ABSTRACT

Explanatory note size – 164 pages, contains 44 illustrations, 1 table, 4 appendices, 34 references.

Topicality. Examines the problem of effective management and monitoring of objects in modern logistics and industrial systems. The main features of existing solutions, their advantages and disadvantages are shown. The need for improvement of automated identification processes by integrating IoT devices with machine learning methods for movement prediction is revealed .

The aim of the study. The main target is to create a scalable, reliable, and flexible identification and monitoring system capable of working with various IoT devices, ensuring automation of data collection, and analyzing object movement using machine learning models.

The object of research: software for object identification and monitoring.

The subject of research: processes of development, modification, analysis, quality assurance, implementation, and maintenance of software for automated identification and tracking of objects.

To achieve this goal, the following tasks were formulated: − analysis of existing identification methods and review of modern IoT platforms; − design of the microservice system architecture and selection of the technology stack; − development of software and a hardware prototype based on ESP8266; − implementation of a machine learning module for anomaly detection and route prediction.

The scientific novelty of the results of the master's dissertation is that an architectural solution for building an intelligent monitoring system is proposed, which, unlike existing analogs, combines event-driven communication (MQTT) with graph analytics and deep learning. The result is achieved by developing a prediction module that allows detecting structural and temporal anomalies in object movement in real time .

The practical value of the obtained results is that the implemented methods are combined within a single application and ensure a full data processing cycle:

from reading an RFID tag to visualizing the route on a map. A REST API interface has also been implemented, through which third-party services can easily receive and apply algorithm results. The developed service can be applied in logistics, industry, warehouse complexes, transport networks, supermarkets, security systems, and other environments where movement control and the ability to predict object behavior are important.

Relationship with working with scientific programs, plans, topics. Work was performed at the Department of Informatics and Software Engineering of the National Technical University of Ukraine «Kyiv Polytechnic Institute. Igor Sikorsky».

Approbation. The scientific provisions of the dissertation were tested at the IX International Scientific and Practical Conference of Young Scientists and Students "Software Engineering and Advanced Information Technologies" (SoftTech-2025) - Kyiv.

Keywords: IOT, RFID, JAVA, SPRING BOOT, MQTT, MACHINE LEARNING, MICROSERVICES.