IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 8, Issue 4 (Nov. - Dec. 2013), PP 43-45
www.iosrjournals.org

Image Encryption of Underwater Bodies Using Wavelets 2013

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***Abstract**: The explosive growth of multimedia information and its transmission over the widely opened communication channels requires heightened awareness of security. Transmitting and storing of images which forms the highest percentage of multimedia data in a highly secured manner is quite challenging. Hence image encryption is a key weapon to maintain confidentiality from unauthorized person. In this paper, the proposed algorithms used for image encryption using wavelets for underwater bodies is more effective and efficient as compared to previous techniques.*

To achieve secure, reliable and encrypted image transmission from unmanned vehicle by using new image encryption technique using wavelet transformation. Encryption is required for transmission of images captured from undersea using existing small bandwidth channels as it is capable to compressing and decompressing the image and secure transmission is possible between ships and ground station.An implementation could be taken up using various possible channels with low bandwidth and highly noisy conditions.

***Keywords**: Encryption, Underwater images, Wavelets*

I. Introduction

Images are the captured two dimensional data**,** an array, or a matrix, of square pixels (picture elements) arranged in columns and rows. These images are available in gray scale or color images.Processing these images involves many techniques.In certain areas of applications,these images need to be transmitted over long distances.Sometimes it may be required to safely transmit these images with high security and in some other form so that no other unauthorized person will be able to hack it.One such way is encryption**.** Encryption is a safe method adopted for this purpose and can be described as converting or transforming the original message content into unreadable form thereby disguising and securing the original information from any unauthorized person[1]. The message can be in any form such as image, text, audio or video files. Image encryption hence is a form of encrypting the image which acts as the original content. The encrypted form of the original message is called as the ciphered message. The applications of image encryption includes military communication, radar tracking objects, medical imaging for storing the images of patients, satellite images, finger prints etc(and many more).

Basically, there are two fundamental technologies for protecting digital images,namely image encryption and digital watermark.

The thought of image encryption is originated from early classical encryption theory,and its aim is to transform a given image into a disorderly and unsystematic one by applying a kind of transformation regulation with a secret key in the spatial domain or frequency domain so as to hide the true information of the source image.The encrypted image cannot be recognized by the attacker without a correct secret key.On the other hand,digital watermark adopts a different technique,which is intended to complement cryptographic processes.It is a visible,or preferably invisible,identification code that is permanently embedded in the image and remains present within the image after any decryption process(cox et al.1997).A simple example of a digial watermark would be a visible "seal" placed over an image to identify the copyright owner. The encryption idea can also be extended to underwater bodies.The concept in this paper is to encrypt the images of the underwater bodies using wavelets. A wavelet is a mathematical function useful in digital signal processing and image compression. Wavelets have been used to compress images to a greater extent than is generally possible with other methods. In some cases, a wavelet-compressed image can be as small as about 25 percent the size of a similar-quality image using the more familiar JPEG method. Thus, for example, a photograph that requires 200 KB and takes a minute to download in JPEG format might require only 50 KB and take 15 seconds to download in wavelet-compressed format.

II. Literature Survey

The underwater bodies in the early days were difficult to capture where they used to use manual cameras with a person going underwater.Capturing such images with noisy conditions was difficult.Then as the technologies were advanced unmanned vehicles with automatic water proof cameras on board were used to

capture the images.These images gave a better clear picture about the original data captured.Different methods were adopted to to get the images without shaking due to the water flow currents.

A basic research was started in order to achieve secure, reliable and encrypted image transmission from unmanned vehicle and to overcome bottleneck of low bandwidth by using new image compression technique with encryption[2]. Exhaustive investigation of various mechanisms was carried out and A New Algorithm for image compression and secure transmission was proposed. The algorithm needs validation and implementation Likely Application of the Outcome was it will be useful for transmission of images captured from undersea using existing small bandwidth channels as it is capable to compressing and decompressing the image and secure transmission is possible between ships and ground station .An implementation could be taken up using various possible channels with low bandwidth and highly noisy conditions.

III. Proposed Methodology

In this method, the color image of underwater fish is encrypted using two methods of encryption for comparison..At first,the image is encrypted by separating the RGB components and then reshaping each component into a single dimensional array thereby the pixel values are interchanged[4]. Hence there is no change in the size of the image. The result is the ciphered image.This is the first method of encryption.This ciphered image is further encrypted by the second method of encryption by directly applying the wavelet 2D using Matlab.This is the stego image.Even the algorithm is in Matlab. This appears in a pyramid form.In Pyramidal scheme the image is stored as successive layers of the same image at different resolutions. We can choose one among that for second level.

As the process follows, the original captured images say the images as shown below with their respective dimensions is considered for encryption. Initially the color RGB components are extracted separately using Matlab version 7.6.

100 x 75 pixels

ALGORITHM

- At the initial step, an image is taken as the input.
- Its size is known and stored as length and breadth.
- It is then resized to a desired value say [0 255] and this is referred to as image pyramid in nature.
- Extract the RED, GREEN and BLUE components separately of the original image. The R-G-B components can be considered as the triplet that forms the characteristics of a pixel.
- Transpose the Red, Green and Blue components.
- Reshape the Red, Green, Blue components into a single row with all the columns of these frames respectively which will now be a single dimensional array each.
- Arrange the Blue component values as the first row of an array, Green as the second row and Red as the third row so as to form a column matrix[3].
- Transpose the above column matrix.
- Reshape the column matrix to form a single dimensional array.
- Consider 1st to 1/3rd part of this 1D array and place as the first row of a matrix, next 1/3rd to 2/3rd part as the second row and 2/3rd part to the last asthe third row of each frame size separately.
- Concatenate all these to form a matrix.
- Thus we obtain FIRST method of encrypted image.

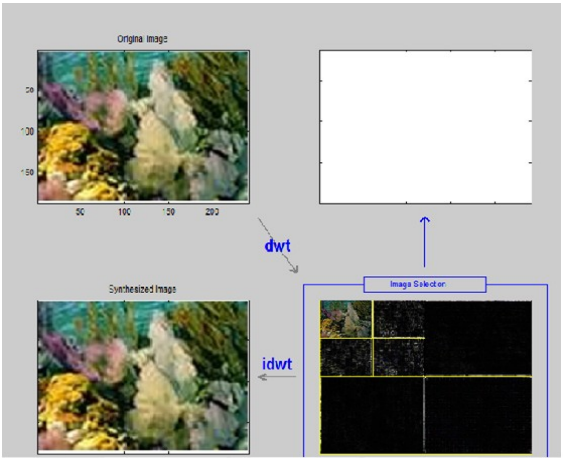
Then we apply the wavelet function to obtain second way of encryption by using the image processing toolbox.

Thus we obtain second level of encryption.

IV. Results

First method encrypted image

Second method Encryption



V. Conclusion

The processing of the original image into an unreadable form what is called as ciphered image was successfully is carried out. The two methods of encryption of the image has really proved to be more authenticated and secure. The main advantage of using single level 2D wavelet transform was to save enough space of the ciphered image to be transmitted.

VI. Future Work

The reverse process of encryption can be carried out for decryption to regain the original image without any distortion using wavelets.

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