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Use of Fourier and Hartley Transforms in Motion Estimation: A Comparative Study

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ABSTRACT

A comparison between the use of Fourier and Hartley transforms for motion estimation of multiple moving objects in image sequences is presented. The spectrum of the two transforms show that the temporal frequencies at the peaks (of the spectrum) is related to the velocity of the moving objects. The analysis shows that the Hartley technique is faster and requires less memory space than the Fourier technique. However, it gives the velocity of the moving objects but not the direction. The Fourier spectrum, on the other hand, gives the velocity and direction. An efficient implementation is possible by using the Hartley transform to estimate the temporal frequencies of the peaks and hence the velocities. The fast Fourier transform is then used to compute the spectrum at those peaks. The direction is easily found from the Fourier spectrum by reversing the sign of the temporal frequency corresponding to the peak.