MACHINES SOUND SEPARATION FROM MICROPHONE ARRAY USING INDEPENDENT COMPONENT ANALYSIS FOR FAULT DETECTION

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ABSTRACT

Machine condition monitoring plays an important in industry to ensure the continuity of the process. This work presents a simple and yet, fast approach to detect simultaneous machinery faults using sound mixture emitted by machines. We developed a microphone array as the sensor. By exploiting the independency of each individual signal, we compared time-domain independent component analysis (TDICA), frequency-domain independent component analysis (FDICA) and Multi-stage ICA. In this research, four fault conditions commonly occurred in industry were evaluated, namely normal (as baseline), unbalance, misalignment and bearing fault. The results showed that the best separation process by SNR criterion was time-domain ICA. At the final stage, the separated signal was analyzed using Instantaneous Frequency technique to determine the exact location of the frequency at the specific time better than spectrogram. Result of this research indicate that normal machine condition have frequency at 51 Hz, 1000-1300 Hz, 1770 Hz and 2650 Hz; unbalance at 46 Hz, 1000 Hz, 1770 Hz and 1990 Hz; misalignment at normally frequency 46 Hz, 1772 Hz, 2600 Hz and 3542 Hz; and bearing fault at 73 Hz, 250 Hz and 350 Hz.

Keywords: ICA, Sound Signal, Fault Detection