Abstract

In this paper, a study of quadratic transformations under Cohen’s class is presented, to see the variations in resolution for performing time-frequency analysis of signals. The study concentrated on the analysis of linear chirp signals and non-stationary signals in presence of noise as well as without noise. The resolutions based on Wavelet Transform, Short Time Fourier Transform are analysed. The effects of widow length, wavelet scale and presence of noise are researched and analyzed against the performance of different time-frequency representations. The Cohen’s class is a class of time-frequency quadratic energy distributions which are covariant by translations in time and in frequency. This important property by the members of Cohen’s class makes those representations suitable for the analysis and detection of linear as well as transient signals. Spectrogram, the squared modulus of Short Time Fourier Transform is considered to be an element of Cohen’s class since it is quadratic and also co-variant in time and frequency. Wigner Ville Distribution is another member of Cohen’s class which can be extended to many other variants by changing the kernel functions used for cross-term reductions. The trade-off in the time-frequency localization are studied and demonstrated with the help of different plots. The result of this study can be
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applied to enhance the detection and analysis of signals and to develop efficient algorithms in medical diagnosis as well as defense applications.

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Index Terms

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Keywords

Wavelet Transform (WT) Scalogram Short Time Fourier Transform (STFT) Fast Fourier Transform (FFT)
Wigner Ville Distribution (WVD)
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Spectrogram