ABSTRACT

Linear transforms and expansions are fundamental mathematical tools of signal processing. Accordingly, wavelet transform has played an important role in several signal processing tasks such as compression and denoising. However, wavelet transform fails to represent effectively the images, which have edges and treated them as smooth functions with discontinuities along curves. The curvelet transform has been developed as an alternative to wavelet transform in which frame elements are indexed by scale, location, and orientation parameters. The elements obey a special scaling law, where the length of the support of frame elements is approximately equal to square of the width of the support. Recently it has an important impact in image processing and communications.

The digital implementation of curvelets can be done in two ways the first one being unequally-spaced fast Fourier transforms (USFFT) and second is wrapping technique applied for selected Fourier samples. It is observed that the two implementations essentially differ by the choice of spatial grid used to translate curvelets at each scale and angle. Both implementations are fast in the sense that they run in $O(n^2 \log n)$ flops for $n$ by $n$ Cartesian arrays.

An attempt has been made to apply curvelet based wrapping technique for image compression and denoising. The curvelet
transforms involve parameters which have a high degree of directional specificity. Also these transforms involve anisotropic scaling where as the wavelet transforms involve isotropic scaling. It has been shown that the curvelet-based algorithms out perform wavelet based methods in certain aspects such as image compression and denoising.

Apart from this the denoising method based on Lossy compression and curvelet thresholding (LCCT) has been developed and tested for it’s validity and found that the results obtained are comparable and better than the existing results.