Heuristic Diagnosis with Association Rules

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Abstract

This thesis introduces a new methodology for generating an efficient diagnosis model from a complex behavior model of a technical system. The methodology is operationalized as an off-line process and realizes the automatic acquisition of heuristic knowledge; for the main part, it is based on data mining techniques. The diagnostic knowledge is encoded in the form of association rules. These rules allow for a fast and reliable fault classification.

The knowledge acquisition approach is presented for hydraulic systems and comprises two steps. At first, various behavior simulations of the interesting system are performed, which are based on assumptions of faulty components. In the second step these simulations are analyzed to derive a heuristic rule model for symptom–cause relationships. Theoretical and algorithmic foundations of this knowledge transformation are described in detail.

The approach has been validated by a prototypic implementation of a diagnosis system generator, called ARGUS. Using ARGUS numerous tests for various hydraulic circuit types have been performed; the results show the suitability for the considered domain.