Hybridization of Mathematical Transforms for Robust Video Watermarking Technique

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Abstract : The widespread and easy accesses to multimedia contents and possibility to make numerous copies without loss of significant fidelity have roused the requirement of digital rights management. Thus this problem can be effectively solved by Digital watermarking technology. This is a concept of embedding some sort of data or special pattern (watermark) in the multimedia content; this information will later prove ownership in case of a dispute, trace the marked document's dissemination, identify a misappropriating person or simply inform user about the rights-holder. The primary motive of digital watermarking is to embed the data imperceptibly and robustly in the host information. Extensive counts of watermarking techniques have been developed to embed copyright marks or data in digital images, video, audio and other multimedia objects. With the development of digital video-based innovations, copyright dilemma for the multimedia industry increases. Video watermarking had been proposed in recent years to serve the issue of illicit copying and allocation of videos. It is the process of embedding copyright information in video bit streams. Practically video watermarking schemes have to address some serious challenges as compared to image watermarking schemes like real-time requirements in the video broadcasting, large volume of inherently redundant data between frames, the unbalance between the motion and motionless regions etc. and they are particularly vulnerable to attacks, for example, frame swapping, statistical analysis, rotation, noise, median and crop attacks. In this paper, an effective, robust and imperceptible video watermarking algorithm is proposed based on hybridization of powerful mathematical transforms; Fractional Fourier Transform (FrFT), Discrete Wavelet transforms (DWT) and Singular Value Decomposition (SVD) using redundant wavelet. This scheme utilizes various transforms for embedding watermarks on different layers by using Hybrid systems. For this purpose, the video frames are portioned into layers (RGB) and the watermark is being embedded in two forms in the video frames using SVD portioning of the watermark, and DWT sub-band decomposition of host video, to facilitate copyright safeguard as well as reliability. The FrFT orders are used as the encryption key that allows the watermarking method to be more robust against various attacks. The fidelity of the scheme is enhanced by introducing key generation and wavelet based key embedding watermarking scheme. Thus, for watermark embedding and extraction, same key is required. Therefore the key must be shared between the owner and the verifier via some safe network. This paper demonstrates the performance by considering different qualitative metrics namely Peak Signal to Noise ratio, Structure similarity index and correlation values and also apply some attacks to prove the robustness. The Experimental results are presented to demonstrate that the proposed scheme can withstand a variety of video processing attacks as well as imperceptibility.

Keywords : discrete wavelet transform, robustness, video watermarking, watermark

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