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Збірник містить тези доповідей науковців вищих навчальних закладів України та інших країн, підприємств транспортної та машинобудівної галузей за чотирьма напрямками: розвиток інтелектуальних технологій при управлінні транспортними системами; транспортні системи та логістика; інтелектуальне проектування та сервіс на транспорті; функціональні матеріали та технології при виготовленні та відновленні деталей транспортного призначення.

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«ATTO» ЯК ІНСТРУМЕНТ СТВОРЕННЯ ЄДИНОГО ТАРИФНОГО ПРОСТОРУ МІЖ МІСЬКИМ І ПРИМІСЬКИМ ТРАНСПОРТОМ

«ATTO» AS A TOOL FOR CREATING A UNIFIED FARE SPACE BETWEEN URBAN AND SUBURBAN TRANSPORT

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Modern trends in urbanization require effective interaction between urban and suburban public transport systems. In Tashkent, a partial digital integration system for urban transport services based on the unified ATTO transport card has already been implemented. It enables passengers to pay for rides and receive fare compensation for transfers between different modes of transport (bus and metro) within one hour. However, the system currently does not cover suburban railway routes, which creates fragmentation and increases total transport costs for passengers, especially those commuting daily between suburban and urban areas.

In the city of Tashkent, partial tariff integration through the ATTO card already allows discounts for transfers between modes of urban transport. However, suburban railway routes remain outside this system. Expanding the current framework to include railway routes is necessary to establish a single tariff zone and promote the use of public transport.

Currently, passengers can use the ATTO transport card for cashless payments on urban transport, where the compensation system operates as follows [1]:

- *Start of accounting period:* from the first card validation;
- *Compensation window duration:* 1 hour;
- *Additional limit:* 30-minute restriction for repeated validation on the same bus;
- *Repeated metro entry:* not compensated — considered a new trip.

On suburban electric trains of the Tashkent Railway Junction, fares are paid by purchasing one-time tickets at station ticket offices or directly from the conductor at intermediate stops. Payment can also be made via mobile terminals using ATTO transport cards or online bank cards [2]. Despite these digital tools, integration between the city and suburban fare systems remains incomplete.

The purpose of this methodology is to develop a mathematically and logically justified framework for calculating the integrated tariff, allowing suburban train travel to be recognized as part of the general route within the city transport network. The methodology takes into account transfer timeframes, existing discounts, digital payment validation, and the technical capabilities of processing data from the ATTO card.

The key tasks include:

- Formalizing the concept of *integrated travel* and defining the criteria for discount recalculation;
- Developing an algorithm that recognizes transfers between urban and suburban transport as a single route;
- Establishing a fair and economically balanced discount applicable under specific transfer conditions;
- Preparing a calculation formula for automated fare systems;
- Developing practical examples to test the methodology's effectiveness in real Tashkent conditions.

The methodology is designed for digital implementation through the ATTO transport card, which is already used on most urban routes and supported by mobile terminals in suburban trains. Thus, the calculation of the integrated tariff is based on principles of fairness, passenger convenience, and technical feasibility.

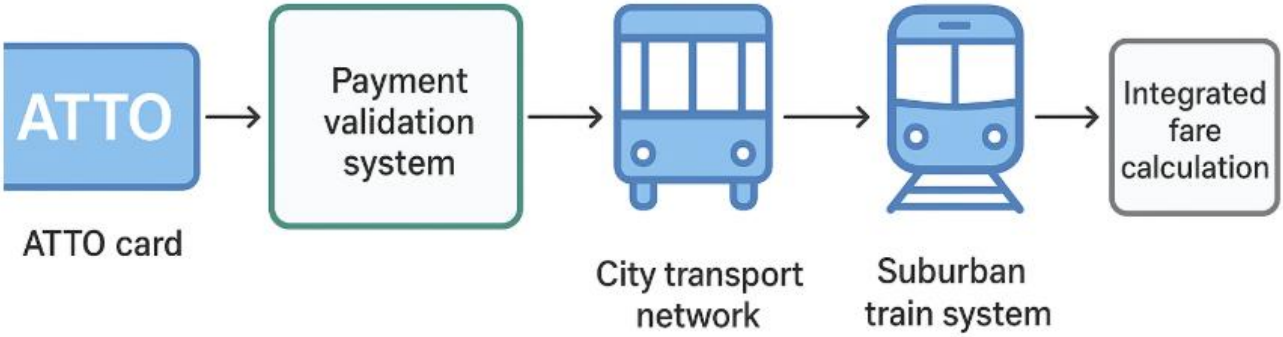

Figure 1. The role of the ATTO system in forming a unified fare space between urban and suburban transport.

Analysis shows that the ATTO system already supports digital validation and mobile terminal use on suburban routes, providing a technical foundation for unified tariffing. However, three main obstacles remain [3]:

1. Lack of automatic data transmission on train travel to the ATTO system;
2. Absence of software logic for recognizing train transfers within the hourly compensation framework;
3. Lack of unified ticketing and fare schemes.

These issues lead to duplicate payments when transferring from urban to suburban transport, increasing total passenger costs. As a result, a tariff gap arises: passengers transferring from bus to train pay twice — 1,700 soums per bus ride (or 1,100 soums with a transfer discount) plus the train fare, which currently excludes any transfer discount.

The conducted analysis indicates that the ATTO transport card possesses the essential technical infrastructure required for the integration of suburban transport services into the existing urban fare system. By introducing updated software modules and refined tariff calculation algorithms, it becomes feasible to establish a unified

digital fare platform, within which suburban train journeys are recognized as a continuous segment of the overall transport route.

The implementation of such a system is expected to reduce passengers' total travel expenditures, streamline the processes of payment and transfer validation, and encourage the wider use of public transport for extended commuting distances. Thus, the proposed methodology constitutes both a theoretical foundation and a practical framework for achieving comprehensive tariff integration between urban and suburban transport modes in Tashkent, thereby contributing to the development of a seamless, efficient, and passenger-oriented public transport network.

[1] ATTO Transport Card // JSC Avtomatlashtirilgan Transport to'lov tizimi Operatori : official website. URL: https://www.atto.uz/ru/passengers (date of access: 09/26/2025).
[2] Payment by bank cards and ATTO transport cards has been launched in electric trains // Vzglyad.uz. URL: https://vzglyad.uz/ru/post/2024/02/29/v-elektropoezdahzapustili-oplatu-bankovskimi-kartami-i-transportnymi-atto/ (date of access: 09/26/2025).
[3] Diyorakhon Z. Ikramova. Socio-economic rationale of an integrated tariff for urban and suburban transportations in Tashkent // Инновационный транспорт №3 (57), ISSN 2311-164X.