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«Metrological Support of Innovative Technologies» ICMSIT-2020

«Wavelet decomposition algorithm for machine learning model in wind turbines»

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Problem statement

It is based on methods for analyzing the wind energy turbine vibration spectrum and the envelope spectrum of a high-frequency total vibration. However, these methods have several disadvantages, namely:

- 1) most complete kinematic diagram of the equipment with a decrease in exact parameters of its elements;
- 2) reliability of the diagnosis is directly related to the accuracy of determining the frequency rotational frequencies of the rotor (impeller);
- 3) parameters of some items of equipment, for example, bearings values can change during long-term operation or when changing the mode equipment operation, which reduces the reliability of the diagnostic model [6,7].

Solution methods

| Dataset / Parameters | Frequency | | | | | | | |
|-------------------------------------|-----------|-------|-------|-----|-------|-------|-------|-------|
| | f1 | | f2 | | f3 | | f4 | |
| | TPR | PPV | TPR | PPV | TPR | PPV | TPR | PPV |
| High Speed Gearbox Dataset (G) | 0,589 | 0,786 | 0,923 | 1 | 0,706 | 0,733 | 0,804 | 0,945 |
| High Speed Bearing Dataset (G) | 1 | 1 | 0,951 | 1 | 0,782 | 0,932 | 0,742 | 1 |
| Bearing 6213 OR Dataset (B) | 0,921 | 0,960 | 1 | 1 | 0,897 | 1 | 0,950 | 1 |
| Bearing 6213 Norm/OR Dataset (B) | 0,821 | 0,92 | 1 | 1 | 0,865 | 1 | 0,756 | 0,982 |

Conclusions

Results, implementation

The best classification results for vibrational signals were obtained with using the polynomial core of MOV. Moreover, for feature space classification accuracy on average has a value close to unity: ACC = 0.964; TPR = 1; TNR = 0.974. This position was proved in researches about energy market [20, 21, 22].

The best attribute space, providing on average the highest the classification accuracy for various types of nuclear functions of the MOM is feature space No. 4 (BFS-C- I + BFS-C- II). On average, the accuracy of the classification based on ACC = 0.919.

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