

## Optional Expansion of The Automated Fare Collection System in Public Transportation

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### ABSTRACT

The subject of this research is the automated fare collection system and the possibility of its expansion. The purpose of the work is the optional expansion of the automated fare collection system in public transport of the city of Kharkiv to improve the transport network based on the use of GPS tracker. The following tasks are solved in the article: analysis of the existing automated fare collection system, construction of the structure of the automated system, construction of the data exchange model between the server and the devices validating the system, assessing the capabilities of the existing system, developing an extension for further improvement of the system. The following methods are used: process modeling using the IDEF0 charts. The following results were obtained: The article proposes an optional extension of the automated fare collection system for public transport in the city of Kharkiv to improve the transport network based on the use of GPS tracker. The analysis of the working system and its possibilities is carried out, namely: the analysis of data flow exchange in the existing system has been performed in order to identify the possibilities of its expansion; the structure of the existing system of automated payment of travel has been developed. The proposed expansion is characterized by minimal costs, since it is based on an already functioning system, which enables the provision of full dispatching and logistics of public transport in the city of Kharkiv using the subsystem of analysis and processing of information. The system is characterized by the ability to optimize the route network by collecting and analyzing the statistics of travel paid, passenger traffic and behavioral models of passengers, as well as information on road conditions and routes. Conclusions: The proposed expansion of the automated payment system for public

transport in the city of Kharkiv can be applied without changing the hardware base of the system, and will also achieve results such as increasing road safety, reducing time and energy resources costs for travel, improving vehicle comfort, increasing the competitiveness of carriers, improving public transport image.

**Key words:** automated fare collection system, automatic payment systems, GPS, electronic travel document, IDEF0.

### 1. INTRODUCTION

Nowadays, the lives of most citizens of the world is closely connected with the use of information systems. Due to the significant advances in information technology, the transport sector is undergoing significant changes: from smart ticket payments to new initiatives multimodal mobility and autonomous vehicles.

There is a rapid increase in the popularity of cashless settlement [20]. At the time when most financial settlements can be made even without leaving home, it becomes obvious that the method of payment of travel in transport with the help of a paper ticket is completely outdated.

This article presents solutions for increasing the efficiency of the use of the existing automated fare collection system (AFC)..

#### 1.1 Final Stage

A wide range of publications on this subject emphasizes the importance and relevance of this study. The articles in different areas of improvement of the AFC were analyzed. Thus, the work of Carmelo R. Garcia and Ricardo



