Progress in the higher order crossings (HOC) method included development of "contraction mapping" for the estimation of discrete frequencies in noise. Parametric filters allow the estimates to attain high precision. Reports and papers on this technique are listed, and applications to the discrimination of metal plates has begun.
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FINAL REPORT FOR 9.30.92-9.30.93

HIGHER ORDER CROSSINGS

Grant AFSOR-89-0049

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1 Overview

During this period we have completed several works on higher order crossings (HOC) and related topics.

As outlined in our previous reports, particularly the final report for 10.1.90–9.30.92, our research led to a method called the contraction mapping method (CM) useful for the estimation of discrete frequencies in noise. Accordingly, a parametric filter is fine-tuned by a HOC sequence to lock on a frequency in noise. The obtained estimates can achieve high precision. In later versions of CM, instead of parametrizing zero-crossing counts, we have parametrized the first order autocorrelation and certain least squares estimates.

We have also experimented with HOC methods trying to discriminate in metal plates using real data from the National Institute of Science and Technology.

2 Publications

2.1 Books


2.2 Papers in Journals and Proceedings


2.3 Submitted Papers


2.4 Technical Reports

1. "Strong consistency of the contraction mapping method for frequency estimation," (with T. Li), TR 92-21

2. "Asymptotic normality of the contraction mapping estimator for frequency estimation," (with T. Li and S. Yakowitz), TR-92-22

3. "On the contraction mapping method for frequency detection," (with S. Yakowitz), TR 92-45

4. "Estimation of Multiple sinusoids by parametric filtering," (with T. Li), TR 92-51


3 Invited Presentations


15. “Improving the AR approach of frequency estimation by parametric filtering,” (with T. Li), Penn State, May 6, 1992.


4 Workshop

Our research was presented in a special workshop titled "SIGNAL PROCESSING BY ZERO-CROSSINGS," held at Mathematics Department, University of Maryland, College Park, on March 4, 1992.

5 Honors/Awards/Prizes


2. B. Kedem was invited by Tsinghua University, Beijing, China, to give a sequence of lectures on HOC, Dec. 22, 1990-Jan. 10, 1991.

6 Ph.D.'s


