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This book includes abstracts of the 3rd International Conference "Computational Intelligence (Results, Problems and Prospects) – 2015". Philosophical, theoretical and applied aspects which describe the results, problems and prospects of the creation and use of intelligent computing methods and creating of information systems and technologies on their basis are reviewing.

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INTELLIGENT SYSTEM OF TECHNOLOGICAL MONITORING OF DISTILLATION UNIT

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Introduction. The majority of complicated objects have uncertainty, which requires further expansion of already known tools and means of forecasting for the purpose of avoidance of unwanted conditions. More and more often are used the intelligent methods that extend the classical classification of prognostic methods and represent a combination of formal procedures for processing information received by estimations of experts. Research of data and methods have led to the establishment of a separate direction, which is called Time Series Data Mining or Intelligent data analysis in which the analyze of the behavior and trends of processes can be considered as an intellectual analysis of time series, the main objectives of which is the analysis and modeling of processes that are characterized by high degree of uncertainty, including «nonstochastic» type, increased of intellectual support of modern experts and detection of hidden patterns and extract of new knowledge from time series.

Main results. The method of intelligent analysis is based on fuzzy time series model, called fuzzy time series (FTS), built with the involvement of fuzzy expert assessments and fuzzy systems. This model allows you to use additional subject-dependent knowledge and describe the behavior of the time series as qualitative assessments of changes and fuzzy trends, so in this sense the same time series in various subject areas will have different fuzzy models [1].

The intelligent system (IS) of technological monitoring of distillation unit (DU) allows to analyze quantitative and qualitative characteristics of the object behavior based on the current information about the state of the control object (CO) and prepare the necessary data for the organization of control strategies and objectives of operator which takes control solution. It should be noted that this intelligent system of monitoring changes at the objects of control does not require organization of a specific new network stations of observations, lines and telecommunications or data processing centers. It is a part of a system of complicated technological complexes such as our control object.

The architecture of intellectual monitoring system includes three main levels:

1. level of primary data collection of monitoring (observation of factors that affect the environment and the state of the process);
2. level of delivery;
3. level of analytical processing and submission of information (assessment of the actual state of the technological process and forecast of this condition).

Intelligent system of technological monitoring refers to the decision support subsystems which create the necessary conditions for improving the process of making control decisions. Technological monitoring allows to analyze quantitative and qualitative characteristics of the object behavior on the basis of current information of the control object state and objectives of operator, to prepare the necessary data for the organization of control strategies and to make a control decisions.

The structure of intelligent system of technological monitoring control system includes processing the input-output information, building the necessary models, analysing of the state of the technological process, technology forecasting, storing information, ensuring the functioning of technological monitoring subsystem [2].

Data processing is conducted in several stages: the selection of anomalous measurements, recovery data gaps, filtration, definition of comprehensive indicators, fuzzification-defuzzification. Using structural and parametric identification is performed for construction of a process model and / or control object.

Monitoring data are analyzed by means of data mining techniques using induction of statistical models which allow to reveal internal structure of the vector of operative monitoring parameters.

The main task of intelligent monitoring is automated comprehensive analysis of data, that come from sensors of operational monitoring with the aim to identify their internal structure, keeping track of the changes in the structure with further evaluation of the admissibility of detected deviations. The usefulness of signals, which are based on monitoring changes occurring in the internal structure of data, lies in the possibility of prevent the occurrence of an extraordinary situation before its real appearance and long before the release of the values of individual parameters outside permissible limits. When determining the monitoring as a process of tracking of structural changes can be predicted only emergency situations, which are as a result of various violations of technological chains of the monitoring object [3].

Those problems could be successfully solved using intelligent mechanisms, which are used by the operator or involved in software and hardware complex of control system. Thus, intellectual functions of the operator based on his operational thinking, that is his ability to display problematic situation by thinking.

Intelligent system of technological monitoring as a part of automated control system of technological process allows to provide:

- collection of measurement data in reach of small for direct human intervention in the process of measurement and control;
- prolonged measurements and those that repeated many times;
- simultaneous measurement of a large number of variables;
- measuring parameters of fast processes, the time of parameters change of which are comparable with the time of measurement, processing of results and decision making;
- measurements which are characterized by large amounts of received information and complicated processing algorithms.

Methods and algorithms of receipt knowledge from data array of operational monitoring of complicated technological objects use modern methods of artificial intelligence and data mining.

The problem solved by the intelligent system can be divided into several sub-tasks:

- tracking the the passage of rectification processes (monitoring the state of DU and comparison of observed indicators with specified);
- image recognition of the situation and its comparison with algorithm (complex identification image of the situation in DU);
- control of distillation unit processes;
- prediction of the rectification processes development (detection of the predictive characteristic of changes of a single variable, that characterizes the distillation process and therefore provides an opportunity to prevent emergency situations).

Conclusions. Hence, the intelligent system of technological monitoring is a multipurpose information system, the main objectives of which are: monitoring the state of object, assessment and forecast of its condition; determining the intensity of various influences, identification of factors and sources of impacts, and the intensity of their influence.

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