Sobol B.V., Vasiliev P.V.

Application of Artificial Intelligence to Solve the Problems of Monitoring and Assessingthe Technical Condition of Building Structures and Their Members

Abstract: At the moment, a large number of buildings, infrastructure facilities and critical structures that require special attention to their operational safety and control of their structural integrity are being operated in the Russian Federation. With the growth of the above factors, there increases the need to monitor and assess the technical condition of new and existing facilities, as well as to provide a reliable control system.

This paper studies the scientific problem of improving the efficiency and accuracy of monitoring the condition of building structures. The existing methods of control and diagnostics do not always provide the sufficient reliability and early detection of the defects, which can lead to the serious consequences to the safety and durability of structures. This paper proposes the development and application of the mathematical models of nondestructive testing for the various building structures. This includes conducting the numerical experiments and generating a data set for further analysis and processing. Additionally, creation of the architectures, implementation and training of the neural networks for defect retrieval, classification, segmentation and determination of mechanical and geometric parameters thereof are foreseen.

Special attention is paid to detecting the internal and surface defects of the building structures based on a combination of the nondestructive testing and artificial neural networks methods. The development of a software system for processing and analysing the big data aimed at monitoring and assessing the critical condition of building structures and their members with subsequent analysis of their load-bearing capacity is also studied.

This paper reveals the potential of applying the innovative methods in the context of ensuring safety and operation reliability of the building structures. The work is a synthesis of advanced technologies and methods aimed at efficient monitoring and early detection of defects, which contributes to ensuring a high level of safety during operationof structures.