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Meta-data based secret image sharing application for different sized bio-medical images.

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Abstract

Usually in image sharing schemes, shares are generated first for a given secret image and then embedded into cover images to produce stego images. These two steps are done sequentially. There exist some relationship in the first step, the size of the secret image and size of the shares which are derived from them. In the proposed method, these two steps are done concurrently. A cover image is chosen and according to its embedding capacity, share is generated and subsequently embedded into chosen cover to produce the stego image. This process is repeated till all the image portions are embedded. While generating share, meta-data (i.e.) header is created for each shares and appended to shares before being embedded. At the destination end, shares are extracted from each stego images and are reassembled into a single original secret image according to the meta-data present in each share. Methods available in the literature embeds uniform sized secret image into cover images of uniform sizes. Using proposed method different sized secret images have been embedded into cover images of varying sizes.

Keywords: Image sharing, Different sized image, Batch steganography, Least significant bit, Compression.

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Introduction

Shamir et al. designed a Secret Sharing (SS) method to share a secret key where secret key is an integer valued which can be divided into many integer values according to the polynomial equation [1,2]. SS methods are used for many real world application [3,4]. In real life, SS schemes can be applied. Consider this scenario. A country does not want to give the supreme power of giving permission to the use of nuclear weapon in a war. But instead, this power rest on three persons, president, prime minister and the defence minister of that country. At least two out of three must agree to the idea of invocation of nuclear war [5]. SS scheme can be applied to images as well. This is referred as Secret Image Sharing (SIS). This is reported first in [6]. Later SS schemes are applied on the other types of cover as well, i.e., test, audio and video [7]. Many SIS schemes have been proposed so far using different concepts [8,9].

In data communications networks, original data is divided into small chunks called packets by segmentation process when it cannot be transmitted as single packet. Process done at the source end needs to be computed in a reversed order at the destination end to reconstruct the original data from packets [10]. Sometimes, information to be transmitted called payload can be compressed and if need be can be encrypted also [11]. In data communications networks, after original data are segmented into packets. It is encoded as signals and transmitted across the communication medium to reach the destination. This can be modified for steganography. In SIS, after images are divided into shares, it can be embedded into a chosen cover image. So encoding of packets in data communication is correlated with embedding of share in steganography in our proposed method.

Related Works

Thien et al. describes the method for construction of shares from a secret image. Size of the constructed share is smaller than the secret image. This share looks like a random noise image. If shares are sent as such, there will be suspicion. To avoid this, shares are embedded into a cover image to produce a stego image. If t numbers of shares are produced, then size of the share is 1/t of secret image. Size of the cover image which is chosen for embedding these shares must be either 2 times or 4 times the size of share [12]. Wu et al. modifies the paper in such a way the size of the share is 1/t but the size of the stego image is also 1/t [12,13].

Yuan et al. described methods for sharing a binary secret image into multi cover images. For sharing a secret image, four cover images of similar size are chosen. A binary matrix is calculated by XORing LSB planes of all the cover images. To embed secret image into cover, each secret pixel $A_{i, j}$ of secret image is compared with $B_{i, j}$ of binary matrix, if both are same, no operation is done and next secret pixel are examined, otherwise using gradient measure, particular cover image is chosen for embedding this particular secret pixel into $C_{i, j}$ of the chosen

A novel image processing approach for finding the bubble count in neutron dosimeter

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Abstract

The bubble detector is used to detect the amount of neutron and hence used to measure the neutron dose under intense gamma field. It can be used to monitor radioactive exposure. The number of nucleated bubbles yields the neutron dose. Hence the accuracy of the measurement depends on the counting of bubbles. This work proposes an image processing based technique to increase the accuracy in finding the number of bubbles in the bubble detector.

It is carried out by using watershed and region growing based segmentation. The image processing segmentation techniques shade the digital image of bubble detector into various segments from which the number of bubbles in the bubble detector is detected.

Keywords: Region growing segmentation, Watershed segmentation, Neutron dosimeter, Bubble detector, Neutron dose.

Introduction

In this nuclear era, various technologies that apply nuclear science have popped up for different applications. These range from power production to radiotherapy. In these applications, there is a natural urge for controlled or minimal exposure of neutrons. The modern world is prone to radio hazards. Hence the calibration of neutron dose which is exposed is very much essential. By calibration we can check whether the radioactive exposure is in safe levels and if not, it is possible to take immediate steps to prevent unforeseen impacts[8]. For this, various appliances have been developed to give the neutron level[2].

A bubble detector is considered as one of the most preferred neutron detector for measuring neutron dose rate amidst high-intense gamma fields[3, 4]. From the count of the bubbles in this dosimeter the neutron dose can be detected[13].The bubbles in this detector are of uniform size and are distributed uniformly throughout the dosimeter. As the visualization of all the generated bubbles in the bubble detectors is not practically feasible, they can be found out by employing various techniques. Image processing is one such field on whose application we can find the bubble count. Image segmentation plays a crucial role in evaluating the image for essential information[5, 6, 9]. It is used in analysis of an image and deriving a conclusion.

The segmentation techniques are categorized into two groups[10]. One group is grounded on discontinuity property of intensities also referred as region based segmentation. And another one is grounded on similarity property of intensities. On the whole, there are many segmentation techniques suitable for various applications; this paper employs watershed based segmentation and region growing segmentation.

Moghaddamzadeh et al[11] used a fuzzy based approach on region growing segmentation. Two methods were proposed: one for compression and other for object recognition by using finer and coarse segmentation techniques respectively. Information about edges was used to segment in coarse segmentation process. Fuzzy based criteria have been used to grow the segments and merging pixels with a segment. Each image segment is taken as a fuzzy set and fuzzy operators have been used to handle boundaries.

Tremeau et al[16] proposed usage of region growing and merging for segmentation. Color similarity and spatial proximity were taken as criteria for region growing process. After the region growing process, region merging process has been carried out to merge regions having color similarity. This work portrays region growing as more appropriate when compared to clustering and thresholding approaches. To measure color homogeneity, they use three criteria: local homogeneity, average homogeneity and second average homogeneity criteria. This approach combines local parameters as well as global parameters to get a non-partitioned segmentation for processing regions that have similar colors.

The work of Senthilkumar et al[14] proposes a methodology for detecting breast cancer by using region growing segmentation of mammograms. The methodology uses a cloud model to recognize automatic segmentation. Pre-processing has been carried out using selective median filter and the enhancement of image has been done by CLAHE (Contrast Limited Adaptive Histogram Equalization) methods. The region growing method have provided with good segmentation results and when combined with the above said techniques, identification of cancer area has been achieved with 93% accuracy.

The study by Ng et al[12] used K-Means clustering algorithm and improved watershed algorithm for image segmentation. The watershed algorithm provides complete division of images. An unsupervised learning has been carried out by

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Enhancing Security for Data Hiding in Radiographic Images using Burrows Wheeler Transform

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Abstract

Objectives: This paper proposes a new method to enhance security for data hiding in radiographic images through distortion of original data. **Method**: The process involves applying a Burrows-Wheeler Transform (BWT) to the original data, which groups and stores similar patterns in data, causing distortion. This distorted data is then further encoded in a safe format before hiding it in the cover image. The decoding process decoding from the safe format and applying Inverse Burrows-Wheeler Transform (IBWT) to retrieve the original data from the stego image. **Findings**: Thus, a 2-level security scheme is implemented. Cryptanalysis of the hidden data becomes difficult since the original data is distorted, thus enhancing the security of the hidden data. Nevertheless, the stego image obtained from this method is less deviated from the original cover image. This is shown from the satisfactory PSNR (Peak Signal to Noise Ratio) and MSE (Mean Square Error) obtained. **Application/Improvements**: This proposed method can be used wherever steganography or data hiding has its applications. This method can be used in commercial communication, military communication etc.

Keywords: Burrows-Wheeler Transform (BWT), Data Hiding, Inverse Burrows-Wheeler Transform (IBWT), Least Significant Bit (LSB), Radiographic Images, Steganography

1. Introduction

Security enhancement in communication and information exchange is one of the most explored domains in the field of Information Technology. Today in the world of universal electronic connectivity with diverse cyber threats, secure connectivity is indeed a very essential tool for information exchange. Steganographic techniques grant information exchange by hiding secret data into a carrier image, which facilitates the communication. Though other data encryption provides security to some extent, the cryptanalysis of cipher texts encrypted with outdated techniques and improved steganalysis can be performed with little effort. So, there has been a constant urge to introduce a more efficient cryptographic algorithm. The combination of both steganographic and cryptographic techniques could afford an optimum solution for this. A methodology, involving Burrows-Wheeler Transform (BWT), a non-linear transform[1] is presented in this paper. The input bits are first grouped using BWT. This is followed by storing the positions of the least occurring bit in the grouped order. The positions of the least occurring bit are only embedded in the cover image to form the stego image. Thus, two levels of distortion are added to the secret data which makes cryptanalysis difficult. Retrieval of the message is done by forming the grouped string; by using the positions of the least occurring bit in the entire bit sequence. This bit sequence represents the grouped string of bits. Inverse Burrows Wheeler Transform (IBWT) is applied to this string to retrieve the original message.

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Elimination of grey level distortion using multiscale gradient multiplication

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Abstract: Pixels are the smallest solitary constituent of a digital image. Breaking down an image into its composite pixels elucidates its properties and subjecting it to thresholding helps to perceive the decomposition of its pixels rationally. This is done in assent with the pixel properties based on a threshold value. However, thresholding does not assure that these decomposed pixels are always pure. The odds of discerning the distortion (noise) enmeshed in the grey scale values are high. Hence removal of noise from the image is given paramount importance. Multiscale gradient multiplication is a method to obtain optimal threshold value which can be used to effectively eliminate grey level distortion upon segmentation. This method multiplies the responses from various filters operating at different scales. The proposed technique assists in eliminating distortion in grey levels while improving robustness towards edge signals, and thus, considerably outperforms other conventional methods.

Keywords: thresholding; multiscale gradient multiplication; transition region; distortion; filters; segmentation; misclassification error.

Reference to this paper should be made as follows: Karthikeyan, B., Ballakur, S., Sowvarnica, S., Vaithiyanathan, V., Vinayakaram, N. and Vasanth, G. (2016) 'Elimination of grey level distortion using multiscale gradient multiplication', *Int. J. Computational Vision and Robotics*, Vol. 6, No. 4, pp.369–380.

Biographical notes: B. Karthikeyan is currently working as Assistant Professor in School of Computing, SASTRA University, Thanjavur, India. Presently he is pursuing PhD in the area of image processing. His research area includes image processing and steganography.

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A REVIEW: ASSESSMENT OF THE PERFORMANCE OF VARIOUS IMAGE COMPRESSORS FOR RADIOGRAPHIC IMAGES

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***Abstract*—Modern Digital world is mainly concerned with storage space and bandwidth utilization. Digital images requires huge amount of storage space in uncompressed form and require large bandwidth for transmission over the network. As a result of growing demand for effective utilization of storage space and bandwidth many efficient image compression techniques were developed. The Internal details of an opaque body can be obtained by using electromagnetic radiations like X-rays other than visible light and images obtained by this way are called Radiographic images. In this paper a comprehensive survey of performance of various image compression software are presented and performance is evaluated based on Compression Ratio (CR), Relative Data redundancy and Compression Ratio per byte and Entropy. Based on the experimental results, PAQ8pxd method has a good performance when compared with other image compression software.**

Keyword:-Compression Ratio, Entropy, PAQ8pxd, WinZip, WinRAR, Context Tree Weighting (CTW), Relative Data redundancy.

I. INTRODUCTION

Compression is a process of reducing the storage space, processing time and transmission time required for information by subjecting it to some modification. Image compression is reducing storage space of image by removing irrelevant and redundant data. Image compression should be performed with the capability of providing image reconstruction. The content of the image data is one factor that determines the amount of compression. A photographic image can be compressed to 80% without any degradation in quality.

Image compression [17] techniques are divided into two kinds, lossless and lossy compression techniques. Original information can be retrieved from the compressed data without any loss by using Lossless image compression techniques. It is very useful in the cases when original data and decompressed data should look similar. Arithmetic coding, Run length encoding, Huffman coding, LZW coding are some of the lossless compression techniques. Whereas in a Lossy compression the original information of the data is lost to some extent, so an approximation of original image can only be reconstructed. Lossy compression [18] is useful for applications which are not very concerned about some loss of data. Compression ratio of lossy compression is more when compared with lossless compression. Some of the lossy compression techniques are Discrete Wavelet Transform (DWT), Discrete Cosine Transform (DCT) and Discrete Fourier Transform (DFT).

II. LITERATURE SURVEY

Chen et al [3] proposed a Game playing approach to analyze the Password Based Key Generation algorithm, which is the core for the security of the WinRAR mechanism. The paper explains the security of the WinRAR encrypted file using a theoretical derivation. Using GPU-Based exhaustive password search attacks, the paper concludes that if the password length is greater than 6 characters, then better security can be achieved.

WinZip is compression software, which also has encryption feature, belonging to computers with Microsoft Windows. Kohno et al [4] proposed a paper which exhibits several attacks against the WinZip security. It also discusses security alternatives. It is mainly concerned with the subtleties in designing a secure cryptographic algorithm.

Neill et al [7] using context tree weighting method proposed Adaptive Context Tree Weighting (ACTW) algorithm which is its extended version. In this algorithm more weights are given to recent observations unlike giving equal weights to all observations in order to improve performance. Experimental results obtained using merged files reveal that Adaptive context tree weighting algorithm has better performance over normal Context Tree weighting algorithm. When WinRAR software is used, it creates a temporary folder which associates with specific users. Geoffrey Fellows et al [1] proposed that these temporary folders help forensic analysts to provide evidence for the files that have been viewed from the WinRAR archive. Such evidence will be very useful when user denies that the files were not accessed by him.

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AN AMALGAMATED APPROACH OF CRYPTOGRAPHY AND STEGANOGRAPHY USING IWT AND RANDOM PIXEL SELECTION FOR SECURE TRANSMISSION

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ABSTRACT

Steganography is the art of concealing the message such that even the cyber geeks do not suspect the existence of the message. Cryptography is the technique of secret writing especially in the form of code and cipher systems but the presence of message is known. This paper, presents a secured data transformation by blending Steganography and cryptographic techniques together to improve the standard of data security such that none other than the intender and the receiver will be able to extract the proper data. The integer wavelet transformation is used to transform the data into an unintelligible format. Transformed data are embedded using least significant bit substitution into the cover image. The intensity of the pixel range which is frequent in image is selected and infixing of data is done on this selected range of pixels. This process is also reversible. This improves the efficiency in secured transmission as it approaches different patterns each time the same data embedded in different images. This algorithm can be best utilized to encrypt passwords and keys which are transmitted by 3rd party. It can also be considered to store digital signatures in the database.

Keywords: steganography, cryptography, integer wavelet transform.

INTRODUCTION

Developing effective secured systems across two dealers to transmit the data secretly is one of the most required techniques worldwide. Each data around the world has been digitalized for data maintenance, retrieval and efficient storage. But the data transmitted across, is being hacked by the intruder. Even though several methods and techniques have been used by the service providers, possibility of security breech still exists (Ajit Singh *et al*., 2013; Shilpa Sunil Wankade *et al*., 2013). Focusing on the advanced techniques of data security, this paper is being implemented on steganography (M. Padmaa *et al*., 2014). Here the secret information is embedded into an image which will be transmitted to the receiver. Data being hidden in the image, none other than the sender and the receiver is aware of the existence of the data (Amirtharajan *et al*., 2012). Infixing of data into the pixel has been done on the basis of pixel selection using particular criteria (B. Elangovan *et al.,* 2013). This paradigm considers pixel intensity of certain range. Due to this criterion, culling of pixels depends on the image, which is carried away by positional variance of the pixel. This results in uniqueness in embedding process, as insertion of data depends on the image in which it is inserted. This sets a hindrance to the cryptanalysis to determine the track of embedding technique. Invariably, implementation of this technique is easier since the only criterion put upon is judgment of pixels within certain range.

To enhance the system of data security, cryptography is also implemented on the hidden message (Manikandan *et al*., 2011). Cryptography is a technique which transforms the data into unintelligible format. Several transformations could be applied on the data to make it more secured. In any discretized transformations, wavelet transformation (Po-Yueh Chen *et al*., 2006) is considered to be one of the most popular candidates among time-frequency transformations, which are oscillations that start at zero, increase, and then decrease again to zero. As a mathematical tool, wavelets can also be used to represent data and to extract information from different kinds of sources, not restricted to audio signals and images. Wavelet transform can be broadly classified into three classes: continuous, discrete and mutli-resolution based.

Continuous wavelet transforms are subjected to uncertainity principle of fourier analysis. For a given event in a signal, one can find it difficult to assign simultaneously exact frequency and time scale to that event. It results in mapping of entire scale map instead of just a point. In discrete wavelet wavelet transformation, the signals are discretely sampled. Unlike fourier transformation, it can capture both location information and frequency.

The wavelet series can be represented as square-integrable function by certain orthonormal series. A function can be defined as orthonormal function if it is completely defined by orthonormal system, i.e. 

The complete orthonormal system is defined by Hilbert basis

For integers 
The integral wavelet transformation is defined as

where a and b are scaling and time factor respectively.

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Identification of Favorable Scanning Paths for Optimal Image Compression

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Abstract

Image compression serves the intention of dipping redundancy or trivial information contained in the image in order to make it suitable for efficient transmission. The image information can be figured out by traversing across various paths or pixel positions. Analysis of these traversal or scanning paths directs the user to the best path which helps to achieve finest compression. For this purpose, calculation of three parameters, which give an idea of how far the image is compressed, is crucial. Experimentation on several images of different sizes and textures unfolds the best traversal path. Once the best scanning traversal path is identified, it is compressed using Huffman coding technique. Generally, this method can be applied for compression of radiographic images, X-ray imaging of various human body parts and in medical imaging. Compression techniques can also be used in many areas including technical drawing and transfer of images through the internet.

Keywords Radiographic Image, Image compression, Scanning path, Correlation, Huffman coding

1. Introduction:

Images are used extensively because they can put across more information than a piece of text. The urge to store more information in images gave rise to compression techniques. These techniques aim at eliminating redundant and irrelevant data. Data redundancy can occur in multiple ways as in coding and inter pixel redundancies and compromises the quality of the resulting image. When an image is well compressed, the size of the file is reduced without affecting its quality. For instance, compression is useful in high speed imaging applications where the system bandwidth imposes restriction on the speed (Fu et al 2011). Compressed images are in great demand in

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Various Clustering Techniques: A Survey

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ABSTRACT

The purpose of the paper is to explore versatile kinds of clustering techniques and their uses in different scenarios. The various clustering techniques have different and complex computational complexities due to the hyper dimensional points which are taken as the input parameters which will be a vector. Clustering has algorithms of different categories such as Agglomerative clustering, Divisive clustering have been discussed. Comparison of Hierarchical clustering types along with their advantages and limitations are discussed. A study of latest clustering techniques by various researchersalong with their merits and demerits are also mentioned.

Keyword: clustering, K Means, Agglomerative clustering, Divisive clustering.

INTRODUCTION

Clustering refers to the dividing of data into its relevant groups or classes such that data which are present in same class are similar and data present in the different class are dissimilar. In other terms the mechanism by which a group of patterns are identified and separated into its characteristic group is called clustering. Clustering has a wide variety of applications in various fields such as image segmentation[11], market research, software evolutions, mathematical chemistry, climatology, transcriptomics, human genetic clustering, evolutionary algorithms, and so-on[4]. There are two types of clustering namely Hierarchical clustering[9], [10] and Partitionalclustering[10][12].

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Change Detection in Video using Pixel based Parametric Analysis

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Abstract

Background/Objectives: This paper contains the change detection between frames of a video. The main objective is to show how the sequence of frames differ from one another in a video. **Methods/Statistical Analysis:** The amount of change between two frames is measured using the pixel based change detection parameter's Absolute Average Difference (AAD), Peak Signal to Noise Ratio (PSNR), Normalized Correlation (NC), Signal to Noise Ratio (SNR) and Mean Squared Error (MSE). These parameters detect the changes in each and every pixel of the frame with respect to other frame and values are calculated for each frame of a video and compared in the tables followed by analysis of the values. **Findings:** The results indicated the changes that are not perceived by the human eyes. They depict that if the change between two frames are visible to the human eyes then they differ more based on the parameter we have considered and if the change is not visible to the eyes then minute differences is observed between the two respective frames. **Application/Improvements:** The change detection plays a significant role in visual media. Based on the change detection of frames, analysis of a video can be done.

Keywords: Change Detection, Frame, Mean Squared Error, Normalized Correlation, Peak Signal to Noise Ratio, Pixel

1. Introduction

In a sequence of frames the detection of intensity changes in the two consecutive frames is an important. Converting a single scene into a multiple set of images is called framing of scene. Every video or scene consists of certain amount of frames. The more the clarity of the video is, the more is the number of pixels present in the frames of that respective video. Pixels in the frames of a video behave as a medium for depicting the video quality. So as the movement of frames at a particular constant rate constitute a video, it is important to detect the changes in the frames along the movement of the frames for obtaining the better quality. Detection of change based on the changes in pixels of the frames can be done effectively.

Human eye can sense the changes in video up to some extent and some changes are not in the vicinity of human eye. Change detection helps to identify some changes that cannot be perceived by the human eye. So detection of change based on the changes in pixels of the frames can be done effectively. Change detection is classified into two types, the supervised method and the unsupervised method[2]. Detection of change based on the pixels values of images taken at different times comes under unsupervised method[2]. In supervised method the change is calculated from the data produced from multi spectral images. Most widely used change-detection techniques in unsupervised method is "difference image" based on pixels[3]. Many unsupervised methods were proposed which are based on parametric estimation of change detection[4]. In various applications image processing measures plays a crucial role. MSE, PSNR and SNR are most widely used parametric measures[5]. The parametric estimation of

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