Doctoral School of Information and Biomedical Technologies Polish Academy of Sciences

Domain: IT

SUBJECT: Fuzzy approach in simulation of malfunctions of elements of networks

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Recruitment & Selection: interview

Number of positions: 1

Project Description

In the literature, many models, which describe an occurrence of malfunctions of elements of different networks (e.g., water supply network, computer network) in a random way, are known. Usually, these models are very precise and take into account many physical factors and other parameters of elements of networks. Unfortunately, respective real-life data is usually sparse, incomplete, and imprecise. Therefore, a simulation of the behaviour of a network taking into account its reliability aspect, even a network with a simple topography, requires an aggregation of data or, e.g., application of the experts' knowledge. Hence, it seems that the important research subject is to merge the simulation approach, which is based on sampling from a random distribution, with the imprecise approach when data is described in a fuzzy way and requires the experts' opinions. Then, because of the convergence of these two approaches, a more complete estimation (based on, e.g., the Monte Carlo methods) of important reliability parameters of a network (like maintenance costs or costs of malfunctions) will be possible.

References

[1] Amani N, Ali N M, Mohammed A H, Samat R A. Maintenance and management of wastewater system components using the condition index system, prediction process and costs estimation. Eksploatacja i Niezawodnosc – Maintenance and Reliability, 15(2), 2013
[2] Buckley J J. Simulating fuzzy systems. Berlin Heidelberg: Springer-Verlag, 2005
[3] Rojek I, Studziński J. Comparison of different types of neuronal nets for failures location within water-supply networks. Eksploatacja i Niezawodnosc – Maintenance and Reliability, 16 (1), 2014
[4] Romaniuk M., Optimization of maintenance costs of a pipeline for a V-shaped hazard rate of malfunction intensities, Eksploatacja i Niezawodnosc – Maintenance and Reliability, 20 (1), 2018
[5] Romaniuk M., Hryniewicz O., Estimation of maintenance costs of a pipeline for a U-shaped hazard rate function in the imprecise setting, Eksploatacja i Niezawodnosc – Maintenance and Reliability, 22 (2), 2020

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