Computational Methods, Communication Techniques and Informatics
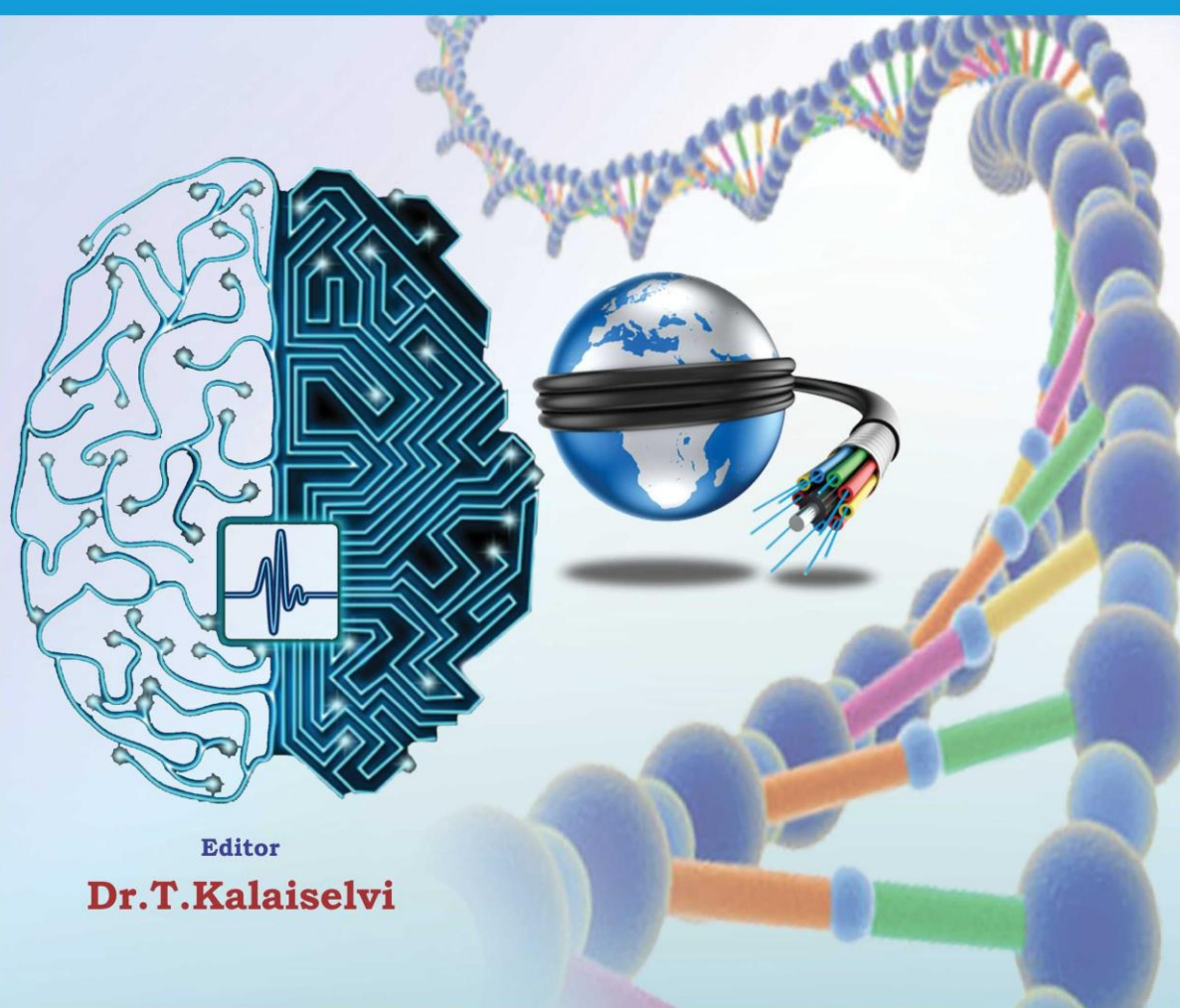
Editor

Dr. T. Kalaiselvi

Department of Computer Science and Applications
The Gandhigram Rural Institute - Deemed University
Gandhigram - 624 302, Dindigul Dt. Tamil Nadu, India.

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Volume Editor

© **Dr. T. Kalaiselvi**

Department of Computer Science and Applications
The Gandhigram Rural Institute-Deemed University
Gandhigram 624 302, Tamilnadu, India
E-mail: kalaiselvi.gri@gmail.com

SECTION II: COMMUNICATION TECHNIQUES

Efficient and Secured Image Sharing using Visual Cryptography and Genetic Algorithm

M. Mary Shanthi Rani[1] and G. Germine Mary[2]
Department of Computer Science and Applications[1]
The Gandhigram Rural Institute-Deemed University[1], Gandhigram, Tamil Nadu
Department of Computer Science[2], Fatima College[2], Madurai, Tamil Nadu, India
drmaryshanthi@gmail.com   germinemary@yahoo.co.in

Abstract

The recent and rapid developments in imaging and communication technologies have resulted in a mass generation and transmission of digital images, eventually increasing its number of applications in almost all fields like remote sensing, medicine, agriculture, forensics, defense etc. This demands effective and secure transmission of images over the networks as information is prone to vulnerable threats online. The proposed algorithm guarantees highly secure transmission of secret information in the form of images using Visual Cryptography. Visual cryptography provides a very powerful technique by which a secret image is distributed into two or more shares. These shares are meaningless images and look like random dots. At the point when the shares on transparencies are superimposed precisely together, the original secret can be found without the utilization of computer. One of the main drawbacks of traditional Visual Cryptography is the pixel expansion, where each pixel is represented using m pixels in each resulting shares. The parameter m is known as the pixel expansion. This pixel expansion results in a loss of resolution. The restored secret image has a resolution lower than that of the original secret image. The proposed method enhances the visual quality and resolution of visual cryptography using the genetic algorithm. A Genetic algorithm is an optimization technique based on natural selection, the process that drives biological evolution. The proposed method increases the clarity, enhances the degree of detail, improves the contrast, increases the average information content, PSNR value and at the same time maintaining the security of the secret image.

Keywords: Genetic Algorithm, Image Enhancement, Information Security, Secret Image Sharing, Visual Cryptography.

[1] Introduction

The growth of IT and Internet Technologies has opened new opportunities in scientific and commercial applications. Through these technologies, lots of information is transmitted quickly to all parts of the world. However, it also leads to many serious problems such as hacking, duplications and malicious usage of digital information. Security issues become more complex in a network environment. We must ensure that access to the network is controlled and that data is not susceptible to attack through transmission over the network. Many technologies are available to encrypt data and thus help to ensure its privacy and integrity.

The encrypting technologies of cryptography are generally used to protect information. Visual Cryptography (VC) is a powerful cryptography technique for secured image sharing through an unsecured network such as the Internet. VC uses the characteristics of human vision to decrypt encrypted images. It needs neither cryptography knowledge nor complex computation. For security concerns, it also guarantees that hackers cannot recognize any clues about a secret image from individual cover images.

VC encrypts Secret Image (SI) into some n shares of the image. The decryption only requires stacking of n shares on top of each other. It is impossible to retrieve the secret information from $n-1$ shares of the images. In VC, each pixel in the original secret image is represented using m pixels in each of the ensuing shares. The parameter m is known as the pixel expansion because the recovered image will be m times larger than the secret image [1, 2].

One of the main drawbacks of traditional VC is the pixel expansion. This pixel expansion results in a loss of resolution. The decrypted secret image has a resolution lesser than that of the original secret image [3, 4]. Splitting the secret image into multiple shares in VC has the effect of reducing the contrast in the recovered image. Hence improving the visual quality of VC is a commonly researched area. The proposed method enhances the visual quality and resolution of visual cryptography using Genetic Algorithm (GA).

For grayscale images, the perceived visual feature of the recovered image can be enhanced by using image filtering techniques prior to encrypting the secret image [5]. This proposed study enhances the quality of image using GA and it caters to all kinds of images, color as well as gray. The algorithm performs enhancement in RGB color space.