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SIGNAL PROCESSING

Special Issue on : Fourier Related Transforms for Non-Stationary Signals

Guest Editors:

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The classical Fourier transform and its variances have provided well known mathematical tools for acquisition, processing and presentation of various stationary signals to achieve desirable performance in the frequency domain with affordable computational costs. When dealing with non-stationary signals, including speech, biological and biomedical signals, sonar, radar, communication signals, etc., that have time-varying spectral contents, these transforms become less effective to provide sufficient information in the frequency domain because the transform kernels do not have enough capability of describing time-varying spectral characteristics. Time-frequency representations are generally useful to provide more accurate information on the spectral distribution as a function of time. The potentials and pitfalls of many time-frequency representations have been well studied and reported in the literature.

Two frequency representations that are closely related to the classical Fourier transform are the fractional Fourier transform and the polynomial Fourier transform. They both are linear and reported to deal with the non-stationary signals. In terms of their definitions, the transform kernel of the former depends on a parameter that is generally interpreted as a rotation by an angle in the time-frequency domain. It has been seen in the literature that the fractional Fourier transform has gained more attention for various applications of using chirp signals. On the other hand, the polynomial Fourier transform uses a polynomial function of time variable in the transform kernel to describe the time-varying phase or frequency characteristics of the signal. Because being reported only 15 years ago, the polynomial Fourier transform has not been well perceived although its desired advantages for some practical applications have been demonstrated in the literature. At present, there is still a lot of work to be done for both theoretical development and practical computations to support various practical applications.

This special issue attempts to provide a platform for the researchers to present their recent work related to various issues of the two Fourier related transforms. Submissions are invited in, but not limited to, the following areas:

- Fast algorithms and computation methods for applications of these transforms
- Performance evaluations and comparisons with other time-frequency representations
- Parameter estimation, detection and filtering of non-stationary signals

- Time-frequency analysis methods and distributions
- Applications in radar, sonar, audio signal processing and communications, etc..
- Analysis and synthesis of non-stationary signals based on these transforms

Submission Schedule: The following is a strict schedule:

- Manuscript due: Feb. 28 2010
- Acceptance notification: June 31 2010
- Final manuscript due: July 31 2010
- Publication date: Oct. 2010