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APPLICATION OF GENETIC ALGORITHM FOR IMAGE TRANSFER

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ABSTRACT

For images transfer, different embedding system exist which works by creating a mosaic image from the source image and recovery from the target image using some sort of algorithm. In current study, a method is proposed using the genetic algorithm for recovery of image from the source image. The algorithm utilized is genetic algorithm which is a search method along with another additional technique for obtaining higher robustness and security. The proposed methodology works by dividing the source image into smaller parts which are fitted into target image using the lossless compression. The mosaic image is recovered at retrieving side by the permutation array which is recovered and mapped using the pre-select key.

Keywords: Genetic Algorithm, Image, Permutation, Greedy Algorithm

INTRODUCTION

There are variety of methods for developing computer-based mosaic images. There are various embedding systems in place for creating a mosaic image based on source image. We will be discussing the mosaic image where the mosaic image retains all important details of the source image using some sort of embedded in the output image. This aim is achieved by dividing source image into smaller parts with set embeddedness. The information obtained from the source image is fitted in some part of the mosaic image using a random secret key. The method of embedding is used for transferring the images over the network while retaining their privacy. Application of such include military image database, company archive, personal photogram albums, and so on. The desire to protect these images while transferring over the network lead to

development of some sort of embedding system. Two common techniques include image encryption and data hiding. The natural property of an image includes strong spatial correlation and high redundancy. By making use of image encryption, natural properties of an image are encrypted for obtaining the encrypted image (Zamani, 2009). The encrypted image which is also labelled as noise image become protected and can easily be transferred over the network. The encrypted image can be obtained using the secret key which protect it from the attackers. The other technique is data hiding which is about hiding secret message in another image where it is difficult for anyone to identify the secret message. The data hiding method may include recursive graph conversion and transformation in discrete cosine/wavelet, difference expansion, histogram shifting, and LSB substitution. Secret fragment visible mosaic is also an image data hiding technique proposed by 8. The technique works by random rearrangement of the pieces of an image for secret hiding in another image and creating a steganography image effects. The technique also solves for the problem of hiding larger image data behind an image of cover.

The proposed technique utilizes the Genetic Algorithm which is based on a search algorithm. The source image is divided into smaller parts and placed in a random sequence in a target image. For performing certain permutation P of a given size N out of N! permutation, a process name knowledge base research program is utilized. The method function by arriving on a personal permutation for different sizes.

The proposed methodology can yield the desired results by dividing the source image into rectangular size pieces which are labelled as tile picture. These tile pictures are fitted into resembling blocks in the target image which is labelled as blocks for target. The color characteristics of every tile picture is transferred to its respective goal module which produce a mosaic looks like image. The benefit of the proposed method is that it produces a mosaic image which is useful in image data hiding and has superior qualities compare to the image encryption. The method can also be used for transforming image in to disguising image of mosaic which do not requires any compression.

LITERATURE REVIEW

Chavan and Manjrekar (2015) propose a mosaic steganography method for image data hiding. The method is based on producing mosaic image by taking smaller parts of the source image. In this method, development of a suitable database is the first thing. The second stage is the mosaic image development and the third stage are mosaic image decryption. The limitations of the method include development and maintenance of large database. Furthermore, for the function to work, there is requirement of calculation of each image histogram in the database and the required storage.

In the same stream, work by Lama, Han, & Kwoon (2014) shows that the function works by using the greedy search algorithms which is a time-consuming process. Study showed that using mosaic images of secret-fragment visible by crating color transformation which is almost reversible in nature.

By making use of database, another method can create mosaic images of the secret-fragment. The image is chosen for target image of secret. The method consists of two stages including

creation and recovery. The process is based on several sub-stages. The first sub-stage is selection of a target image and fitting secret image tiles into it. Then transforming each tile image color based on the target image. The next sub-stage is rotation of beach tile image in a direction having minimum RMSE value. finally, information embeddedness in mosaic image for secret image future recovery.

The next sub-stage includes extraction of embedded information for recovery of secret image from the mosaic image. Based on information extracted, the secret image is recovered.

Problem Identification

For several digital images, the steganography for images are the cover items for popular image file formats. Numbers collection in an image is intensity of various lightings in different image areas. These representations are called pixels. Pixel rectangular map is frequently used for images display on internet where these pixels are displayed horizontally. Bit number in a scheme of color is represented by depth. For every pixel, bit number is used. For example, a depth of 5 bits refers to 5 bits used for describing that bit color. For every pixel, 5 monochrome bits and images of grey scale are able for displaying 325 variety of colors or respective color shade. There are three main colors used in creating pixel scheme based on 24-bit image. The primary colors are represented by RGB and 8 bits. Hence, there are varying quantities for every pixel which consist of 256 RGB color which enable a combination of 16 million colors. Thus, there is required to involve mathematical calculations to cover the processing related to display image based on complicated color scheme. For example, if b denotes the bit number, then the respective data redundancy R with bits is

$R= (1-1/C)$

where c refers to the compression ratio.

The Compression ratio or C= b/b’ used for compressing the data in an image.

The two common types of compression include the lossless and lossy compression. Both compressions compress the data for storage and process saving. Lossless compression does not remove any details from the original image information but makes compression using the mathematical formulas. The original image solidarity is retained and the image is compressed using the bit-by-bit which is identical related to the original image. For lossless compression, the 8-bit bitmap file and Graphical interchange are the most common formats for the windows-based operating system.

The lossy compression on the other hand reduce the image information by accepting only suitable information and rejecting excessive information and thus creating a compressed file which maintains lesser amount of data than the original one. Mostly, it removes that information which are not distinguishable by human eyes. The outcome of lossy compression is an image which is closely resemble with the original one but contains lesser amount of data in it.

In stenographic algorithm, compression plays a major role. The lossy compression technique leads to a smaller output image but also contains possibility that the embedded file may be somewhat lost because of removal of some of the information. Hence, for stenographic algorithm, the suitable compression is the lossless compression which make sure that the image

remains intact and maintain important information from the original version. Thus, the mosaic image can be saved in lossless bmp format which will be suitable but not bringing much reduction in its size.

The procedure starts with cutting secret image into smaller pieces which mostly are in rectangular size and fitted into target image using a control key which creates a stego-image. The output image is difficult for anyone to interpret and is in the state of stego-image. There is also a requirement to maintain large database for selection of suitable target image for color matching purpose.

The domain image technique includes applying bits and manipulation of noise. The transform domain works by transforming image first and then fixing a message in the image. The hidden message retains important image areas and thus making it a strong technique.

Problem Description

A new method of embedding image is proposed by (Singhavi, 2015). The method works by inserting tiles from secret image into target image using the greedy search algorithm using the predefined target images database. The process works by dividing image into equal size tiles in an image file matrix form using the codes developed in MATLAB. Extraction of histogram values and feature of every tile of secret image is done and embedded into matching tile in the target image. The embeddedness is done having random location in the target image.

The mosaic image output of secret-fragment-visible consist of small fragment of source image. The output mosaic image looks so fragment that no one can figure out what the source image may looks like. Thus, using this method, the source image is embedded secretly in the target image. The target image is searched using the Greedy Search algorithm. Histogram and values for feature is used for searching. However, it also poses challenge of computation due to the higher volume of computation requirements. If the target image is smaller, the greedy search algorithm may end up with less than an optimum solution. However, if the database is large, the greedy search algorithm will work perfectly there. In DB, the greedy search algorithm is essential for optimum choice by calculating each image values for h features and respective histogram.

However, DB on an image creates resource burden and become very expensive. By making use of computations, this problem can be overcome up to some extent. An alternative can be to avoid the DB in image which can be done using the arbitrarily selection of an image using the genetic algorithm which will be based on mapping sequence generation. The process consists of mapping sequence for tiles which once created, can be associate with advance security such as chi square or KBRP for creating random permutation. Under this process, a customization permutation based on particular size is created using the knowledge base research program. For same size and key, same permutation can be utilized in future. For overcoming this issue, a genetic algorithm is proposed in the present study. the genetic algorithm revolves around robustness and security. We propose that by making use of the genetic algorithm, image of secret is divided into smaller tiles. By making use of the knowledge base research program, these tiles are rearranged in array in reiterative process until embedded mosaic image first few pixels are

created. Later, the image is reconstructed using the sequence and key mapped by retrieving side. The selection in target image is another feature of proposed method which can be done by making arbitrary selection for reducing memory load. The genetic algorithm also reduces the computation requirements.

The mosaic image is created and recovered by starting the process from selection of suitable image from the database which matches well with the secret image. After selection of such image from the database, different tile images are fitted into the target image having similar sizes from secret image to the target image. Array of random generator is used for placing tile images into the target image. At retrieving side, the permutation array is recovered and mapped using the same key.

PROPOSED TECHNIQUE

The proposed technique is based on genetic algorithm and by making use of additional programs, obtains higher robustness and security. The additional program can be the KBRP algorithm which helps in creating an array of random permutation. Certain keys are used for producing permutation.

The basic idea of the proposed method is based on two stages. In the first stage, mosaic image of secret-fragment-visible is created using secret image tile images and making arbitrary selection of target image. The second stage is secret image recovery from the mosaic image output. In the first stage, the sub-stages include division of secret image into suitable number of rectangular shaped pieces. Then the next sub-stage is running the genetic algorithm which creates sequence mapping. The next sub-stage is tile-image fitting information which is hided in the secret image. In the second main stage, the sub-stage includes retrieval of array and its embedded from previous tile-image fitting information. Final sub-stage is reconstruction of secret image using the information which is retrieved from the mosaic image. The merits of the proposed system are the selection of arbitrary target image which can be selected by choice.

The genetic algorithms mimic the process of mapping. Furthermore, the genetic algorithm is considered efficient in creating sequence of mapping compare to many other possible alternatives. By making use of key based permutation, additional security can be added. The tiles are placed on the target image which increases its robustness and permuted array are created which enhances its security.

Image is recovered using the key which result in mosaic image. By making use of embedded information, we can regenerate the secret image.

Mosaic Image Creation

Translation of colors between blocks is among the initial stages in the proposed methodology. If secret image tile is denoted by T which are fitted into blocks B a preselected domain is selected. The target image and secret image tiles may have different colors so the challenge is to reconcile this. Hu (2015) propose a color transfer scheme which is proposed to be followed in this method. The scheme works by converting an image color characteristic to be that of another in the color space of 1αβ which is used for bringing reduction in the required information volume of original

secret image recovery. If there are two sets of pixels with image T and target block B, then we get the following two sets
{p1,p2,……,pn} and
{p_1,p_2,……,p_n} respectively.
Accordingly, each pi color can be denoted with replacement as follows;
(ri,gi,bi)
and that of each
p_i by (r_i, g_i, b_i).
Finally, we can calculate the B and T means of standard deviation
In next stage, a color characteristic T of a tile image is transformed to its respective block in target represented by B. the issue of making decision for every T for every B is overcome by making use of color standard deviation in every block for such selection.
The overflow problem which can be due to the pixel values in the new tile image T can be dealt by conversion of pixel into T values which are not less than 256. By making use of this method, the variance because of over or underflow can be overcome.
For recovery of secret image, we make use of the technique proposed by Hu (2015) which is based on least significant bits in the mosaic image. The technique is utilized for data embedding. Forward and backward integers were conducted by making use of this technique. Accordingly, (x, y) is a pixel values pair and transformed ones is (x', y'). for title image T, the required information is recovered by mapping it to B which consist of B index and T angle of optimal rotation.

Solution for Algorithm

The mapping sequence creation is as follows;
Step 1 is starting with creation of random chromosomes population.
Step 2 is assessment of each chromosome in the population for its fitness function
Step 3 is new population creation using the following sub-steps
- Step 3a is selection of parent chromosomes based on their fitness
- Step 3b is crossover the parents for new offspring form
- Step 3c is mutating new offspring using the mutation probability
- Step 3d is placement of new offspring in population

Step 4 is a further run in algorithm for replacement purpose
Step 5 is testing the end conditions whether these are satisfied or not.
Step 6 is loop which is restarting from stage 2 in case of end conditions are not satisfied.
The KBRP algorithm is as follows;
Step 1: initiation of KBRP algorithm where
N refers to the size of array
P refers to holding array permutation with 1 to N values
K refers to the size of S key
A[i] = K[i]
For i=1 to S

P[i] = P[i] + P [i+1]
For i=1 to S-1
P[S] = A [1]
While (S < N)
j = S+1
For (i = 1 to S-1)
For (k = j to R-1 &&i _ N)
P[j] = P[j] + P [j+1]
i++
P[i] = P[i] MOD N for i = 1 to N

Step 2 is eliminating where sequence P consist of N values. This stage requires elimination of the repetitive values. These values can be replaced with zero or set average. The result of the elimination stage is that every P contains unique values and hence the problem of repetition is removed.

L: array left P.
R: array right P.
For values of all where L < R
P[i] = 0 if P [L] = P[i] for i = L+1 to R
P[j] = 0 if P[R] = P[j] for j = R-1 to L+1
L of Increment by 1
R of Decrement by 1

Step 3 is fill which is about replacing any P value of zero with range from 1 to N which is not repetitive. The process is repetitive until all P values obtains the unique values by making replacement of the value of zero.

CONCLUSION

The study proposes a method for creating mosaic image for the purpose of transferring secret image by making use of genetic algorithm and the KBRP. The proposed methodology is tested through simulation conducted using the MATLAB and found to be producing satisfactory result. The proposed methodology has advantages in terms of higher robustness and security compare to the other existing methods.

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