

PROBLEMS AND PROSPECTS OF ARTIFICIAL NEURAL NETWORKS APPLIED FOR IDENTIFICATION AND DIAGNOSTICS OF TECHNICAL OBJECTS

Neural networks are a branch of artificial intelligence that uses phenomena similar to those occurring in the neurons of living beings to process signals [4].

The main functions of artificial neural networks are:

1. an approximation function relevant for solving problems of modeling, identification and signal processing;
2. a function of classification and pattern recognition, relevant, for example, when solving problems of diagnosing the state of an object;
3. a forecasting function relevant when assessing the future behavior of the system according to the neurons of living beings for signal processing.
4. a function of classification and pattern recognition, relevant, for example, when solving problems of diagnosing the state of the object;
5. a forecasting function, relevant when assessing the future behavior of the system in accordance with available sequence of its previous states;
6. a function of identification and evaluation, relevant when solving problems of control of dynamic processes;
7. a function of associative control.

Analyzing foreign studies, we can conclude that the level of solving a large number of problems of analysis and synthesis of the automatic control system is lower than the level of needs and opportunities for the development of scientific and technical achievements. In particular, the problem of determining and localizing faults in an automatic control system designed on the basis of microcontrollers and microprocessors is urgent[1].

Also the study of foreign sources devoted to artificial neural networks and neurocomputers allows us to highlight the following promising areas of modern development of neural network and neurocomputer technologies:

1. neuro packages;
2. neural network expert systems;
3. signal and image processing;
4. management of dynamic systems and financial activities;
5. optical neurocomputers;
6. virtual reality systems.

Solving technical problems, such as, for example, identification of control objects, synthesis of regulators, diagnostics of faults, the use of artificial neural networks is still quite limited. This is partly due to the presence of a developed mathematical apparatus that describes the processes and phenomena occurring in objects, and partly to the presence of a large number of methods for solving these problems [2]. Despite this, in recent years, there has been a positive trend in terms of the use of artificial neural networks for solving problems of identification and diagnosing faults in technical objects.

The development and implementation of new non-trivial algorithms for operational diagnostics of technical objects and automatic control systems based on artificial neural networks will improve the reliability of devices and, at the same time, simplify their design by eliminating the so-called "hot backup", as well as reduce operating costs, maintenance costs and equipment repair. At the same time, when developing diagnostic algorithms and designing an automatic control system based on artificial neural networks, a number of problems have not yet been resolved, the main ones of which are the following:

1. lack of formal methods for choosing the type of artificial neural networks adequate to the class of problems being solved;
2. insufficient validity of the choice of optimization methods in the training procedure for artificial neural networks, which leads to large forecast errors and training time;
3. high combinatorial complexity of the problems associated with the automatic formation of the topology of artificial neural networks, which in many cases does not allow the creation of intelligent information technologies based on artificial neural networks with minimal complexity.

Currently, the most promising is the use of artificial neural networks for solving problems of diagnostics and forecasting, primarily in industries where there are no ways to formally describe the objects or phenomena under study [3].

To solve problems of identification and diagnostics of technical objects using artificial neural networks, it is necessary to develop formal methods for choosing an initial description of an object, such as artificial neural networks, a reasonable choice of a learning algorithm for artificial neural networks and optimization methods in the training procedure. In terms of artificial neural networks, the problem of identifying a technical object belongs to the class of approximation problems, and the problem of diagnosing faults belongs to the group of problems of classification and pattern recognition.

In recent years, there has been a tendency to move from software to software and hardware implementation of neural network algorithms.

On the part of modern software and hardware there are no restrictions on the complexity of the algorithms used, however, to realize the significant potential

capabilities that control systems based on artificial neural networks, it is necessary to develop conceptually new approaches to the construction of such systems [3].

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