In this paper a robust multiplicative video watermarking scheme is presented. We segment the video signal into 3-D blocks like cubes and then apply 3-D wavelet transform to each block. The low frequency components of the wavelet coefficients are then used for data embedding to make the process robust against both malicious and unintentional attacks. The hidden message is inserted through multiplying/dividing these coefficients by a constant parameter which controls the power of the watermark. The watermark extraction relies on a maximum likelihood based procedure, observing the distribution of the watermarked coefficients. The performance of the proposed scheme has been verified via simulations and shown to be superior to some well-known existing video watermarking methods.

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Multiplicative video watermarking, Maximum likelihood decoding, 3D Wavelet transform.

I. Introduction

Watermarking as an elegant solution has been proposed for the purpose of copyright protection, where it has also been found to be an efficient solution to several other problems in copy control, broadcast monitoring, fingerprinting, signal and data authentication, etc. Among the media types, image signals have been of special concern for copyright protection and authentication through watermarking. Nevertheless, by development of new handsets and their ability in transmitting and capturing video signals over the webs, the video watermarking is getting more demanding.

Video is a moving picture signal in nature, so methods for watermarking of still image may actually be extended to video watermarking by minimal effort. However, this extension is technically rejected for certain reasons, as: i) a video signal generally contains sequences of highly correlated frames, ii) there exist some video-based attacks such as MPEG compression, spatial desynchronization, frame collision, etc., and iii) video signals are often used in real-time applications and hence require real-time watermarking methods in most cases [].

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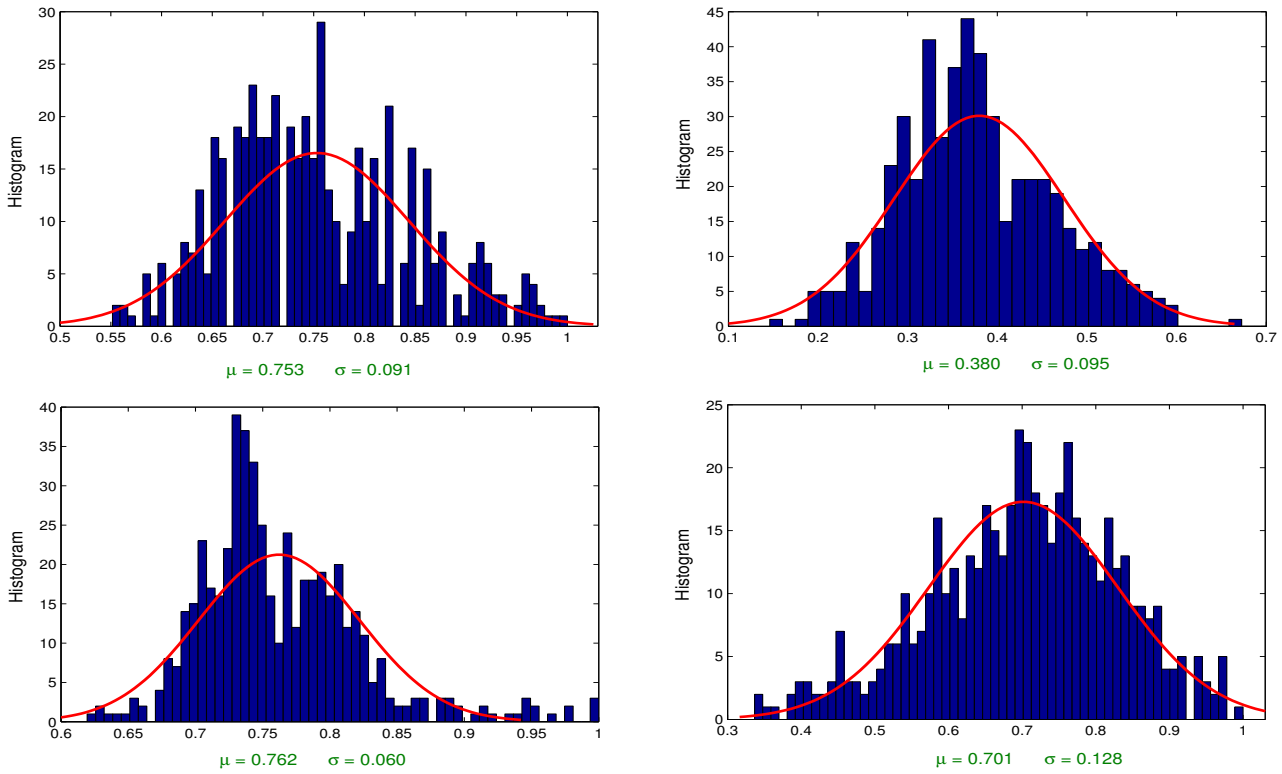

Fig. 1. Histogram of approximation wavelet coefficients for 3D block of 4 video in *Hollywood2* database

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