Hiding the Type of Skin Texture in Mice based on Fuzzy Clustering Technique

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Abstract:

A substantial matter to confidential messages' interchange through the internet is transmission of information safely. For example, digital products' consumers and producers are keen for knowing those products are genuine and must be distinguished from worthless products. Encryption's science can be defined as the technique to embed the data in an images file, audio or videos in a style which should be met the safety requirements. Steganography is a portion of data concealment science that aiming to be reached a coveted security scale in the interchange of private not clear commercial and military data. This research offers a novel technique for steganography based on hiding data inside the clusters that resulted from fuzzy clustering. The approach has been employed to use Fuzzy C-Mean clustering (FCM) to find the robust image regions for hiding the type of skin texture features in mice. The steganography was implemented using Least Significant Bit (LSB) method.

Key words: C-Mean, Extracting, LSB, Information hiding, Steganography.

Introduction:

At the times which enable humans to communicate, improving a connection secretly is one major requirement. Although owing minute methods in past, people had attempted for data hiding in order to not reveal the data simply. Information which their safety were connected with military or warfare and the details of countries' borders which were hided in different frames based on their importance level (1).Three generally approaches for text hiding in an image. Encryption is the first approach such that information can be encrypted in a style which cannot be understood by a third side. The data of the transmitter and receiver was decrypted by a popular key. The operations of decryption or encryption are implemented via programming algorithms within a digital field and sometimes one could be realized secret data by relying on algorithm's security scale. Steganography is the second approach which is not only the information residues secretly but confidential connection' presence is hidden.

Steganography is the science and art that hides the communication. The main objective of steganography is hiding the existence of every connection between the transmitter and receiver. Oftentimes, it is intellect that a connection can secure via coding the interchanged message. Coding practically is insufficient. Accordingly numerous approaches were suggested to hide data in coding state. If this image steals and places on a website then its owner's legitimate can supply the court with this assurance message for proofing of his possession. This kind of concealment is known watermarking (2). Before explicate the LSB approach, it should explain the major variation between steganography and encryption. The main variation between steganography and encryption is that, encryption's aim to message content concealment and not message's existence concealment, while steganography objective to hide each sign to the message's existence. In cases that encrypted of information interchange can suspicious; the communication's existence must be unobserved.

For example, if anyone can arrival encrypted part with any path; it would be known that such part holds encrypted messages. The third party in steganography unable to gain all information at all about covert message existence .The approaches of steganography developed to protect the multimedia products' possession rights .In another words, such approach intended for protecting the media itself (2).

Before to more explication, a summarized consideration about a method of LSB is needful to facilities the following topics. Extreme approaches of steganography which conceal the data in a pixel's space and take the advantage of LSB approach. If a file is created then several of its bytes generally are worthless or unusable and that bytes could be altered without file's harming. These enable us to be written some information in those bytes without anyone can know this operation has happen. Every file of video is solely a binary file which holds light intensity and colors of each pixel based on the binary number. Normally images utilize 24-bits 8-bits format.

For the format of 8-bits, it can use merely 256 colors for every pixel each bit holds single value either 1or 0 that completely supplies 2^8 various colors. For the format of 24-bits, each pixel also has the ability of 2^{24} and every pixel employs of three bytes hold 8 bits. Every byte displays the light intensity of 3 major colors of R(Red) , G(Green) and B(Blue) (1).

Overview of Texture Features:

The texture considered as a significant feature for the analysis of many types of images. Texture analysis is one of the most important techniques used for the analysis and classification of image regions where repetition of image pixels occurs. An substantial method for description of an area is to quantify its texture content. There is no official definition to present a texture but this descriptor supply intuitively many scales of properties like coarseness, smoothness and regularity. Statistical methods give textures' characterizations like smooth, grainy, coarse and etc. Structural methods focus on an image primitives' arrangement, such like a texture description which depended on the regularly spaced parallel lines. To analysis texture statistically, the features of texture are calculated from distribution of combined intensities at particular locations proportional to every other image locations. Statistics is classified like higher-order, second-order and

first-order according to the intensity of pixels (points) number in every combination (3).

Proposed Methodology:

The suggested method for hiding the type of skin texture consists from major steps. Firstly, Image features have been clustered using C-Means approach. Secondly the skin texture specification is read from the file and then converted to binary format. Thirdly, the values of each cluster are converted to binary format and then the binary values of texture are hided using Least Significant bits (LSB) inside the each bit of each cluster's value to construct the stego image.

### Classical steganography method using Least Significant Bit Substitution:

LSB steganography employs the least significant bits from the cover data for message hiding. Substitution in LSB is the simplest technique of LSB techniques. Substitution in LSB technique flips the last bit of all values of data for reflecting the message, that desire to hide. Suppose a gray scale image that can be stored a value of gray scale as a byte for every pixel in an image (4). Assume eight pixels can be taken from the ethnic image as illustrated in the following:

```
11010010
01001010
10010111
10001100
00010101
01010111
00100110
01000011
```

For embedding the binary value of letter C (10000011), it can be substituted the LSBs of eight pixels for resultant the following values of gray scale:

```
11010011
01001010
10010110
10001100
00010100
01010110
00100111
01000011
```

Only half the technique of LSB requires changing. The variance between the cover and the stego images will be difficult to notice by the human eye. Figure 1 a and b that display a cover and a stego images respectively, there is no visual difference between these images (5).
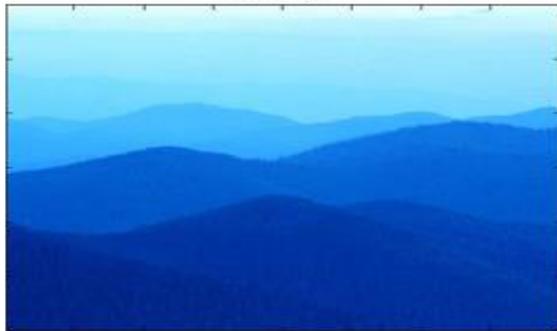
(a)

(b)

**Figure1. Bitmap images (a) Cover Image
(b) Stego Image (5)**

Fuzzy C-Means Clustering:

Fuzzy clustering is a strong unsupervised technique to analysis data and models' building. Objects at the boundaries between numerous are not obliged to completely belong to one of the portions, but they can assign a degrees of membership between 1and 0 to determine their partial membership. Clustering algorithm of FCM is one of the widely employed techniques between associated fuzzy models. Fuzzy clustering techniques can be employed to count the function of membership which defines to which degree the objects belong to clusters and employed to detect the overlapping clusters in the data-set. The FCM utilizes fuzzy dividing which able a point of data could belong to full sets at various grades of membership among 1and 0 (6). This algorithm can work by specifying membership for every data-point that correspond with every cluster's center based on the distance's basis among the center of data point and a cluster. Further data is near to a center of the cluster further is its membership across a specific center of the cluster. The addition from membership for every data point must be equal to one (7).

The main steps of FCM algorithm are,

1. An initial random centroid is assigned to every group (cluster).

2. Calculating the distance between cluster center and every point by employing easy algorithm.

3. Based on the distance among the center's cluster and every point, re-calculate a membership function.

4. Based on the recent function of the membership, re-calculate the centroid.

5. If the variance between the original centroid and the next one is below a certain threshold value like €, then the algorithm will stop, else it continues until this condition is true.

Proposed algorithm:

The algorithm of the proposed methodology for hiding process can be illustrated bellow:

| |
|---|
| **Input :** image of skin texture , type of skin texture

Output : stgo-image that contains skin texture type |
| **Begin**
Step1: **For** Row=0 to image_width-1
    For Column= 0 to image_length-1
  1.1 Get **pixels[Row, Column]** from **image**
 1.2 Apply C-means fuzzy clustering for **pixels[Row, Column]**
    End for // for Column loop
   End for // for Row loop
Step2: Store the clustered image in another image called **cluster_image**
Step 3: Enter the text of skin's type , convert it to binary and then store the result in **serect_text** file.
Step 4: set n=No bits in **serect_text** ,set m=1
Step 5: **For** k=1 to No. of cluster in **cluster_image**
  5.1 Get all pixels from cluster[k]
  5.2 Convert all pixels of cluster[k] to binary and put the results in bin_cluster
  5.3 **For** d=1 to 4
   bin_cluster[d]= serect_text [m]
  m=m+1 // to take the next bit from skin type text
    End for // for d loop
   If m>n **then** Exit For K loop

End for
 End. |

The Outcomes of Experimental:

The proposed methodology outcomes are explained and debated in this section. C# language is utilized to implement the suggested method .Twenty kinds of skin texture are utilized to evaluate the suggested method. Images in database are JPEG.

The propose methodology involves multiple stages:-

1) A process of loading an image of skin texture and the type of skin onto the project's form can be carried out in the first stage as explained in Fig.2
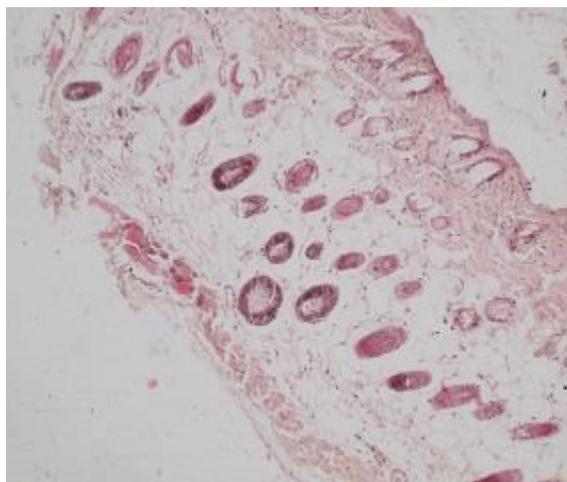
a)

b)

Figure 2. Loading Process a) Skin Texture image of mice   b) Type of Skin

2) The second step involves the application of C-means clustering to the skin texture of the mice as illustrated in Fig.3
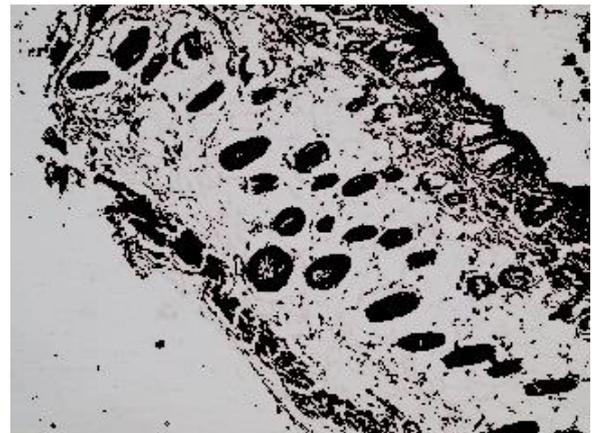

Figure 3. Skin Texture image of mice after C-Means clustering

3) The third step involves the application of steganography to hide the skin type inside the clustered image and obtain a stego image as illustrated in Fig.4.
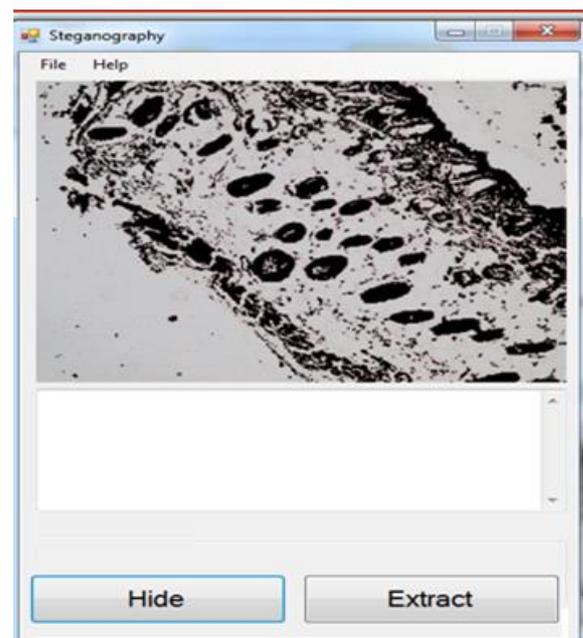

Figure 4. Hiding Process

4) The forth step involves the application of extracting the skin type from the stego image as illustrated in Fig.5

Figure 5. Extracting Skin Type Process

Conclusion

The research's objective was to hide the skin type of mice in a clustered color image. The suggested methodology used C-Means fuzzy clustering for mice skin image. FCM is really convenient to handle the affair concerning for understanding patterns' capability, noise and incomplete data, mixed information of media, interaction of human and it supply the solutions quickly. LSB approach is the simplest of the approaches employed to embed confidential or secret information in digital media. descriptor scheme. The classifier of KNN was robust to noisy training data and efficient if the training data is huge.

Authors' declaration:

- Conflicts of Interest: None.
- We hereby confirm that all the Figures and Tables in the manuscript are mine ours. Besides, the Figures and images, which are not mine ours, have been given the permission for re-publication attached with the manuscript.
- The author has signed an animal welfare statement.

- Ethical Clearance: The project was approved by the local ethical committee in University of Technology.

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إخفاء نوع نسيج الجلد في الفئران بالأعتماد على تقنية المجموعات الضبابية

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الخلاصه:

أمن نقل المعلومات موضوع هام في تبادل الرسائل السرية عبر الإنترنت. فعلى سبيل المثال ، يحرص منتجون ومستهلكون المنتجات الرقمية على معرفة أن منتجاتهم أصلية ويمكن تمييزها عن تلك المنتجات غير الصالحة. علم التشفير هو فن أخفاء البيانات في الملفات الصوتية أو الصور أو مقاطع الفيديو في الطريقة التي من شأنها تلبية الاحتياجات الأمنية المذكورة أعلاه. إن علم إخفاء المعلومات هو فرع من فروع علم أخفاء البيانات الذي يهدف إلى الوصول إلى مستوى مرغوب فيه من الأمن في تبادل البيانات العسكرية والتجارية الخاصة غير الواضحة.هذا البحث يعرض تقنيه جديده للأخفاء بالأعتماد على أخفاء البيانات داخل العناقيد والتي نتجت من المجاميع الضبابيه.الطريقه أستخدمت المجموعه الضبابيه (C-Mean) لأيجاد مناطق الصوره المتينه لأخفاء صفات نوع نسيج الجلد في الفئران.نفذت عمليه الأخفاء بأستخدام طريقة البت الأقل اهميه.

الكلمات المفتاحيه: أخفاء المعلومات, علم الأخفاء , C-Mean , البت الأقل أهميه , الأستخراج