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INTELLECTUAL AUTOMATION SYSTEMS FOR ENERGY SAVING MANAGEMENT

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Issues related to measures for optimal resources use while maintaining a comfort set level (for a person) or a production set level are relevant for almost any country. Optimal solutions due to the minimization target function of electricity consumption allow you to create programs for consumer systems and energy storage devices, taking into account the specified (target) level of comfort or production plan. The issue becomes particularly relevant under the market conditions for free trade in resources, in which 1) there are alternatives to the electricity supply (other resources), 2) there are flexible tariffs that depend on the time of day, 3) there are alternative sources of electricity.

Therefore, the designing issues and developing an intelligent system for automating the energy saving process are critical and timely in the field of using information technologies in resource saving issues.

When designing intelligent systems for automation of energy saving management, the following knowledge areas should be taken into account: intelligent systems development based on the principle of biological objects functioning, intelligent control systems, hybrid intelligent systems, intelligent data processing and knowledge extraction from data, and evolutionary intelligent systems. Despite a large number of approaches and theoretical research, critical issues in design remain: 1) structure selection and formation of the management object model (identification); 2) data quality control, 3) models adaptation to changes in the object behavior; 4) results interpretation and replication; 5) knowledge formation based on both methods of extracting knowledge from experts and extracting knowledge from data.

Thus, as the operation result of the intelligent unit, the control object models and the control device are formed.

Processes from the view point of the intelligent control unit are its functioning result. The input information is data describing the control object (here, a consumer or a network of electricity consumers), restrictions (on variables, for example, the changing values interval in a certain period of time), and target characteristics (model accuracy, stability). In addition, the knowledge

base and models implementation and intelligent information processing methods are used for process synthesis.

Let's look at the procedures for synthesizing the forecasting process. As input information, there are electricity consumption readings, enterprise status sensors (open – closed), temperature sensors, wind speed, and time stamp (date – time). The information was collected over time T with an interval of 15 minutes. The objective function is the mean square deviation. You must generate a forecast on the forecast horizon a. There is a set of connectivist forecasting models and information preprocessing models.

The block algorithm is characterized by the following steps.

1) Determine the available information number (sensors).

2) Perform a data quality analysis using an outlier and anomaly detection approach based on a prediction model.

3) Perform a one-parameter analysis and build a one-parameter model for predicting electricity consumption.

4) Perform a multiparametric analysis and build a multiparametric model for predicting electricity consumption.

5) Perform an analysis of the energy saving potential by comparing the predicted and measured values.

The forecasting processes formation based on the above algorithm will allow you to achieve the forecasting models formation in automatic mode without the expert participation at the formation time and models verification. The knowledge base formation about the process can occur in the background, and knowledge about the forming forecasting models process can be extracted from the data.

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