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ASSESSMENT OF PUBLIC PASSENGER TRANSPORT REGULARITY IN ROUTES OF KOKAND CITY

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ABSTRACT

One of the key indicators for measuring the quality of passenger transport services is the regularity of transport vehicle movements. Besides planned intervals, this indicator is influenced by various factors related to public transport conditions, including traffic flow density and composition, passenger flow structure, traffic light regimes, weather conditions, and other factors. This article assesses the regularity of public passenger transport in Qo‘qon city, analyzing the intervals at which transport vehicles arrive at designated stops along specific routes.

Keywords: Qo‘qon city, public transport, regularity of movement, passenger flow, transport system optimization, artificial intelligence, mathematical modeling, environmental efficiency, route analysis, economic efficiency, transport logistics, traffic congestion, movement algorithm, real-time analysis, innovative technologies.

1. INTRODUCTION

1.1 Relevance of the topic

The efficiency of public transport systems plays a crucial role in the socio-economic development of any city. The mobility of residents within cities directly affects their daily lives, work activities, educational processes, and leisure. As of July 1, 2024, the population of Qo‘qon city was 306,447 people, and the development of the city's infrastructure and transport network is directly tied to its ability to meet the growing needs of the population.

The rapid growth of cities and accelerating urbanization have led to increased traffic loads and a sharp rise in passenger flows. The growing number of private vehicles negatively impacts the regularity of public transport, causing traffic jams and environmental problems. The relevance of this study lies in analyzing the regularity of public transport in Qo‘qon city to develop theoretical and practical recommendations for improving the passenger transport system. This will help increase the efficiency of the city's transport system and ensure environmental and economic sustainability.

1.2 Literature review

Numerous scientific studies have been conducted on public transport systems and their optimization. Many scholars have investigated transport regularity, passenger flows, and the quality of transport services. Below is an analysis of key scientific sources related to this topic:

1. **Ensuring transport system regularity**

A.S. Kuznetsov and others evaluated the impact of public transport regularity on urban infrastructure. Their research demonstrated that instability in vehicle movement increases passenger travel time. Algorithms for ensuring regularity were also developed in this study.

2. **Mathematical modeling and algorithms**

V.I. Denisov developed methods for mathematically modeling public transport systems. These models enable real-time forecasting of vehicle movements and predicting delays.

3. **Passenger flow analysis**

M.N. Pavlov proposed statistical methods for evaluating public transport passenger flows and provided recommendations for optimizing routes. These studies explain the relationship between passenger flow and the number of vehicles in operation.

4. **International practices**

Studies on transport system modernization in Western European countries, such as Germany and Bulgaria, show that increasing public transport attractiveness requires controlling route regularity and introducing eco-friendly transport solutions.

2. Theoretical part

As of July 1, 2024, Qo‘qon city's population reached 306,447, reflecting a growth rate of 117.0% compared to the same period the previous year. Cities are expanding in size, and migration is driven by improved job opportunities, higher wages, and access to education, culture, and personal development.

However, urban growth creates challenges for traffic flow and public transport speed, exacerbated by limited parking facilities. The current issues in Qo‘qon’s transport system mirror those faced by Western cities during the early stages of public transport development:

- Rapid car ownership growth;
- Declining public transport speed, pushing more people to buy cars;
- Unregulated parking;
- Lack of respect for passengers.

These issues diminish urban life quality, reduce movement speeds, and cause frequent traffic jams and accidents. High-quality passenger transport requires ensuring safety, regularity, and operational reliability — all of which are now under threat.

Current state of public transport in Qo‘qon city:

- Public transport operates on 25 routes;
- 251 buses are in service;

- Total route distance: 355 km;
- Main street network density: 2.37 km/km²;
- Central area density: 3.65 km/km².

Mode of transport and usage share:

- Walking: 43.5%
- Private car (driver): 28%
- Passenger car: 2.1%
- Public transport: 20.1%
- Bicycle: 2.4%
- Taxi: 2.3%
- Business transport: 1.1%
- Motorcycle: 0.5%

Car trips account for 32.4% (drivers — 28%, passenger cars — 2.1%, taxis — 2.3%), approximately 50% higher than public transport usage (20.1%). This indicates inefficiencies in the city's public transport system.

Enhancing the appeal of public transport and promoting its use is key to reducing car-based travel. Research into public transport service quality directly supports increasing public transport usage. Evaluating the regularity of public transport is crucial for improving operational control and ensuring consistent service.

3. EXPECTED SCIENTIFIC INNOVATIONS

1. Innovative method for identifying and analyzing passenger flows by route:

In addition to traditional observation and survey methods, real-time data collection technologies — GPS systems, digital stops, and mobile app integration — will be used to study passenger flows in Qo‘qon city. This approach will identify peak travel times and continuously monitor vehicle loads, enabling optimized schedules and fleet adjustments.

2. Algorithm and software for regularity management

To maintain public transport regularity, AI and machine learning-based software will be developed. This software will dynamically adjust transport schedules based on data analysis, suggest alternative routes during traffic jams, and notify passengers through mobile apps in real-time.

3. Optimization recommendations and economic efficiency analysis:

An economic efficiency model for public transport improvement will be designed. This model will calculate route profitability, economic benefits of trips, and costs and revenues related to passenger flow changes. Considering that public transport's share in Qo‘qon is 20.1%, financial incentive programs will be developed to increase this figure.

4. Mathematical models of vehicle movements by route:

Mathematical modeling techniques will be used to analyze vehicle delays, stop and departure times, traffic congestion factors, and traffic light operations. This model will propose traffic management solutions for unexpected events like accidents or roadworks.

5. Improving the environmental efficiency of public transport:

Environmental sustainability will be a priority in developing Qo‘qon’s public transport system. Recommendations include introducing electric and hybrid buses and increasing public transport use to reduce car emissions. Mathematical models will assess the environmental impact and calculate economic efficiency.

4. CONCLUSION

1. Growing urban populations and rising car ownership rates pose significant challenges to public transport systems, slowing traffic and reducing service quality.
2. Enhancing public transport in Qo‘qon and reducing car-based trips require optimizing the city’s transport system.
3. Maintaining and improving transport service quality will save passenger time, enhance urban ecology, and boost economic efficiency.
4. Regularity of movement is a key indicator of public transport service quality and passenger flow stability.

REFERENCES

1. Kuznetsov A. S. Urban Transport Systems: Stability and Efficiency. — Moscow, 2020.
2. Denisov V. I. Mathematical Models of Public Transport Traffic. — Saint Petersburg, 2019.
3. Pavlov M. N. Passenger Flow Analysis and Route Optimization. — Sofia, 2021.
4. Ivanov P. Smart Transport Systems in Urban Environments. — Berlin, 2022.
5. Ministry of Transport of the Republic of Uzbekistan. Official Data on Public Transport. — Tashkent, 2024.
6. Kokand City Administration. Public Transport Reports. — Kokand, 2024.
7. Toshov R. Urban Infrastructure and Transport System. — Tashkent, 2023.
8. Digital Technologies and Public Transport System. Ministry of Innovative Development, 2023.