

Transforms and Pattern Recognition

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Abstract

Physiological studies have revealed that the Human Visual System (HVS) transforms the input image so that the brain can process it better. These transformations convert visual stimuli into a format that brings out the salient features of the input image. Our study has been into determining the techniques that would mimic this for a pattern recognition system. We have looked at various techniques which have been proven to be useful for the purpose. We have also come up with our own technique which is superior to the state of the art. Our work focuses on the application of the Wavelet Transform for pattern recognition. Wavelet transform enables the analysis of an input stimuli both in the scale and space domain simultaneously. This presentation would present our work in the area.

Description

Our work is into determining the effectiveness of transforms in pattern recognition. There is ample proof in physiological studies that the human eye transforms the input visual stimuli before brain performs recognition. The input image is converted by the Human Visual System (HVS) into a more effective representation that enables better transmission and recognition of the visual data. We have aimed to mimic this biological process in our study.

Application of transforms in pattern recognition is not new. Gabor transforms have been used in pattern recognition as early as 1980s. The Gabor transforms are said to approximate the function of the Gabor cells found in the human eye. The Gabor cells perform frequency and space domain processing on what is observed by the eye so that it could be better understood by the brain. Since, the application of Gabor transform various other transforms have been envisaged and applied to image processing. One such transform is the wavelet transform which led to the development of the Multiresolution Theory. Multiresolution analysis has become the mainstay of image processing and pattern analysis. Good results have been obtained using the technique. Various analysis could be performed by using multiresolution theory to obtain various decompositions. We have invented our own technique for the computation of wavelet decomposition. The technique aims to optimize the difference between various images that need to be differentiated between and hence is called the adaptive wavelet packet transform (ADWPT). In our work, we apply Gabor analysis and ADWPT analysis for classification of brain tumours called meningiomas. We prove that our technique performs better than Gabor analysis and hence is perhaps closer to what the HVS attains using its transform.