MACHINE TRANSLATION FROM POLISH (CONFERENCE WAS IN POLISH) 😊

Prediction of industrial equipment failure based on vibrodiagnostic analysis using artificial intelligence

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Abstract: The poster covers the presentation of the most important aspects, previous research, experience and results within the framework of the implementation doctorate "Prediction of industrial equipment failures based on vibrodiagnostic analysis using artificial intelligence".

As an introduction, a series of scenarios involving periodic overhauls of a machine confronted with its potential failures embedded at different intervals are presented. The benefits of predictive maintenance will be indicated, as well as the damage that can be done by not using equipment monitoring systems.

The purpose of the presentation is to show tools describing the wear and tear of industrial machinery. Survival curves, degradation progression and RUL. Indicators of the quality of performance of systems that predict failure of industrial equipment will be discussed. Quantifying the failure rate of production makes it possible to track the state of the production process. Moreover, it allows estimating production capacity or searching for bottlenecks. Basic indicators that describe failure rate and production efficiency will be given, described and compared. Examples of indicators used extensively in the manufacturing part of the industry will be cited. Especially in large factories, where the production process is complex and prone to perturbations. Examples of the indicators discussed are MTBF and MTTR.

Special emphasis in the speech is placed on the methods developed to predict the failure of industrial equipment. A distinction is made between methods involving statistical and frequency analysis. The validity of using tools that fit into the issues of Machine Learning and Deep Learning is indicated. Some of the results of several methods are discussed using the example of the implementation of Predictive Maintenance.

The next stages of conducting research and the direction of activities in a broader perspective will be cited. The validity of using other methods of time series modeling is highlighted and motivated. Moreover, the implementation of the C-FEaPM (CNN Feature Extraction and Predictive Modeling) fault detection method, which is not used in the literature, is proposed. It assumes feature extraction using convolutional neural networks (but not only) and modeling the waveforms of indicators responsible for indicating the cause of the failure and the remaining time until its occurrence.

Literature:

Wang, Weixin & He, Qing & Cui, Yu & Li, Zhiguo. 2018. Joint Prediction of Remaining Useful Life and Failure Type of Train Wheelsets: Multitask Learning Approach. Journal of Transportation Engineering Part A: Systems. 144.

Cai, C., Zong, H., Weng, X. 2015, Rotor test platform vibration state detection based on improved harmonic wavelet, IEEE International Conference on Information and Automation, pp. 2165-2170.

Mathew J., Stecki J.S. 1987. Comparison of vibration and direct reading Ferro graphic techniques in application to high-speed gears operating under steady and varying load conditions. J. Soc. Tribol. Lubr. Eng, Volume 43, pp. 646-653