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HIDING CLINICAL INFORMATION IN MEDICAL IMAGES: A NEW HIGH CAPACITY AND REVERSIBLE DATA HIDING TECHNIQUE

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Abstract

A new high capacity and reversible data hiding scheme for e-healthcare applications has been presented in this paper. Pixel to Block (PTB) conversion technique has been used as an effective and computationally efficient alternative to interpolation for the cover image generation to ensure reversibility of medical images. A fragile watermark and Block Checksum (computed for each 4×4 block) have been embedded in the cover image for facilitating tamper detection and tamper localization, and hence content authentication at receiver. The EPR, watermark data and checksum data has been embedded using Intermediate Significant Bit Substitution (ISBS) to avoid commonly used LSB removal/replacement attack. Non-Linear dynamics of chaos have been put to use for encrypting the Electronic Patient record (EPR)/clinical data and watermark data for improving the security of data embedded. The scheme has been evaluated for perceptual imperceptibility and tamper detection capability by subjecting it to various image processing and geometric attacks. Experimental results reveal that the proposed system besides being completely reversible is capable of providing high quality watermarked images for fairly high payload. Further, it has been observed that the proposed technique is able to detect and localise the tamper. A comparison of the observed results with that of some state-of-art schemes show that our scheme performs better.

Keywords: *Reversibility, Chaotic encryption, Checksum, Embedding, Tamper localization*

1. Introduction

The exponential growth of the internet and networked infrastructure has resulted in electronics creeping into every important sphere like banking, governance, commerce and healthcare etc., giving rise to e-banking, e-governance, e-commerce and e-healthcare. Electronic-healthcare is nowadays taking lead in healthcare related activities and is rapidly changing the dynamics of conventional paper based healthcare and making the distance between a patient and doctor immaterial. However, successful implementation of an e-healthcare system is accompanied by a number of challenges. Some of the fundamental issues are authentication of the Electronic Patient Record (EPR) available at the receiving end and payload capability of medical images used to carry EPR. Besides, other important issues are security of the EPR and ability of system to exactly retrieve the medical image at the receiver for proper diagnosis. Though cryptography is being used as an effective solution for issues pertaining to security and content authentication, but the disguised nature of encrypted data attracts attention of an adversary. In such a situation data hiding in images has been found to be an efficient and effective alternative to cryptography for solving issues pertaining to security, content authentication and copyright protection etc. [1, 2]. In a typical data hiding situation, EPR and other relevant information is imperceptibly embedded in medical images and transmitted

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