Subject: Analysis of Uncertain Information in Fault Diagnosis
Speciality: Production Engineering
Name: Shen Lixiang (Signature)
Instructor: Shen Yudi (Signature)

ABSTRACT

This thesis focuses on the analysis of uncertain information in fault diagnosis. The various methods so far used for processing uncertain information are studied and compared.

FFT (Fast Fourier Transform) has been proved useless by means of analyzing the non-stationary signals from a 4135 diesel engine.

For the convenience of following calculation and comparing, the standard parameter domain, including IT, σ, D_x, α_4, IF, CG, is constructed.

Grey relation analysis has been used for processing uncertain information. According to the resolving power ε, it is proved to be effective in distinguishing the fault type to a certain degree.

Dempster-Shafer evidence reasoning integrates and fuses all the information, either certain or uncertain, from every resource. During the fusion process, the construction of basic probability assignment (BPA) is a key point to the outcome of fusion. In this thesis, the quality of classification in Rough sets theory is applied to the construction of BPA. According to the resolving power ε, the efficacy of Dempster-Shafer evidence reasoning to process uncertain information is superior to Grey Relation analysis.

Rough Sets theory is a new method to analyze data sets. It can extract the feature from data sets without any prior information. Being used to process signals sampled from reciprocating machines, its result is more accurate than the other means.

Discretization is crucial for Rough Sets theory's practical application. In this thesis, a new algorithm-χ^2 method is formulated. It's more applicable than other methods in discretization.

Keywords: uncertain information; Grey Relation analysis; Dempster-Shafer evidence reasoning; Rough Sets theory

Thesis type: Application Fundamentals