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ОПТИКО-ЭЛЕКТРОННЫЕ ПРИБОРЫ И УСТРОЙСТВА В СИСТЕМАХ РАСПОЗНАВАНИЯ ОБРАЗОВ И ОБРАБОТКИ ИЗОБРАЖЕНИЙ

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3. Zhang Z. Multiple imputation with multivariate imputation by chained equation (MICE) package // Annals of Translational Medicine. 2016. Vol. 4, no. 2. P. 30. DOI 10.3978/j.isssn.2305-5839.2015.12.63.

4. Li J. UCI ML Drug Review dataset // Kaggle.com. URL: https:// www.kaggle.com/datasets/jessicali9530/kuc-hackathon-winter-2018 (accessed 18.04.2025).

5. Breast cancer risk detection using xgb classification machine learning technique / P. Nagaraj, M. Dass Venkat, E. Mahender, K. R. Kumar // 2022 IEEE International Conference on Current Development in Engineering and Technology (CCET). Bhopal, India: IEEE, 2022. DOI 10/1109/CCET56606.2022.10080076.

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Detection of incidents that occur during the operation of the software system

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Abstract. *The main goal of software system maintenance is to preserve the functionality of the software system over time. The main goal of the work is to explore the software system maintenance process and its main issues.*

Keywords: *detecting of incidents; sowtware systems.*

Software system (SS) maintenance is an integral part of the software system life cycle.

Software efficiency (ISO/IEC standard 25010: 2011 (R ISO/MEK 25010-2015 state standard) defines the quality model of the product as it includes eight top-level features (Fig.1) [1].

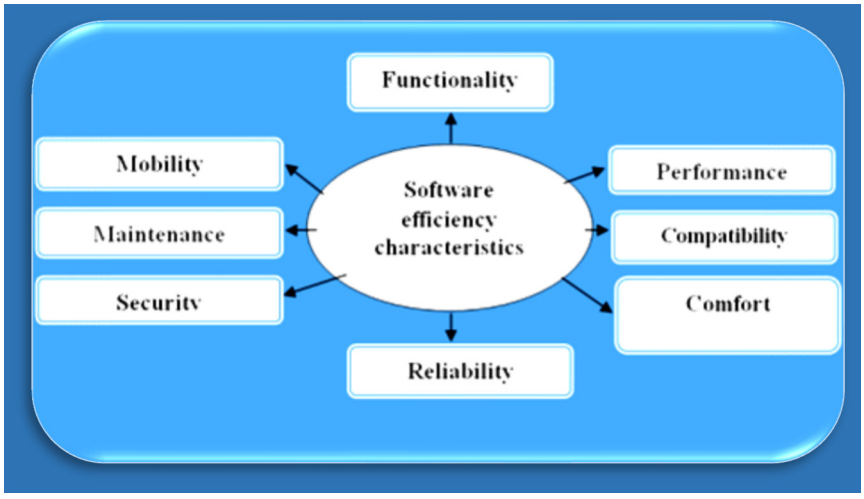

Fig. 1. Software efficiency

Problem statement. The main goal of the work is to explore the SS monitoring process and its main issues.

SS maintenance is an integral part of the software system life cycle. It includes the process of debugging, optimizing, and correctingdefects of software after its commissioning. It is possible to add new functions to improve the application of SS by making changes to the program to correct the defects discovered during the operation [2].

In software engineering, the life cycle of a software system is a sequence of steps for designing and developing software. During these stages, program maintenance plays an important role. After the delivery of the software system, certain changes are required on it for some reasons. These changes may be related to the presence of bugs in the program, expansion of the software functionality, etc. The main purpose of supporting the software system is to eliminate the problems arisen. This paper touches upon these issues and studies the process of maintaining the software system. The problems appeared during the software system maintenance are identified.

The main goal of the software system life cycle is to develop a high-quality, effective and efficient SS that meets user requirements. To organize SS quickly and efficiently, its life cycle is grouped into different stages. The number of these stages varies depending on the purpose for which the software system is designed and used. This often number varies between five and seven

There are different models of SS life cycle and which model to choose depends on the given project. Every software engineer should have enough knowledge in this area to choose the appropriate software life cycle model based on the project content and requirements. In these models, the last and most important stage of the life cycle of a software system is its maintenance.

The main goal of the SS maintenance is to preserve the performance of the SS over time. TheSSmaintenance is one of the broad issues, which includes the detection and correction of errors that have arisen after the delivery of the software system to the customer, increase of work capacity, removal of obsolete functions, optimization, etc. The cost of theSSmaintenance is more than 20-25% of the total cost of the software [3].

Choosing the right model is of great importance for the successful development and completion of the project. The choice appropriate model mainly depends on the requirements, system complexity, project size, cost, etc. Each model has its own stages.

Collection of requirements set by the user – This stage collects information from the user about software to be created and for what purpose it will be used. Requirements are grouped as user requirements, system requirements, and functional requirements. Fig.2 presents these requirements [4].

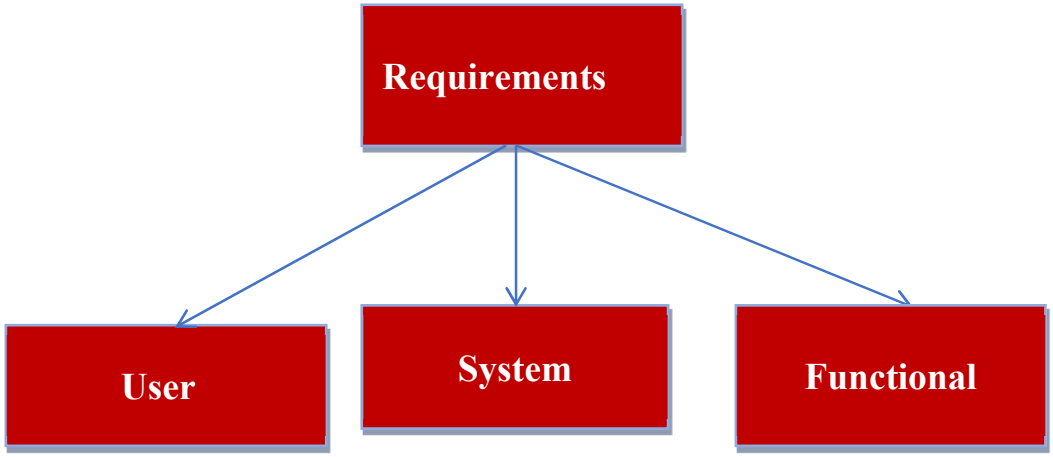

Fig. 2. Software requirements

Maintenance, which is the last phase of the SS life cycle, is one of the main issues. Meir.M. Lehman spoke for the first time about the accompaniment of SS and its evolution in 1969. His two decades of research resulted in the validation of Lehman's laws. Based on his research and key findings, tracking helps software development and understanding what happens to a software system over time. Lehman demonstrated that systems evolve over time.

References

1. Mahmudova S. Application of the TOPSİS method to improve software efficiency and to optimize its management // Soft Computing. 2020. Vol. 24, no. 1. P. 697–708.

2. Aakriti G., Shreta S. Software Maintenance: Challenges and Issues // International Journal of Computer Science Engineering. 2015. Vol. 4, no. 1. P. 23–25.

3. Mohammad Ikbal H. Software development life cycle (SDLC) // Methodologies for Information Systems Project Management. 2023. Vol. 5, no. 5. P. 1–36. DOI 10.36948/ijfmr.2023.v05i05.6223.

4. Oberhauser R. VR-SDLC: A context-enhanced life cycle visualization of software-or-systems development in virtual reality // Business Modeling and Software Design.BMSD. Lecture Notes in Business Information Processing. Springer. Cham, 2024. P. 112–129. DOI 10.1007/978-3-031-64073-5_8.

5. Stuti D. Importance of software maintenance / Alpha Information Systems is the Global Pioneer. 2024. URL: https://www.aalpha.net/articles/ importance-of-software-maintenance (accessed 30.04.2025).