

Recursive Data Analysis and Modelling in Prognostics

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Abstract

The vibration level grows considerably when the breakdown point is being approached. Regression analysis and fuzzy reasoning with triangular episodic representations, which are based on the estimated first and second derivatives of a feature, have been used in trend analysis. A slight linear increase of feature values turns to a steeper and steeper increase when the point of failure is approaching. The time of failure depends strongly on machines and the stress caused by operating conditions. Signal processing and feature extraction also have strong effects on sensitivity. Trend indices are calculated from the scaled values by using the means obtained for a short and a long time period. The severity of the situation can be evaluated with a deviation index, which combines the current level, the trend index and the change of the trend index. This index obtains its highest absolute values, when there is considerable difference between the variable and the reference point and this difference continues to grow with increasing speed. The scaling functions are updated recursively, which is triggered by a fast increase of the deviation indices. The higher levels, which are rough estimates in the beginning, are gradually refined.

Keywords: Prognostics, data analysis, condition monitoring, vibration analysis

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