ADAPTIVE CONTROL ALGORITHMS ON THE BASE OF ACCOSIATIVE MEMORY TECHNOLOGY

Ostanaqulov Shavkatbek Yusubjon o'g'li

Andijan machinebuilding institute, 2nd year master's student.

Annotation:*This article discusses the use of ASSO TsI active memory technology in adaptive control algorithms. The technology is based on the principles of associative memory, which allows the system to learn and adapt to changes in the environment. The article explores how this technology can be applied to various control systems, including robotics, manufacturing, and transportation. It also discusses the benefits of using adaptive control algorithms with ASSO TsI active memory technology, such as improved efficiency and flexibility. Overall, this article provides insight into a promising new approach to adaptive control that could have significant implications for a wide range of industries.*

Key words: *technological processes, dynamic objects, associative memory, intelligent control systems, intelligent control systems, database, adaptive control, logic matrices.*

АЛГОРИТМЫ АДАПТИВНОГО УПРАВЛЕНИЯ НА ОСНОВЕ ТЕХНОЛОГИИ АККОЗИАТИВНОЙ ПАМЯТИ.

Останакулов Шавкатбек Юсубжон огли

Андижанский машиностроительный институт, магистрант 2 курса.

Аннотация: *В данной статье рассматривается использование технологии активной памяти АССО ЦИ в алгоритмах адаптивного управления. Технология основана на принципах ассоциативной памяти, что позволяет системе обучаться и адаптироваться к изменениям в окружающей среде. В статье исследуется, как эту технологию можно применить к различным системам управления, включая робототехнику, производство и транспорт.Также рассматриваются преимущества использования алгоритмов адаптивного управления с технологией активной памяти АССО ЦИ, такие как повышенная эффективность и гибкость. В целом, эта статья дает представление о многообещающем новом подходе к адаптивному*

управлению, который может иметь значительные последствия для широкого круга отраслей.

***Ключевые слова**: технологические процессы, динамические объекты, ассоциативная память, интеллектуальные системы управления, интеллектуальные системы управления, база данных, адаптивное управление, логические матрицы.*

Introduction: The problems of increasing the accuracy and speed of various means of automation of technological processes are relevant for many fields. A simple increase in the speed of movement of technological equipment leads to a sharp deterioration of dynamic accuracy, that is, a change in the accuracy of movement along a given trajectory b. Therefore, a prerequisite for solving the problem is to take into account the dynamics of the direct control object during the operation of the technological equipment. At the same time, automation tools are a complex dynamic control object due to their complexity, multi-links and interdependence of individual degrees of freedom, and their mathematical models are described by a system of nonlinear differential equations in partial derivatives.

The implementation of control in the management of complex dynamic objects under conditions of uncertainty requires a large amount of calculations, but it is not necessary to perform them in real time during the control process. Pre-calculation and storage in memory - retrieving the finished result from memory is faster than calculating it. However, due to the large amount of memory required, it is almost impossible to store all possible solutions in memory, and the search for solutions takes a very long time. Intelligent control systems of complex dynamic objects work more efficiently under conditions of uncertainty, when system and environmental parameters change unpredictably. The construction and dynamic characteristics of intelligent control systems with associative memory (AM) are determined by the method and descriptions of the organization of AM, the form of presentation and the content of the knowledge recorded in it [1-3].

Related research: The associative memory technology, which is very common in computer technology, is one of the alternative methods for creating high-

speed intelligent control systems (ICS) today. This technology, on the one hand, is based on mechanisms of associative recording and restoration of information, which allows access to information at high speed. Such aspects are traditionally studied in the field of computing technologies. On the other hand, AM technology allows to classify the state of the system at the quality level based on associative links and to form control elements that correspond to the current state of the system and the given criterion of control quality. This aspect of the application of AM has not been studied in practice. The main advantage of AM is the simplicity of software and hardware implementation, which provides high performance determined by the access time of a single memory cell [1,3]. It should be noted that the task of quality control is reduced to studying the most complete set of possible states of the control object . According to an input vector containing information about the state of the object and the input effect, AM forms a control effect on the object. In addition, currently associative rules have become a powerful tool for analytical information systems . Since databases are the basis of any information systems, the direction related to the implementation of intelligent analysis algorithms in data manipulation languages is very relevant. This direction is called "analytics in the database". It involves the development of technologies that enable data processing in the database by building analytical logic into the database itself. In many modern database management systems, these languages, such as Transact SQL or PL/SQL, have adopted the main features of procedure-oriented programming languages. Database queries are written in these languages as programs containing various types of variables and control operators. Query programs are formalized in the form of stored procedures, which are interpreted and therefore run much faster than interpreted queries. In connection with this, there is a need to develop algorithms for synthesizing intelligent control systems with associative memory, which allow for compact implementation and organization of real-time adaptive control.

Analysis and results: In the materials of the lecture, the issues of analysis and synthesis of intelligent control systems of dynamic objects with associative memory are considered. The use of logic elements to build a learnable AM, especially in

conditions where there is a wide range of programmable logic matrices that provide a high level of integration of logic elements and ease of their replacement, control systems of complex dynamic objects is a very promising direction in the development of intelligent control systems. Mathematical models of intelligent executive systems are proposed to ensure the requirements for the quality of control over the entire range of parameters in various laws of change of the moment of inertia. Algorithms for building fuzzy adjusters based on associative memory have been developed , which allow fuzzy control of objects in real time without using special processors. A multi-layer bidirectional associative memory has been developed, which has the ability to remember and repeat chains of associations, as well as to implement memory addresses using individual input images and sequences of associative images. Based on associative memory technology, algorithms for synthesis of production process control systems operating under conditions of uncertainty are proposed.

Methodology: Adaptive control algorithms are used in control systems to adjust the behavior of a system in response to changes in its environment. The goal is to ensure that the system operates optimally under different conditions. These algorithms use feedback from sensors to continuously update the system's parameters and improve its performance.

Associative memory technology is a type of artificial intelligence that is inspired by the way the human brain processes information. It involves creating connections between pieces of information based on their similarity or association, allowing for rapid retrieval of related information. Combining these two technologies, researchers have developed adaptive control algorithms based on associative memory technology. These algorithms use associative memory to store knowledge about past experiences and use it to adjust the system's behavior in real-time. This approach has shown promise in improving the performance of control systems and reducing maintenance costs.

Overall, adaptive control algorithms based on associative memory technology have the potential to revolutionize the field of control engineering by enabling more efficient and intelligent systems.

Conclusion: Adaptive control is a control process that allows a system to change its behavior in response to a changing environment. Adaptive control can be used to solve various problems, for example, to optimize production processes or to improve the quality of customer service. Adaptive control based on associative memory technology uses neural networks to solve problems. A neural network can be trained in certain patterns and, in accordance with these patterns, change its behavior. For example, a neural network can be trained to recognize a certain type of defect on a production line and, in accordance with this knowledge, control the operation of the line. Adaptive control based on associative memory technology can be used in various fields, including manufacturing, banking, medicine, etc. For example, in manufacturing, adaptive control can be used to optimize production processes and improve product quality. Adaptive control algorithms can be useful for teachers to improve the quality of education. For example, with the help of adaptive management, you can create a learning system that automatically adapts to the individual needs of each student. This will allow students to receive more effective learning and increase their success. Adaptive control has some disadvantages. In particular, it can be more difficult to implement than traditional control methods. In addition, it may require a significant amount of data and computing resources to use it effectively.

The obtained results can be practically applied in solving the problems of intellectual management of technological processes with associative memory.

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