Knowledge Representation in the Expert Diagnostic System

Abstract

The synthesis of problem consist the integration of different form of knowledge representation for the complex industrial processes diagnosis has been discussed. The basis of the proposed representation is a using hybrid system with both the symbolic and nonsymbolic knowledge. The symbolic representation includes procedural (Kalman filters) and declarative (heuristic) knowledge. The nonsymbolic one is based on artificial intelligence (AI) technics such as neural networks, fuzzy logic and fuzzy-neural networks.

In the book, the problems of using the AI technics in a diagnostics systems of the complex industrial process (the power plant simulator) are discussed. Preliminary detector based on one layer perceptron and a fuzzy logic classifier is designed. The diagnostic system is based on a shell expert system with the hybrid knowledge representation.

The integration of the knowledge comprising heuristic representation (expert knowledge described using rule forms), analytical representation (Kalman filters) and nonsymbolic representation (Neural Network and Fuzzy Logic). The diagnostic expert system, containing the hybrid knowledge base is based on the hierarchical structure of the rule base with the expert knowledge as a priority.

The experiment with the expert system and the power plant simulator demonstrates the sufficient effectiveness and reliability of the proposed diagnostics system. The diagnostic system dosen't generate false alarms and detects both single and multi failures correctly.

Key words and phrases: advisory expert system, knowledge base representation, rules, Kalman filters, neural networks, fuzzy sets, fuzzy modelling, knowledge discovery in databases, data warehouses, knowledge integration

Domains: technical diagnostics, knowledge representation