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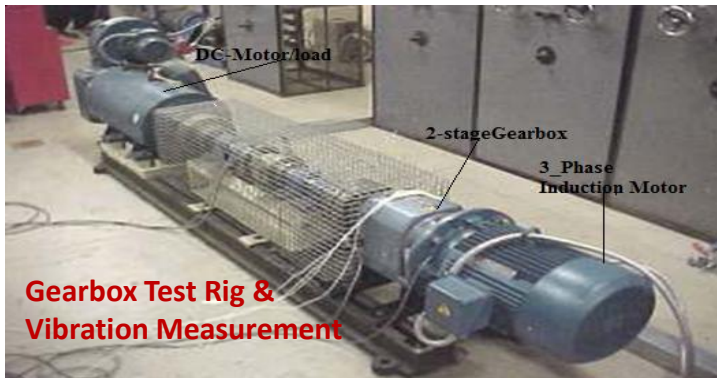
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Machine Performance and Condition Monitoring Through Data Mining

ABSTRACT

Engineering datasets have growing rapidly in size and diversities with data acquisition technology development in recent years. However the full use of the datasets for maximizing machine operation and design has not been investigated systematically because of the complexity of datasets and large scale of data amount. This also means that traditional statistical data analysis methods are no longer efficient so to obtain useful knowledge from the dataset. Therefore this study will focus on applying more advanced data mining technologies and optimizing database systems so that more accurate and efficient knowledge can be extracted from engineering datasets for machine performance and condition monitoring.

Test Facilities



Problems with data explosion

The machines with growing complexity and sensor equipment as well as recent proceeding in information technology (IT), data acquisition systems (DQS) and storage technology lead to an overwhelming amount of data, which is permanently increasing and contains hundreds of attributes. In order to model the system's behaviour accurately, these attributes have to be considered simultaneously. This complexity calls for new techniques and tools for the automated extraction of useful knowledge from huge amounts of raw data. Data Mining is about solving these problems by applying mathematical models to automatically discover patterns in data already present in databases. The extracted knowledge can be used to model, classify, and make predictions for numerous applications.

Characteristics of Gearbox Datasets

Gearbox data can be divided into two types: static datasets and dynamic dataset. As shown in the Table.

Static datasets	Dynamic dataset
Armature Current	Shaft speed
Load Set	Angular Speed
Speed Feedback	motor current
Torque Feedback	vibration signal from gearbox
Motor Current	vibration signal from motor flange
Speed Demand	

Data Mining techniques

There are several techniques, but the basic technologies are: Neural Networks (NNs), Decision Tree (DT), Genetic Algorithms (GAs) and support vector machines (SVMs).

Conclusion and future work

Analysis in Conventional Methods such time domain, frequency domain and spectrum domain show good detection and diagnosis results. However, the amplitude of the features is not sufficiently high for reliable diagnosis. Data Mining techniques analysis will be used to enhance the detection and diagnosis features. Advanced data analysis approaches will be reviewed, In addition, condition monitoring data for evaluating the processing methods reviewed will be collected.

