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**INTELLECTUAL SYSTEMS OF FORECASTING
AND CONTROL OF COMPLEX OBJECTS
BASED ON ARTIFICIAL IMMUNE SYSTEMS**

Monograph

**Science Book Publishing House
Yelm, WA, USA
2014**

UDC 004.89

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Samigulina G.A., Samigulina Z.I. Intellectual systems of forecasting and control of complex objects based on artificial immune systems: Monograph. – Yelm, WA, USA: Science Book Publishing House, 2014. - 172 p.

ISBN 978-1-62174-042-1
SAN 920-3230

The monograph is devoted to the working out immune net technologies of the analysis and processing of the multidimensional data on the basis of the perspective biological approach of Artificial Immune Systems and to construction of intellectual control systems for various applications.

The book is intended for students and experts in the field of the newest information technology, the automated systems of processing of the information, control of complex systems and artificial intelligence.

UDC 004.89

ISBN 978-1-62174-042-1

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INTRODUCTION

Main directions of scientific progress of the modern world and their relevance are determined by the researches and development in the field of artificial intelligence and computer technology. The rapid development in the recent years of the intellectual technologies in various application areas and their actual usage in many areas of human activity have high demands on the quality of the developed intellectual systems (IS), which must operate reliably under the conditions of uncertainty of the parameters and which have adaptive capacities. There are many different IS: for forecasting and control of complex dynamic objects, for support and decision-making, in design automation, in multivariate data analysis, in diagnostics, for computer security, for forecasting of natural and manmade disasters, for forecasting the risks of major innovative projects, etc.

Scientific novelty of the proposed research is to modify the known methods and to develop fundamentally new and innovative approaches while creating intellectual systems of forecasting and control based on immune network modeling. The interdisciplinary nature of the research creates certain difficulties in developing of such systems, and requires the usage of methods and approaches from different areas of knowledge, artificial intelligence, control theory, system analysis, image recognition theory and decision-making, chemometrics, theory of probability and mathematical statistics, technology of object-oriented programming and many others.

The first section shows the analysis of the current problems of control of complex objects, the main directions in the development using the approaches of artificial intelligence and intellectual control systems.

The second section is devoted to the software - hardware systems implementation of forecasting and control based on immune network modeling. With the usage of modern industrial automation

equipment of Schneider Electric there was developed intellectual technology based on artificial immune systems with a view to the practical implementation of this technology in production. Scientific novelty of the approach lies in the intellectualization of multi-dimensional data collection and processing of dynamic industrial control objects, which combines the usage of modern production equipment and the latest developments of artificial intelligence.

The next section is devoted to the computational molecular design of drugs based on immune network modeling. While designing new drugs the particular importance has the problem decision of the installation the relationship between the structure and the properties which are considered as candidates for chemical compounds. There are also shown the latest advances in the field of artificial immune systems applied to the forecasting “structure – property” of unknown compounds.

Investigations are related to the forecasting of the biological activity of barbiturates with the usage of the technology of immune network modeling. There were developed the bases for the system approach to combine methods of processing of chemical structural information with the computer molecular modeling and image recognition based on IIS. There were formulated necessary requirements for IIS to study the relationship between the structure and activity of chemical compounds. Firstly there were developed intellectual technology, algorithms, software for computational molecular design of new drugs based on biological approach of artificial immune systems.

At the end of the monograph there is a glossary and a bibliography.

The text of the monograph was written in Russian

Scientific publication

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Issue is published in author's edition

Assigned to print 05.02.2014. Format 60x84 1/16.

CPP 11,2. Order 0000. Circulation 500.

Science Book Publishing House
17200 153rd Ave SE, Yelm, Washington, 98597 USA
<http://www.sbook.us/>