirish masalalarini keng yoritib berilgan. Maqolaning dolzarbligi shundaki, axborot-kommunikatsiya texnologiyalari yordamida transport xizmatlarini samarali boshqarish, yo‘lovchilar oqimini optimallashtirish va shahar muhitida qulay harakatlanish imkoniyatlarini yaratish bugungi kunning eng muhim vazifalaridan biri hisoblanadi. Natijada, ilg‘or xorijiy tajribalar tahlil qilinib, ularni mahalliy sharoitlarga moslashtirish yo‘llari ko‘rib chiqilgan, mavjud muammolar aniqlanib, ularni bartaraf etish bo‘yicha tavsiyalar berilgan. Shuningdek, sohani tizimli o‘rganish, mustaqil amaliy ko‘nikmalarni shakllantirish hamda raqamli transformatsiyani jadallashtirish orqali shahar yo‘lovchi transportini barqaror rivojlantirish muhimligi ta’kidlangan.

Kalit so‘zlar: Modellashtirish, obyekt, servis, RTI, IVHS, ASU SHPT, metodika, progressive, component, dispetcher.

Аннотация: В данной статье широко освещены вопросы развития городских транспортных систем и их гармонизации с современными информационными технологиями. Актуальность статьи заключается в том, что эффективное управление транспортными услугами с помощью информационно-коммуникационных технологий, оптимизация пассажиропотока и создание возможностей для комфортного передвижения в городской среде является одной из важнейших задач сегодняшнего дня. В результате был проанализирован передовой зарубежный опыт, рассмотрены пути их адаптации к местным условиям, выявлены существующие проблемы и даны рекомендации по их устранению. Также была подчеркнута важность устойчивого развития городского пассажирского транспорта путем систематического изучения отрасли, формирования самостоятельных практических навыков и ускорения цифровой трансформации.

Ключевые слова: Моделирование, объект, сервис, RTI, IVHS, ASU SHPT, методика, progressive, component, диспетчер.

Abstract: This article extensively covers the development of urban transport systems and their integration with modern information technologies. The relevance of the article lies in the fact that one of the most crucial tasks today is the effective management of transport services using information and

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communication technologies, optimizing passenger flow, and creating opportunities for convenient mobility in the urban environment. As a result, advanced foreign experiences were analyzed, ways to adapt them to local conditions were examined, existing problems were identified, and recommendations for their elimination were provided. The importance of sustainable development of urban passenger transport through systematic study of the field, formation of independent practical skills, and acceleration of digital transformation was also emphasized.

Keywords: Modeling, object, service, RTI, IVHS, ASU SHPT, methodology, progressive, component, dispatcher.

Introduction

After the Republic of Uzbekistan gained independence, economic reforms began to be consistently implemented. Thus, the automotive industry was established, the road construction sector was accelerated, and trade relations with foreign countries reached a high level. The organization of traffic safety on highways is becoming one of the most important problems today. Urban passenger transport belongs to the class of spatially distributed objects from the point of view of control dispatching, the application of which is limited to the study of typical mathematical methods of modeling and optimization [1].

All this requires a scientifically based methodology and modern mathematical apparatus within the framework of an integrated information computer system with the active inclusion of service components. Service components ensure the interaction of vehicles in making management decisions in the dispatch control system [2].

Local and foreign experience has shown that the most pressing problems of increasing the efficiency of transport in large cities are the need to automate and optimize planning processes using mathematical models and computer modeling.

The complexity of this problem lies in the multifunctionality of the transport system, the decentralization of planning and management, the dynamic and probabilistic nature of the processes being studied, the activity of the management object, which requires consideration of numerous psychological and socio-economic factors [3].

The specifics of the relevance of the problem under consideration are that specialists in the organization of independent management, ensuring road safety, planning of freight and passenger transportation, road design, and transport urban planning are engaged in the study of various aspects of the functioning of the transport system [4]. This leads to the creation of a number of independent transport disciplines and directions of the transport network, which can operate

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until various systems independently perform tasks. Thus, to solve any task of planning and automating transport processes, it is necessary to apply interconnected factors that determine the nature of the functioning of the entire transport system. In addition, there are repetitions in technological, variational, and theoretical development of experiments.

Methodology. In addition, there are technological variations and repetitions in the theoretical development of experiments.

The newly designed and implemented automated control system in urban passenger transport often operates with insufficient justification [5,6]:

1) selection of the structure of the system;
2) demand for information;
3) technical and programming requirements.

In the context of implementing an automated control system, modeling can be one of the methods for comparing alternatives and selecting the control effect on the system when deviating from the normal state. Modeling methods are widely used in conventional control circuits.

One of the important conditions for increasing the quality of satisfaction of the demand for the transportation process of the population of large cities and improving the economic indicators of urban public passenger transport is increasing the efficiency of operational dispatch control of traffic. This makes it possible to fully utilize the potential of the city's public passenger transport network to provide full transport services to the city's population [7].

Increasing the efficiency of operational dispatch control of urban public transport movement based on increasing the level of automation and introducing new information technologies ensures the development and implementation of an automated control system and control of urban passenger transport movement. The creation of an automatic transport control system (ACS) is not a simple task of an automated control system for a corresponding subsystem of the transport complex. In addition, the use of modern satellite systems in transport, which include other new rapid (progressive) technologies for controlling moving objects in transport, is of great importance; they include other advanced technologies for controlling moving objects actively used in various transport routes of large foreign cities, for example, RTI, IVHS - in vehicle traffic control technologies [8].

Such information technologies are of current importance in the countries of the Commonwealth of Independent States (CIS), the Collective Security Treaty (CSTO), and the Eurasian Economic Union (EAEU). Their application is based on the provision of transport services to the population based on the principles of automation of transport management of large cities and regions, the creation of

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automated systems for managing transport enterprises, and the automation of transport logistics, service logistics, and logistics systems.

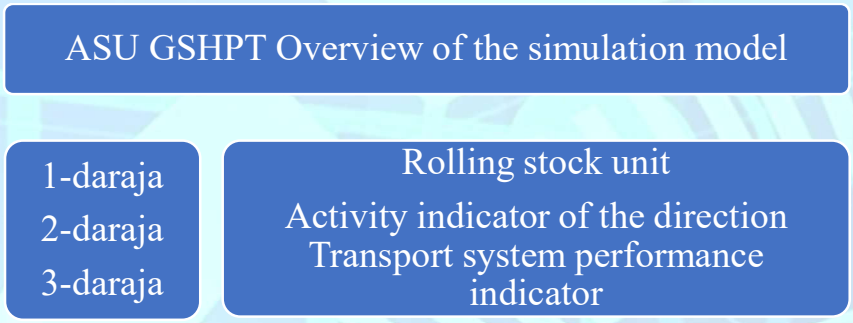


Fig 1. Overview of the simulation model of the ASU GSHPT

The general view of the simulation model of the work of the ASU SHPT can be represented at several levels. Each level of such a system must have its own simulation model. In this case, the input data for the model can be output data from another model at any level, i.e., provide for feedback. Since the main link of the route transport system is a route consisting of vehicles, the following method is used.

Results and Discussion

The integration of information technologies (IT) in passenger transportation systems has emerged as a critical factor in improving urban mobility, enhancing service efficiency, and optimizing the user experience. The findings of this study underscore the transformative impact of IT applications across multiple layers of transportation management, particularly in real-time data processing, route optimization, ticketing systems, and passenger information services.

One of the key results observed is the improved efficiency in route planning and fleet management. Advanced GPS-based systems and AI-driven analytics enable transport operators to monitor traffic conditions in real time and dynamically adjust routes to reduce delays. This has not only minimized idle times for vehicles but also led to better allocation of resources and lower operational costs. Furthermore, predictive analytics assist in understanding peak travel hours and planning service frequency accordingly, ensuring better responsiveness to passenger demand.

The implementation of smart ticketing systems, such as contactless cards and mobile payment platforms, has significantly reduced queuing times and improved the overall passenger experience. These systems also generate valuable data that can be used to understand travel behavior and enhance planning. In cities where such technologies have been fully integrated, public satisfaction rates have shown a notable increase.

From the passenger's perspective, mobile applications and digital platforms

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providing real-time information on bus/train arrival times, seat availability, and estimated travel duration have made commuting more convenient and predictable. This transparency strengthens trust in public transport and encourages greater usage, thereby contributing to reduced traffic congestion and environmental sustainability.

International case studies—such as those from Singapore, London, and Seoul—demonstrate how the strategic use of IT can revolutionize public transportation. For example, Seoul's transportation card system, integrated with a real-time vehicle tracking platform, allows passengers to transfer seamlessly across various modes of transport while also enabling the city administration to monitor and adjust service delivery dynamically. Similarly, London's use of big data and AI for managing underground and bus systems has resulted in measurable reductions in travel time and carbon emissions.

However, challenges remain, especially in developing regions. The digital divide, lack of infrastructure, and limited funding can hinder the deployment of IT-based solutions. Additionally, issues such as cybersecurity, data privacy, and system interoperability need to be addressed to ensure the resilience and safety of these systems.

In the context of Uzbekistan and similar countries in transition, the adoption of IT in passenger transport is progressing, but at a measured pace. Pilot projects in major cities have shown promising results, but broader implementation requires policy support, investment in infrastructure, and public-private partnerships. Capacity-building and training of transport professionals in digital tools are equally essential for sustaining these innovations.

The utilization of information technologies in passenger transportation significantly enhances system efficiency, passenger satisfaction, and urban sustainability. While developed nations provide proven models, adapting these practices to local conditions, addressing implementation barriers, and ensuring inclusivity are crucial for long-term success. Strategic planning, investment, and stakeholder collaboration will be the key drivers in realizing smart and responsive transportation systems of the future.

Conclusion. Along with the functioning of routes, the stage of activity of the transport system is organized and studied based on various technologies, which allows for a number of opportunities in passenger urban planning and their use. The introduction of information technologies in the field of passenger transportation, increasing the level of automation and increasing the efficiency of operational dispatch control of urban public transport based on the introduction of new information technologies, ensures the development and implementation of an

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automated control system and control of urban passenger transport.

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