

The Non-Stationary Signal Processing of Small Drill Bit Breakage and Electrogastrogram

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ABSTRACT

In this research, the Wavelet Transform (WT) is used to extract three indices from the thrust cutting force in small drill bit to predict drill bit breakage. After the machining feature extracted by the WT, a discriminant function is used to classify the drilling status (normal, prefailure). Experimental results showed that the WT does not provide satisfactory classification performances. To improve the classification performances, the Matching Pursuit (MP) is used to search the best basis for the prediction of small drill bit breakage. Experimental results showed that the MP can 100% classify the prefailure signals from the normal signals.

ElectroGastroGrams (EGG) is a potential tool for medical diagnosis. In this research, Neural Networks (NN) are used to eliminate the EGG signals caused by motion artifacts. After the EGG signals processed by the NN, the Fast Fourier Transform (FFT) is used to extract three major measurements: Dominant Amplitude (DA), Dominant Frequency (DF) and Area Under Curve (AUC).

Experimental results showed that DA and AUC significantly reduced in postprandial period when the period of motion artifacts is more than 80%. To improve the drawbacks of the NN method, the MP is applied to the raw EGG signals to eliminate the signals caused by motion artifacts. In this paper, the MP can effectively point out the beginning of the motion artifacts. Since the MP approach to the EGG signal is still in the early stage, no definite conclusions are made yet.

Keywords : 訊號處理 ; 小波變換 ; 匹配搜尋法 ; 倒傳遞類神經網路 ; 小徑鑽頭斷裂預測 ; 胃電圖

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