

ABSTRACT

Explanatory note size – 115 pages, contains 21 illustrations, 15 tables, 6 applications, 71 references.

Topicality. The paper examines the problem of maintenance of evolving hybrid intelligent systems (EHIS) and considers the main features of existing methods and tools. The prospects of using methods of predictive maintenance based on the detection of anomalies in relation to EHIS maintenance have been revealed. The need for the development of an improved maintenance method and a tool that implements this method has been identified.

The aim of the study. The main target is to increase the maintainability of evolving hybrid intelligent systems due to the improvement of the method of maintenance and the development of a tool for maintenance that implements this method.

The object of research: software of hybrid intelligent systems.

The subject of research: methods and tools for maintenance of the software of evolving hybrid intelligent systems.

To achieve this goal, the **following tasks** were formulated:

- analysis of methods and tools for maintenance of EHIS;
- development of an improved method for maintenance of EHIS;
- creation, debugging and testing of a prototype of the tool for maintenance of EHIS that implements the developed method;
- evaluation of the effectiveness of the developed method;
- proposition of possible directions for further research.

The scientific novelty of the results of the master's dissertation is the improvement of the method for maintenance of EHIS and the anomaly detection model used in this method. The method was improved by adding three new stages: the stage of saving data and notification about anomalies; stage of receiving feedback; stage of model retraining. The model was improved by introducing an ensemble of detectors and applying linear regression

to update detector weights during model training. The resulting model can work without initial training, but can improve accuracy during training. As a result of the experiments, it was found that the improved model detects collective anomalies significantly better than the initial model, and the accuracy of the improved model after training can be several times higher than the accuracy of the initial model.

The practical value of the obtained results is the development of a tool for maintenance of EHIS in the form of two modules: a library that can be installed from the PyPI package repository, and a Django web application that provides an interface for convenient configuration and management of models used for EHIS maintenance. The developed tool can be used for predictive maintenance of EHIS.

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 Fourth Scientific and Practical Conference of Young Scientists and Students «Software Engineering and Advanced Information Technologies» (SoftTech-2023) – Kyiv.

Publications. The scientific provisions of the dissertation were published in:

- 1) Pokhylenko O. A., Baklan I. V. Maintenance of Evolving Hybrid Intelligent Systems. *Scientific notes of Taurida National V.I. Vernadsky University. Series: Technical Sciences*. 2022. Vol. 33 (72), No. 1. P. 175-181.
- 2) Pokhylenko O. A., Baklan I. V. Method and Tool for Maintenance of Evolving Hybrid Intelligent Systems. *Proceedings of the IV International Scientific and Practical Conference of Young Scientists and Students «Software Engineering and Advanced Information Technologies (SoftTech-2023)» dedicated to the 125th anniversary of KPI. Igor Sikorsky*. May 9–11, 2023, Kyiv. (under review).

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