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AN ANALYTICAL STUDY OF IMAGE FUSION TECHNIQUES IN IMAGE PROCESSING FOR DATA SECURITY & PRIVACY

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Abstract

Security is one of the crucial one in the technologized world, because information grows rapidly day by day. As population grows every year, information shared over internet becomes faster than what we expect and it needs preservation of data because of third party or unauthorized access. There are several techniques and methods are introduced and implemented to protect the data about the users, but security was not upto the level of protecting the data what actually we need. This review article is written about the concepts and methods implemented by various researchers for securing the data using by different users to communicate with known user at destination point without any third-party access with the help of image fusion techniques.

Keywords: Data security; 3- DWT; Least Significant Bit; Steganography; Image Fusion.

1. INTRODUCTION

An internet growing faster as population increases day by day, which leads over hiking of information sharing over the internet simultaneously. The huge era is about securing the user information from the third-party access and how to protect the data from leakage. Before providing such protection to preserve the data, we have to know the disadvantages of preservation such as very poor correlation and securing technology was powerless. The image fusion technique helps the user to collect all the sensitive information from more than an image merged into single image to protect the data by hiding information as unreadable text. Computer vision had the same fusion process which collects some relevant information from multiple images and combined into single image for fusion techniques.

These techniques have been developing faster in different fields and the quality of an image which is acceptable was set by the receiver which known as human observer. Here, visual analysis is a method helps to assess the quality of fused images. The most suitable test of image fusion is about to check the quality of fused image is adequate.

Least significant bit (LSB) is the simple method for watermarking the content on the cover image in some randomly selected pixels to hide the data

with some procedures. Discrete Wavelet Transform (DWT) helps to perform the image fusion process by exchanging the sub bands. Were, steganography helps to encrypt and decrypt the information from the cover image with some key functions.

We reviewed different fusion method with several techniques and algorithms including discrete wavelet transform, steganography and LSB for better security. The rest of the paper contains about the related works, methodology and execution results of various researchers are discussed.

2. LITERATURE SURVEY

Mohan et.al.,[1] proposed LSB matching techniques with collaboration of DWT method for securing the data. The proposed work generates stegno image to apply fusion techniques. Which helps to secure the original hidden data from the illegal access and the author secured an information using DWT method successfully.

Shiveta Bhat, et.al.,[2] implemented Multi Focus Image Fusion (MFIF) method and compared with existing MFIF method and develop the new classification schema to categorize the MFIF existing models. An author classified their proposed method into four special category as spatial domain, transform domain, deep learning and hybrid method. They discussed about all the drawbacks and challenges with two parametric metrices are discussed. Author analysed 9 images for testing using fusion methods using 30 pairs of images and results are discussed.

T.Saikumar, et.al.,[3] compared different techniques on fusion method using DWT and PCA algorithms by comparing some parameters to choose the best result among the various algorithms. Here, the team studied comparing the execution results by calculating the PSNR values and Error rate like MSE for best performance of the fusion method. Finally, they concluded that, integration of DWT, PCA with morphological operations the fusion method executes better results in securing an information.

Saleha Masood, et.al.,[4] surveyed different models and methods for better image fusion techniques and concluded that no other methods than principal component analysis technique will perform better. PCA algorithm worked better with enhanced image without changing any information of an image like spatial and spectral data and DWT performed to hold its original RGB values to remain same.

Mirza Abdur Razzaq, et.al.,[5] has proposed securing techniques like encryption, steganography and watermarking models. The author proposed three major key points which makes the host image encrypted using some secret key

generation with XOR operation and LSB method used for alteration of an image. To secure the ownership of an image time and frequency domain are watermarked. An author concluded that, the proposed system was more sufficient to secure an information in image to protect from threats and attacks.

Harpreet Kaur, et.al.,[6] surveyed lot of existing papers to discuss the merits and demerits of the fusion methods and discussed about the qualities of spatial and transform methods. The author concluded their research as each image taken for fusion methods are proposed in a different combination to execute better result than one another.

Rui Zhao, et.al.,[7] proposed visual fusion method to protect the data on network security using image recognition method. Author used Visda 2017 datasets for pre-processing methods for fusion and parameters are trained using CNN. An error rate has been calculated using different CNN algorithms. Parameters like threshold and error rates are measured and gained as 2 as threshold and detection rate as 98% whereas false detection rate as 1% using classifier F-CDCGAN. Finally, the execution rate reached 99% of accuracy in securing the data used in network from threats and illegal access.

3. POPULAR METHODOLOGY FOLLOWED BY EXISTING RESEARCHES.

There are various protocols to be followed to secure the data in the proposed research work as follows,

Step 1: Select cover image.

Step 2: Select the data to hide into cover image.

Step 3: Creating stegno image to hide the data.

Step 4: Image fusion process using Discrete Wavelet Transform (DWT) method.

The below image represents the overall process of proposed research work,

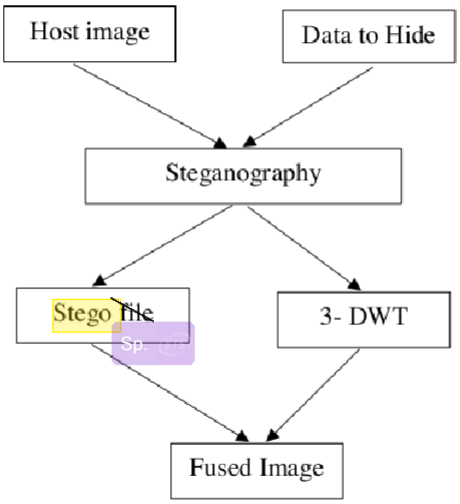

Figure 1. Overall flow chart for proposed research

Fig 1. Stated that the overall performance of the proposed research work with fusion method. The host image had taken for processing the security method and hidden information is collected for securing the data in a host image. The host image and the file taken with data to hide into the cover image had taken. The data taken by the user either as image, audio or text file to hide into the host image. Both the files are integrated with the process called steganography and the discrete wavelet transform method has implemented to perform the thresholding for better performance and accuracy. The fused image has generated successfully with minimum and maximum thresholding values for better visualization after decryption of the file at receiver end.

4. PERFORMANCE COMPARISON

The proposed research has comparison with different fusion algorithm for securing data and best algorithm was used for proposed method with another algorithm for better protection of data. The table compared with different algorithm and highlighted more accuracy executed algorithm.

Table 1. Performance comparison of different research

S. No.	Authors	Algorithms	Description	Error Rate	Accuracy
1	Mirza Abdur Razzaq, et.al.,	XOR + LSB (Encryption + Steganography)	36% has limit to identify data encrypted in image.	7.2	55
2	Hongbing Zhang, et.al.,	F-CDCGAN	Classifier used to detect the data	2	99.46
3	Magesh Kumar, et.al.,	DWT + LSB	LSB used to hide the data	-	98
4	Venkatesh, et.al.,	PCA	Parameters MSE, PSNR, NC are compared for better accuracy.	0.57	97
5	**T. Saikumar, et.al.,**	**DWT + PCA**	**MSE, PSNR are parameters considered for better accuracy**	0.27	99.65

The above table shows the comparison chart performed by various research team. The best algorithm has selected with some parameters like mean square error (MSE) and peak signal to noise ratio (PSNR). Thereby, proposed research implemented with Discrete wavelet Transform (DWT) with principal component analysis (PCA) algorithm to evaluate the fusion method and executes least error rate as 0.27 and highest accuracy of 99.65. The proposed research executed high accuracy result and secure the information of user with fusion method to protect their data. And image processing plays major role in securing the data with fusion techniques and executed successfully with higher accuracy.

5. CONCLUSION

The development of technology with huge data generating and transferring over internet make the users to protect their own information. To secure the users data there are several proposed research has implemented with fusion techniques using wavelet method and component analysis method to highly secure the information is reviewed in this article. The DWT and PCA method execute the results with more stable and secured to protect the data. In future research, the classification of data can be done by securing in a least time with high performance.

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