



**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS**

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SHORT ABSTRACT

With the increased popularity of High Definition (HD) and beyond HD videos ($4K \times 2K$, $8K \times 4K$) and the emergence of the High Efficiency Video Coding (H.265/HEVC) compression standard for HD and beyond-HD video formats, security issues like copyright protection, content authentication etc. of HD videos have become an important research field. In this research work, video watermarking is considered as the tool for ensuring secure HD video transmission. In the first contributory chapter, a compressed domain robust watermarking scheme is proposed using one of the side information (intra prediction mode) of H.265/HEVC compressed video. Since the probability of the mode change during re-compression has been increased in H.265/HEVC with the previous standards, the existing mode-based watermarking schemes (for previous standards like H.264/AVC) are not robust enough if they are applied on HEVC videos. As a countermeasure, first the 4×4 luma Prediction Block (PB)s of intra frame are chosen for embedding based on the sustaining probability after re-compression. Further, the robustness is increased by grouping of the intra prediction modes of H.265/HEVC in a fashion such that the embedded mode-change due to re-compression can be closed within a group. In next chapter, the robustness of the above scheme is enhanced by embedding the watermark in the transform coefficients of 4×4 transform blocks of the HEVC video sequence. To maintain visual quality, temporally homogeneous blocks with similar texture in the consecutive Intra frame are first found out using only the compress domain parameters. As these blocks have similar number of nonzero transform coefficients, a robust watermarking is embedded by the minimal perturbing of the transform coefficients. Both of the proposed schemes are well suited for the re-compression attack but not resilient to the drift errors. So, a compressed domain watermarking scheme is proposed in the third contributory chapter of this dissertation for H.265/HEVC video which can handle drift error propagation both for the intra and the inter prediction processes and improves visual quality of the watermarked video. The intra drift error prevention is achieved by excluding those residual coefficients which are used in the intra prediction process. The inter frame drift error has been prevented by predicting current block from a spatial homogeneous block which has high spatial correlation with the watermarked block. In the final contributory chapter, a watermarking scheme is presented which is robust against video the camcording attack. During camcording attack, the embedded watermark suffers from several geometric distortions and temporal desynchronizations. In the proposed scheme, the required temporal synchronization is done by segmenting the cover video into shot segments using the geometric invariant Scale-Invariant Feature Transform (SIFT) features. Further, the 3D-Discrete wavelet transformation (DWT) and SIFT are used to find watermark embedding regions which are robust against geometric distortions and the frame blending attack. Finally, the dissertation concludes by briefly summarizing the work presented in dissertation and explaining the future research directions.