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PRACA DOKTORSKA

na temat

WYKORZYSTANIE METOD SZTUCZNEJ INTELIGENCJI W UTRZYMANIU SYSTEMÓW ICT NADZORUJĄCYCH FUNKCJONOWANIE WYBRANYCH SYSTEMÓW PRODUKCYJNYCH

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Competition and the rapid changes of business imply the necessity of continuous rationalization of production systems mainly through automation. Automation of production systems for a long time depends on their informatization and introduction of ICT systems into their structure. Nowadays, the reliability of production systems depends to a large extent on the availability of supporting and connecting ICT systems, which is related to the issue of their maintenance and support. The maintenance and support of ICT systems that mediate the exchange of information between processing and management subsystems is critical to the production systems. The availability of ICT systems determines the reliability of production systems. As part of the processes of ICT systems support, we can distinguish the following processes:

- event management focusing on collecting data from ICT systems and correct understanding of available messages,
- incident management that repairs failures found in ICT systems. The priority here is to restore the operations of the ICT system by all means,
- problem management focusing on searching for places in ICT systems where improvements can be implemented. The search is based mainly on the knowledge and experience of the support analyst who, when analyzing incidents, indicates those that should be qualified for further engineering analysis and possibly for the implementation of patches.

The research on the model of ICT systems support based on real life examples shows the potential of automation in selecting incidents and their classification as problems. The aim of the thesis is to research possibilities of using artificial intelligence and its potential implementation to support such a decision-making process. The following research areas have been determined:

- defining the method of artificial intelligence that can be used in ICT systems support process to help decision-making in area of ICT systems improvement as part of the problem management process,
- adaptation of a specific artificial intelligence method for its use to help decision-making process on improving ICT systems as part of the problem management.

Work hypotheses are:

Hypothesis 1. It is possible to use artificial intelligence to further automate the maintenance of ICT systems to support analysts in making decisions about improving these systems.

Hypothesis 2. The use of a certain method of artificial intelligence will reduce the time of making right decisions about improving ICT systems, and thus will contribute to improving their availability and, therefore, the reliability of production systems.

Analysis of signals available in the process of ICT systems support has ruled out expert systems, fuzzy logic and evolutionary algorithms as potential methods of artificial intelligence from further analysis. Those studies indicated as a method of artificial intelligence neural networks, mainly due to their ability to generalize, that is making decisions based on input data other than from the training set. Analysis of neural networks indicated the use of feed-forward networks and learning methods with supervision. Surveys conducted among support experts and statistical analysis of the usefulness of signals allowed to identify a group of signals that can be used at the inputs to the neural network. Additional extended interviews conducted among experts allowed to gather knowledge present in the problem management process based on which experts qualify incidents for further engineering analysis. This approach allowed to build a training set for neural network. Based on the conducted research it was stated that there is a possibility to use artificial intelligence methods to support analysts in maintaining ICT systems, which proved the first work hypothesis. An optimal neural network was created by changing the most important parameters for it with using the MSE error level as a test factor. Application of the model on three examples of companies has shown that the

use of neural networks enables faster decision-making process and that a neural network can be a useful tool in the work of an ICT system maintenance analyst.