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IMPROVED IMAGE TAMPER LOCALISATION USING CHAOTIC MAPS AND
SELF-RECOVERY

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Abstract: In this paper an image tamper localisation scheme is proposed in which authentication bits of a 2×2 image block are generated using the chaotic maps. Further the scheme is improved by including a self-recovery method to recover the tampered regions. To improve the quality of the recovered image, two different sets of restoration bits of a block are generated and each one is embedded into randomly selected distinct blocks. The proposed tamper detection scheme performs better than some of the recent schemes proposed by the researchers. The experimental results demonstrate the accuracy and fragility of the tamper detection scheme, and the efficacy of the recovery method.

Key words: chaotic maps, Fragile watermarking, Image authentication, self recovery, Tamper localisation

1. Introduction

The image authentication assumes paramount importance in the face of easily available software for image manipulation and communication. The image authentication schemes in the literature can be broadly classified into either signature based or watermarking based. A digital signature may be an encrypted or signed hash value of the image contents. The outcome of hash functions is generally extremely sensitive to the modifications to their input and hence extremely difficult to fabricate. A major drawback of digital signature based schemes is that they fail to localise the tampered regions in the image even though they could successfully judge that the image had been modified. The digital watermarking based schemes insert certain data called watermark imperceptibly in the image without severely affecting the perceptual quality of the image. The digital watermarking techniques used for authentication are classified as fragile or semi-fragile. The fragile watermarking can be described as design of watermarks that become undetectable in the face of slightest modification to the image content. On the other hand, the semi-fragile watermarking can be described as the design of watermarks that are not destroyed by specific legitimate modifications but are destroyed by illegitimate modifications to the image content.

Certain image authentication schemes concern with only tamper localisation. But, the recovery of the tampered regions is also a desired component of any image authentication scheme. The authentication and recovery schemes are constrained by imperceptibility factor that limits the number of the bit planes for the watermark embedding to three. This forces researchers to consider rectangle block based approach [1-11, 14-17, 19, 20] against the pixel based approach [12, 18] compromising to certain extent on the accuracy of the tamper localisation and recovery. In [23] the authors used segmentation technique to obtain non-overlapping, semantically independent and non-rectangle patches of the image. The pixel based schemes perform well when the extent of tampering is not extensive. Yet, there are

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