Abstract

With the continual expansion of multimedia and Internet applications, there is an increasing demand to incorporate video data in a wide range of applications, including video telephony, medical imaging, PDA applications etc. Video compression standards have been developed to eliminate redundancy, allowing video information to be transmitted and stored in a compact and efficient manner. In recent years, JPEG2000 image compression technique has been adopted more widely over the baseline JPEG as it could provide a new image representation with a rich set of features.

This thesis proposes a new *Motion Compensated JPEG2000* (MCJ2K) video compression scheme which uses JPEG2000 as its core compression engine along with motion compensation. MCJ2K scheme is a generalization over MJPEG2000, as it allows motion compensation and uses JPEG2000 for compression of *intra* and *inter* frames. In this thesis both the lossy and the lossless variants of MCJ2K scheme have been proposed, using the non-reversible and reversible DWT (Discrete Wavelet Transform) filters respectively. Further, various strategies of rate control and quality control are also proposed using the *Gaussian distribution* and *Exponential distribution* based modeling of error values for the lossy and the lossless MCJ2K scheme respectively. The performance of the proposed scheme is observed to outperform the performance of MJPEG2000 significantly and better than MPEG-2 for low-motion video and at higher bit-rate in case of high-motion video.

The thesis presents the application of MCJ2K scheme in medical video compression and video resizing in compressed domain. The proposed MCJ2K scheme has been applied for compressing medical videos 3-D volumetric medical images. It has shown encouraging results, better results than MJPEG2000 scheme, for compressing medical videos and 3-D volumetric medical images.

The thesis also demonstrates an application for resizing (down-scaling) of MCJ2K coded video in compressed domain. This is targeted towards video applications in small devices, like PDA. Three efficient methods for resizing of the MCJ2K coded video streams are proposed which found to be giving encouraging results compare to MJPEG2000.