Brief information about the project

Name of the project	AP15473354 «Development of neural network algorithms for macroscopic control of systems based on hydrophilic polymers»
Relevance	It has now been established that one of the central problems of the origin of life is the question of under what conditions physical effects can be converted into signals, i.e. the question of when a physicochemical system acquires the ability to process or generate information. This issue is also of applied importance from the point of view of controlling the processes of self-organization in complex systems through a change in thermodynamic variables according to a given law. This project is intended to demonstrate that the solution to the above problem lies in the field of considering the neural network properties of systems based on hydrophilic polymers. Evidence for this will be given through the development of neural network algorithms that allow writing executable programs into systems based on hydrophilic polymers that experience phase transitions.
Purpose	Development of neural network algorithms that allow writing executable programs into systems based on hydrophilic polymers that experience phase transitions by changing the control thermodynamic parameters according to a given law.
Objectives	- Develop the basic principles of neural network macroscopic control of systems at the supramolecular level. The solution of this problem will make it possible to detail the research strategy for the implementation of the project. - To develop modifications of neural networks that allow recording information using signals that change in time according to a given law and the hysteretic nature of the change in the output state of neurons. The solution of this problem will create a basis for the development of algorithms that ensure the recording of executable programs in the structures of the supramolecular level of matter organization. - Prove the existence of physicochemical systems based on hydrophilic polymers with pronounced neural network properties. The solution of this problem will make it possible to prove that there really are systems based on hydrophilic polymers, to which the algorithms developed within the framework of this project can be applied. - Develop neural network algorithms for macroscopic control of systems based on hydrophilic polymers using the parameters of specific physical and chemical systems established based on experimental data, including writing executable programs into structures of the supramolecular level of matter organization. The solution of this problem will allow to achieve the main goal of the project. - Develop application software designed to identify and analyze the neural network properties of systems based on hydrophilic polymers using curves that reflect the change in the state of the system during phase transitions. The solution of this problem will make it possible to demonstrate the constructiveness of the proposed approach and

	create tools that can be used by researchers studying physicochemical systems of the type under consideration.
Expected and achieved results	The basic principles of neural network macroscopic control of systems of the supramolecular level have been developed. Modifications of neural networks have been developed that allow recording information using signals that change in time according to a given law and the hysteretic nature of the change in the output state of neurons. Based on the processing of literary experimental data by the proposed methods, the existence of physicochemical systems based on hydrophilic polymers with pronounced neural network properties have been proved. Neural network algorithms for macroscopic control of systems based on hydrophilic polymers will be developed using the parameters of specific physical and chemical systems established based on experimental data, including algorithms for writing executable programs into structures of the supramolecular level of matter organization. Application software will be developed to identify and analyze the neural network properties of systems based on hydrophilic polymers, the initial data for which are curves that reflect the change in the state of the system during phase transitions.
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List of publications with links to them	Suleimenov I. E. et al. Improving the efficiency of using multivalued logic tools: application of algebraic rings //Scientific Reports. – 2023. – Т. 13. – №. 1. – С. 22021. https://www.nature.com/articles/s41598-023-49593-1
Patents	No