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The steganographic video analysis uses combination of discrete cosine transform and discrete wavelet transform algorithms

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Abstract. In research, steganography of data into video files using Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) algorithms. Their results show that the value of Peak Signal to Noise Ratio (PSNR) obtained by 29 is lower than the PSNR result of the existing method, therefore further research is needed to increase the value of PSNR. In this research, PSNR value was improved on researchers by doing combination of DCT – 2D algorithm with DWT. The results of the experiments on 12 image samples that the DCT-DWT Combination algorithm is better than the two above algorithms i.e. the average MSE value of 2.35 and PSNR of 44.45.

1. Introduction
Steganography is one technique to hide undisclosed data into commonly used media every day. Steganography is the art of hiding the existence of a message so as not to attract attention to secret messages, then third parties or illegal people cannot detect the message [1]. In the field of computer security, steganography is used to hide confidential data into digital media [2, 3]. In steganography the message is inserted in a relatively secure form so it is hard to see. Steganography can be used on various kinds of digital media that is image, sound and video [4].

This paper aims to describe the combination two algorithms, i.e. DCT [5] and DWT [6]: Steganography on video with DCT is done by firstly transforming the video to be inserted. After the transformation we modified the DCT coefficients according to the insertion bit to be inserted. After modification, DCT inverse is done to return image data to the spatial domain in order to be represented.

2. Review and Motivation
Video can be defined as a set of moving images obtained from the recording of the camera or the result of computer animation. Initially this video information is stored analogously, as a continuous waveform change representing the change of color and brightness of the recorded image [7]. The DCT algorithm is one of the techniques used in inserting data at low frequencies
of the cover image pixels. This technique can be used to insert data in size according to need. The file size that has been inserted data is equal to the size of the file before the inserted data plus the size of the data inserted into the file. In this technique, the data is inserted at the end of the file with a special mark as the start identifier of the data and the final identifier of the data [8].

Steganography on video with DCT is done by firstly transforming the video to be inserted. After the transformation we modified the DCT coefficients according to the insertion bit to be inserted. After modification, DCT inverse is done to return image data to the spatial domain in order to be represented [9].

2.1. DCT – 2D steps
Before imaging the image file into a video file, first searched the video frame of the video cover with the middle frequency band for the insertion. The middle band frequency search is done by performing DCT transform on the video cover file with the steps of making transform matrix, transpose matrix and calculating IDCT coefficient value. Calculation of DCT coefficient that is making of transform matrix that is matrix A, making of original image matrix that is X matrix, multiplication of matrix A with X that is matrix A row to zero column of zero multiply with matrix X to column zero in matrix X then done the sum of the transform matrix to the matrix X (the original image matrix) from the column matrix to zero and to the zero row, to A row to n – 1 and X column to n – 1, where n is the number of pixels of the image. So the multiplication of matrix A (transform matrix) to X (original image matrix) is yielded by value Y from row to n – 1 to m – 1. The flowchart DCT coefficient calculation can be seen as in Figure 1.

2.2. Flowchart insertion
The matrices A, X, A’ are transform matrices, frame matrices, Transpose matrices

\[ DCT = A \ast X \ast A' \]  

is a multiplication of the transform matrix with the frame matrix and the Transpose matrix and DCT coefficient is DCT coefficient value for low, middle and high frequency [10]. The flowchart of video insertion with the image using DCT – 2D algorithm can be seen as in Figure 2.

3. An approach
The Flowchart Research Insertion of Image Files into video files using a combination of Discrete Cosine Transform (DCT – 2D) and Discrete Wavelet Transform (DWT) algorithms to be
performed can be seen as in Figure 3. In the flowchart, the input data formats video format Avi and Mp4 and image insertion file formatted Jpg and Gif. In each algorithm, the process of insertion and extraction. After the insertion, then calculated the value of $MSE$ and $PSNR$ each algorithm for analysis.
In the flowchart above, the input data formats video format Avi and Mp4 and image insertion file formatted Jpg and Gif. In each algorithm, the process of insertion and extraction. After the insertion, then calculated the value of $MSE$ and $PSNR$ each algorithm for analysis. The image extraction flowchart of the video stego uses a combination algorithm between $DCT − 2D$ and $DWT$ as in Figure 3.

4. Discussion about experiment
Video Insertion Results of Combine $DCT − DWT$ Algorithm Embed Image: TagMahal.jpg (Size = 17.54 Kb, Dimension = 200 × 200 pixels), see Figure 4. From the results of the insertion of the three algorithms above can be seen that the best algorithm is $DCT − DWT$ Combination algorithm with $MSE$ value of 2.35 which can be seen on a graph.

5. Conclusion
In this research we have analysed image file insertion into video file using combination Discrete Cosine Transform ($DCT − 2D$) algorithm with Discrete Wavelet Transform ($DWT$). From the results of the insertion of the three algorithms above can be seen the best value of $MSE$ is on Combination algorithm with value 2.35. The suggestion in this study is to improve the Combination algorithm in order to obtain better $MSE$ value.
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