RESEARCH ARTICLE

Hiding scrambled text messages in speech signals using a lightweight hyperchaotic map and conditional LSB mechanism

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Abstract

This study presents a lightweight, secure audio steganography system for hiding text messages for transmission over the Internet, with the aim of addressing the current problems of high computational cost and insufficient security identified in earlier studies. We propose a two-phase functioning mechanism. Text characters are first transformed into ASCII code and stored in a vector, which is then divided into three sub-vectors. These sub-vectors are scrambled using two low-complexity operations, namely a forward-backward reading technique and an odd-even index. Two scrambling loops are performed, the first on the small sub-vectors the second on the vector as a whole. In the hiding phase, the speech signal samples are divided into 256 blocks using only 200 values per block, and low-complexity quadratic and the Hénon maps are used to hide the speech signal in a random manner. The conditional LSB is applied as a low-complexity algorithm to identify hidden bits, and a special hyperchaotic map algorithm is developed to randomly choose locations. The proposed approach provides good security for a scrambled text message, with high SNR and PSNR, small MSE and PESQ, a SSIM value of close to one (As indicated in Tables 1, 2, 3, and 4), a BER value of close to zero (as shown in table 8), NCC value near +1 (as shown in table 8), and an MOS value of near five (as described in table 6), as well as a low computational hiding cost.

Section 1: Introduction

Over the last decade, communication methods have changed significantly, with digital media now providing the main communication channel. In all walks of business and private life, people are moving away from the use of paper documents and transitioning towards email and