ABSTRACT

The H.264/AVC is latest video coding standard jointly developed by two International standards bodies i.e. the International Telecommunication Union-Telecommunication sector (ITU-T) and International Organization for Standardization/International Electrotechnical Commission(ISO/IEC). It provides significantly better coding efficiency compared to previous video coding standards. Due to advanced features, it achieves higher coding efficiency but at the same it increases the computational complexity. Digital video signal has play an important role in multimedia applications including digital television, video conferencing, mobile communication, etc. To provide solutions of good quality, better compression and low bit rate of video frames for storage, transmission etc, video compression algorithms are essential. In previous video coding standards, a coarse quantization step degrades picture quality of the reconstructed picture. For Intra frame coding, AVC/H.264 standard gives better coding performance in terms of picture quality, bit rate, encoding time and compression. For Intra frame coding, AVC adopts Rate Distortion Optimization technique (RDO) with full search mode algorithm. But RDO with full search mode algorithm is computationally complex and it is very difficult to implement for real time applications. So in order to reduce computational complexity many researcher have been developed fast mode decision intra prediction algorithms for Intra frames. The previous work on Intra frame coding in AVC/H.264 using fast mode decision Intra prediction algorithm was achieved increased in bit rate, degradation/loss of picture quality i.e. PSNR and reduction of computational complexity for different quantization parameters. The previous work on Intra frame coding achieved only reduction of computational complexity but there is loss i.e. degradation in picture quality (PSNR) and increased in bit rate of reconstructed frame. Previous Intra prediction algorithms is based on different approach such as partial computation of cost function, local edge information of macro block, enhanced of cost function, feature of macro block, variance of macro block, approximating the cost function, early block type selection etc. Using these approaches achieved only reduction of computational complexity at cost of increased in bit rate, loss of PSNR in Intra frame. So far, in Intra frame coding using intra prediction algorithms, reduction in bit rate, consistent of PSNR and high compression was not achieved. In order to avoid loss in picture quality, avoid an increase of bit rate and to improve compression of intra frame a new approach is needed. The aim of the present research is to achieve consistent PSNR, reduce in bit rate and high
compression for Intra frames of different QCIF and CIF yuv video sequences using a new approach. In this thesis developed efficient intra frame coding algorithm in AVC to obtain consistent PSNR, reduce in bit rate, reduce in encoding time and achieve high compression using new approach i.e. Gaussian pulse method. From the input of various yuv video sequences, Intra frames are extracted and segmented into macro blocks 16x16 down to the 4 × 4 sub blocks. For each sub block a prediction is obtained by Intra prediction modes. Obtain the residual data by the prediction is subtracted from the current sub block. This residual data is then transformed into frequency domain samples using integer transformer, these frequency domain samples are multiplied with Gaussian pulse then quantized and encoded. In the new Gaussian approach, the frequency domain samples are made abstract in a known and controllable manner without intermixing of information. It generates abstract frequency domain samples. The degree of abstraction controlled through a simple parameter i.e. Gaussian value. The multiplication of Gaussian pulse with frequency transformed coefficients operation smoothen the signal. Each such multiplication scales the information content of the signal in a reversible way to avoids picture getting bad hit. The resulting signal would turn abstract. It also removes blocking arti-facts due to transform and reduces quantization noise due to coarse quantization step and improves functionality of quantizer. This new approach i.e. Gaussian applied after the transform process.

The present work on Intra frame coding in H.264 Video Codec using Gaussian method for all nine Intra prediction modes was coded in MATLAB. Intra frame coding in H.264 involves various Modules such as Intra prediction, Integer Transform, Quantization, Gaussian, Context Adaptive Variable Length Coding, Inverse Quantization and Inverse Quantization were coded and implemented in MATLAB. Intra frame is successfully coded, tested and implemented for different CIF and QCIF Intra frame sequences in MATLAB. The simulation results in terms of average bit rate, picture quality (PSNR), encoding time and compression of proposed algorithm are compared with recent version JM 18.6 reference algorithm of H.264 Standard. The simulation results of QCIF and CIF different Intra frames for all 4x4 nine intra prediction modes under different quantization parameters and different Gaussian values of proposed method are compared with previous methods (Jin wang et al, Hung et al, Tian Song et al, Pengyu et al) and JM 18.6 reference algorithm of AVC in terms of average bit rate, PSNR, encoding time and compression. The simulation results of proposed algorithm provides consistent PSNR, reduced in bit rate, reduce in encoding time and high compression achieved than previous methods and JM 18.6 reference algorithm.