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# Order tracking using Hinfinity estimator and polynomial approximation

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## Résumé

In this paper we present the Hinfinity estimator for discrete-time varying linear system combined with the polynomial approximation for order tracking of non-stationary signals. The proposed approach is applied to the gearbox diagnosis under variable speed condition. In this instance, it is well known that the occurrence of a fault on a gear tooth leads to the modulation of amplitude and phase of vibration signal orders. Our purpose is to estimate this unknown amplitude and phase modulation by tracking orders. In order to estimate these modulation signals, we model the vibration signal by using state variables. Then, we use the Hinfinity criterion to minimize the worst possible amplification of the estimation error related to both the process and measurement noises. Such an approach doesn't require any assumption on the statistic properties of the noises unlike to the Kalman estimator. A numerical example is given in order to evaluate the performance of the Hinfinity estimator regarding the conventional Kalman estimator.

**Mots-Clés:** Order tracking, Hinfinity estimator, polynomial approximation, Non, stationary conditions

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