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FAULT DETECTION ALGORITHM USING DCS METHOD COMBINED WITH FILTERS BANK DERIVED FROM THE WAVELET TRANSFORM

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Abstract. *This paper aims at proposing an algorithm that improves fault detection, through on-line monitoring, in industrial systems. This is accomplished by analyzing and detecting frequency changes in signal generated by these systems. Early fault detection, which reduces the possibility of catastrophic damage, is possible, by detecting the changes of characteristic features of the signal itself. This approach combines the Filters Bank technique, for extracting frequency and energy characteristic features, and the Dynamic Cumulative Sum method (DCS), which is a recursive calculation of the logarithm of the likelihood ratio between two local hypotheses. The goal of features extraction/detection of signals is to classify the obtained components into two segments (hypotheses), which correspond to healthy and faulty behaviors. The main contribution of this paper is to derive the filters coefficients from the wavelet in order to use the filters bank as a wavelet transform. The advantage of our approach is that the filters bank can be hardware implemented and can be used for on-line detection.*
Keywords: Signal, Filters bank, DCS, Fault, Detection, Wavelet transform

1. **Introduction.** The Fault Detection and Isolation (FDI) problems are of particular importance to the industry. Since, early fault detection in industrial systems can reduce the personal damages and economical losses, and provide a diagnosis of the fault. Generally two methods are used, Model-based and Data-based techniques.

Model-based techniques, that require a sufficiently accurate mathematical model of the process, detect and isolate the faults that disturb the process, by comparing the measured data from the process itself, with the estimations provided by the mathematical model. Parity space approach, observers design and parameters estimators are well known examples of model-based methods [1-4,27].

In contrast, data-based methods require a lot of measurements and can also be divided into signal processing methods and artificial intelligence approaches. Many researchers have performed fault detection by using vibration analysis for mechanical systems [26], or current and voltage signature analysis for electromechanical systems. Other researchers use the artificial intelligence (AI) tools for fault diagnosis [5] and the frequency methods for