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Comparison of Copy Move Forgery Detection Algorithms both Between DWT and SWT

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Abstract: There are various forgery detection techniques available for the detection of tampering on the images. Here in this paper the comparison is done between the two algorithms, DWT Discrete Wavelet Transform and SWT – Stationary Wavelet transform. The results show that SWT outperforms the DWT in detecting forged pixels more precisely. The number of forged pixels detected by using the SWT is more than DWT algorithm.

Keywords —2D-DWT, SWT, SVD, Thresholding, Preprocessing

I. Introduction

The existence of digital video and digital image editing tools has made it challenging to accurately authenticate multimedia content. The current manipulation technique and the dynamic multimedia technology evolution has made it possible even for a novice to easily delete an object from a video sequence, or add an object from another video source, or insert an object developed by graphics software designer. It has become complicated to comprehend and differentiate an authentic video from a tampered one. This is due to the several forgery methods that the public can avail with, which as a result, capturing of digital image processing have become a great challenge [1, 2].

In recent years, blind digital image forgery detection has been employed to determine the authenticity of digital image forms a topic that has been of significance among researchers. Image forgery primarily falls into two methods based on their approaches; Active approaches and Passive-blind approaches. The first approach is primarily focused on the invisible data and requires pre-embedding of information like watermark, fingerprint into images or digital signatures, and to identify them through integrity detection of the pre-embedded information. On the other hand, the latter approach is more appropriate for some occasions like video, photo image or audio [7]. Specifically, passive approaches can be divided into three general types [8, 9] namely splicing, source identification and copy-move forgery.

The image originality and authenticity becomes major threat in many real time applications like banking, news, legal processing documents, crime investigation, scientific processes etc. Therefore such image forgery resulted into major security threat as any end user can tamper or modify the visual contents of original image without keeping any visibly known traces. There are various types of image forgeries such as image splicing, copy-move etc. Image cloning forgery which is called as copy-move forgery is one of the most dangerous method of image forgery, as user can be able to change entire meaning of visual content of original image by copying some region from same or another image and pasted it on image part which is not required or to locate false information on original image by pasting it on original image part [6] [7].

II. Proposed System

Hybrid Copy-Move Forgery Detection Algorithm

To alleviate the current research challenge, in this paper the attempt is to design novel adaptive and light weight blocking based technique for copy-move forgery detection as well as its localization.

In earlier methods, the fixed threshold value have been defined which may not work with different types of digital forged images. We attempt to design the forgery detection using Non-decimated Discrete Stationary Wavelet Transform (SWT) and SVD iteratively over the blocks in order to count the forgery blocks.

New hybrid method proposed for fast, efficient and accurate identification copy-move-forgery in digital images. Below figure 1 is showing overall architecture and steps used for both proposed work .We are extending the recently presented method based on SWT and SVD.

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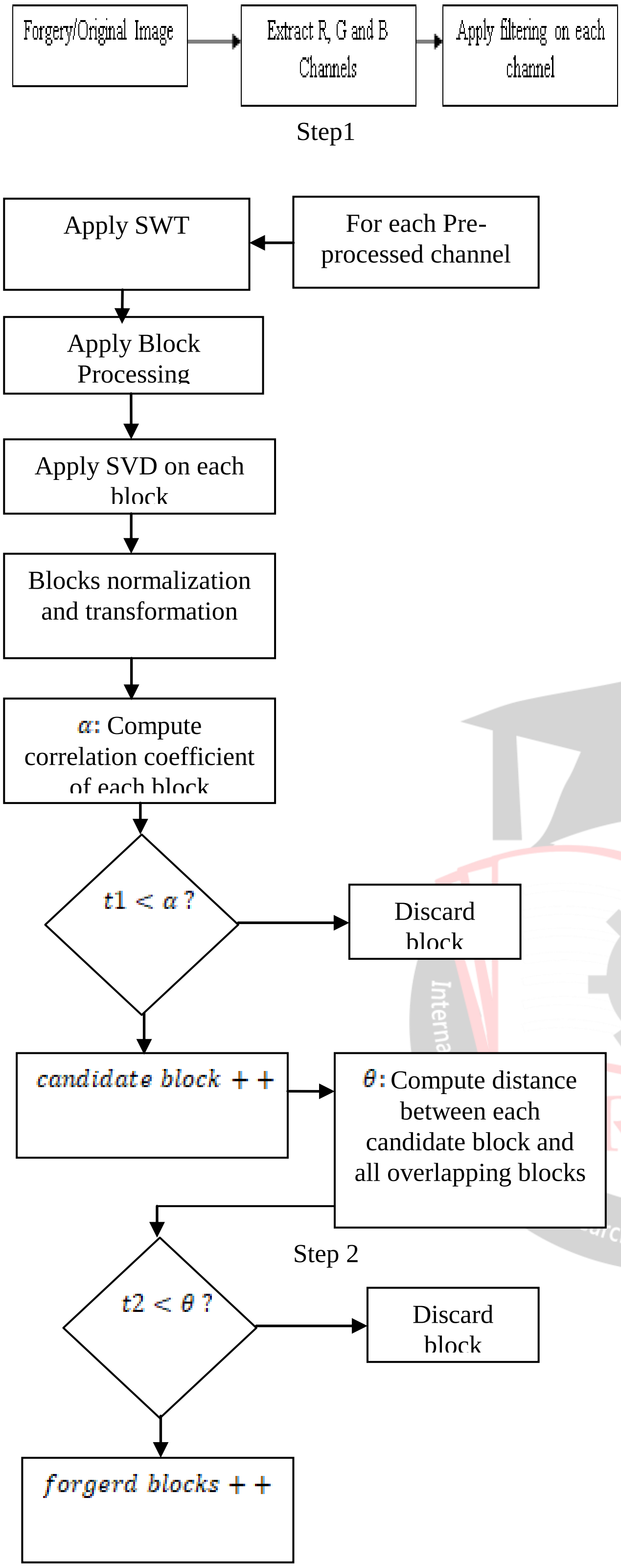

Following are the Hybrid Algorithm Steps:

Inputs

I: *digital image*

B: *block size* $b * b$

t1: Predefined Threshold For Candidate Block Selection

t2: Predefined Threshold For Candidate Block Selection

Output:

Detection of the forgery in the image is done by using the following methods. The colored image is taken as an input to the system. The Red, Green and Blue channels were extracted from the image. The preprocessing is done on these channels by applying Gaussian Filter. After preprocessing Stationary Wavelet Transform is applied on each channel to get their approximation coefficients. On each approximation coefficient of every channel, overlapping blocks of size B are extracted. Thereafter Singular Value Decomposition is applied on each channel.

The overlapping blocks are then transformed into row matrix for every channel. The non-overlapping blocks are then extracted from row matrix. The correlation coefficient is calculated by using the Euclidian distance among pair of non-overlapping blocks. Then $t1$ is selected as threshold of correlation coefficient. Here the objective is to find blocks whose value of correlation coefficient more than set threshold value is α $t1$.The blocks satisfying the above threshold condition are extracted and considered as candidate blocks. The computation of distance among every candidate rows against all other overlapping blocks is done.

There will be three different distances obtained on three channels; hence threshold value $t2$ is selected for extracting forged blocks. The blocks whose value is below $t2$ are considered as forged blocks in original image. If the count of forged blocks is greater 1, then its detected as forged Thus the input image is forged or not detected

III. RESULTS AND DISCUSSIONS

The experiment is conducted on the MATALB 2017 a software. The testing data sets are MICCF220. The comparison is done for forgery detection time as well as the accuracy with which they detect the forgery in the image in terms of number of pixels between DWT and SWT algorithms.

Some of the readings are tabulated below.

Fig.1 Original/Authenticated/Without Tampered Image

This FIG .1 image is taken from the MICC F-220 dataset which is freely available on the internet. This dataset is

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composed of 220 images out of which 110 are tampered and 110 originals.

This Image dimension is 800x532 ,Type is JPG ,Size is 123KB.

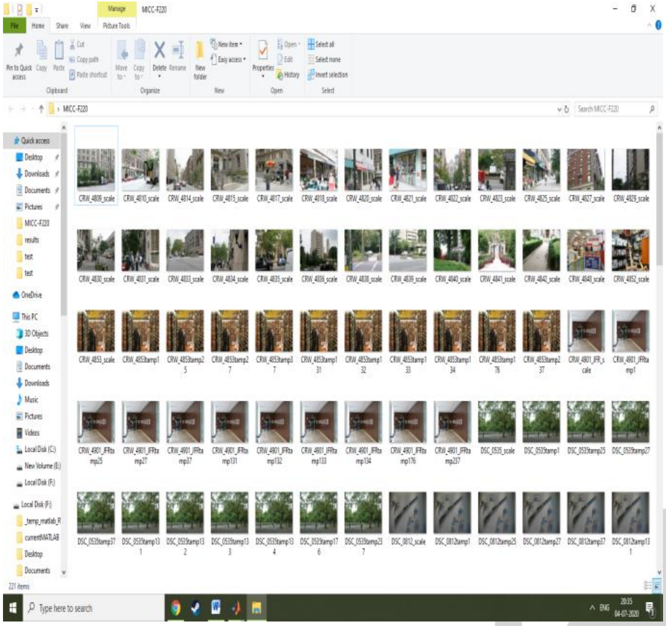

Fig .2 MICC-F220 Folder With Original and Forged Images.

Fig 2 is the screenshot of MICC F220 folder containing

220 images out of which 110 are tampered and 110 originals.

Fig .3.Tampered /Forged Image

Fig 3 shows the image where forger has copied the street lamp from the same image and pasted it into another location of the same image. Hence 2 street lamps are visible to the viewer. Whereas actually only one street lamp is present when the image is captured from the camera. This is called copy move forgery of the images. It falsely enhances the appearance of the image.

Now in this paper comparison is done on the copy move forgery detection algorithms mainly between DWT and SWT.

Initially the Forged Image is selected in the test area region of the MATLAB 2017a GUI window. The image has to be divided into the blocks .There are 3 options available for the block size 10x10, 20x20,and 5x5. For this example 20x20 block size is chosen.

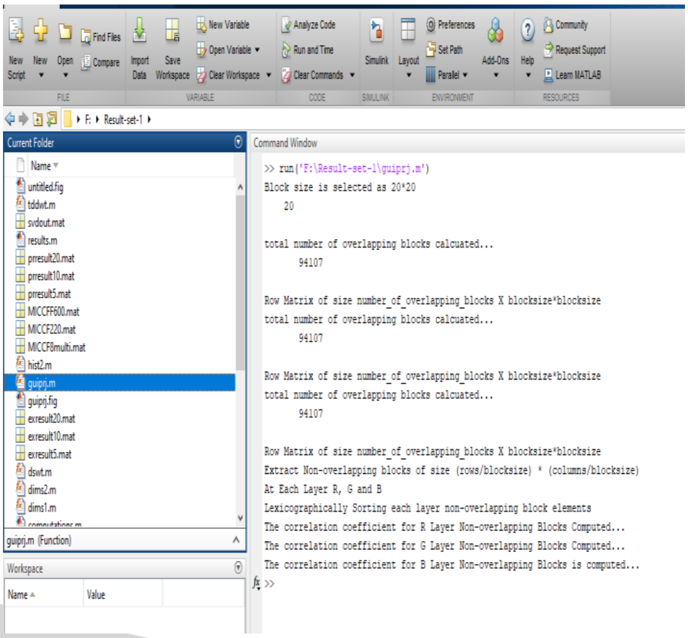

Fig.4. Command Window For The Number Of Blocks In The Test Image

When 20x20 block size is chosen, the image is divided into 94107 total number of overlapping blocks .Fig 4 shows the same command window of the MATLAB where the image is selected and divided into 94107 number of overlapping blocks.

Fig.5.Comparison between DWT and SWT

Fig 5 shows the Copy Move Forgery Detection Test Area.It is divided into 4 subplots.They are [1 1],[1 2],[2 1],[2 2].The original Image selected is displayed on the [1 1] subplot.The forgerey detected by using the DWT method with 20x20 block size is displayed on the [1 2] subplot.The original forged image is diplayed on [2 1] subplot .The forgery detected image by using the SWT method is diplayed on [2 2] subplot.The time taken by the existing DWT method to detect the forgery is 9.60966 seonds.Where as the time taken by the proposed hybrid method SWT SVD is just slighlty more that is 11.4052seonds for this particular

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image.

Fig.6. Forgery Detection in the image by DWT method.

Fig 6 shows the detection of forgery by using the DWT method.The street lamp which is copied and pasted in the same image is being identified by combination of different colored pixels like red,yellow and marun colors.

The copied area is idenetified by less number of pixels by using the DWT method.

Fig.7.Forgery Detection in the image by SWT method

Fig 7 shows the detection of forgery by using the SWT method.The street lamp which is copied and pasted in the same image is being identified by combination of different colored pixels like red and marun colors.

The copied area is idenetified by more number of pixels by using the SWT method.It is visible prominently.

Fig.8. Original Image

Fig 8 shows another test image from the MICC F220 dataset. The dimension of the original image is 800x532.Type is jpg,size is 33.7KB.It is the image without any forgery.

Fig.9.Tampered /Forged Image

Fig 9 shows that the forger has copied and pasted the particular portion once on the same image. Originally there were 6 guns after forgery viewer can see 7 guns in the same image.

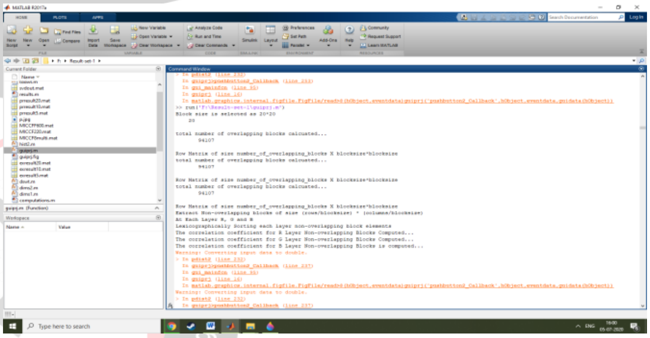

Fig.10.Command Window For The Number Of Blocks In The Test Image

Fig 10 shows the command window for the number of blocks for the above forged image. It has 94107 number of overlapping blocks.

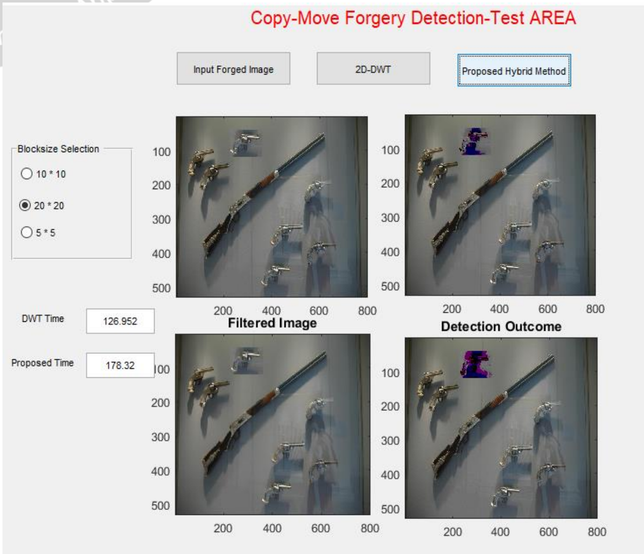

Fig.11.Copy Move Forgery Detction Test Area

Fig 11 shows the Copy Move Forgery Detection Test Area.It is divided into 4 subplots.They are [1 1],[1 2],[2 1],[2 2].The original Image selected is displayed on the [1

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1] subplot.The forgerey detected by using the DWT method with 20x20 block size is displayed on the [1 2] subplot.The original forged image is diplayed on [2 1] subplot .The

forgery detected image by using the SWT method is diplayed on [2 2] subplot.The time taken by the existing DWT method to detect the forgery is 126.952 seonds.Where as the time taken by the proposed hybrid method SWT SVD is just slighlty more that is 178.32seonds for this particular image.

Fig12.Copy Move Forgery Detection by DWT method

The detection of the forged region by DWT Number of pixles identified are comparatively less.

Fig.13.Copy Move Forgery Detection by SWT method

The detection of the forged region by SWT no of pixles identified are comparatively more..

Fig.14 Original/Authenticated/Without Tampered Image

This Fig 14. Image is taken from dataset which is freely available on the internet.

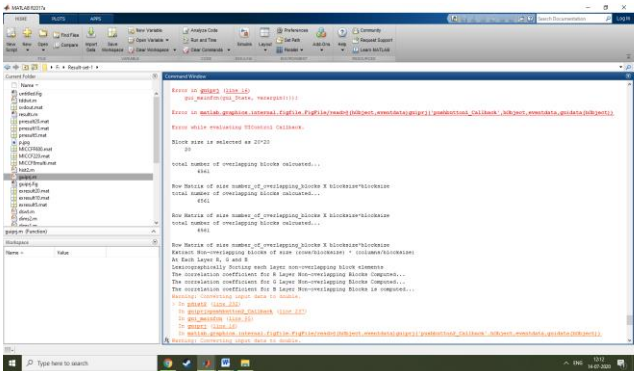

Fig.15.Command Window For The Number Of Blocks In The Test Image

Fig 15 shows the command window for the number of blocks for the above forged image. It has 6561 number of overlapping blocks.

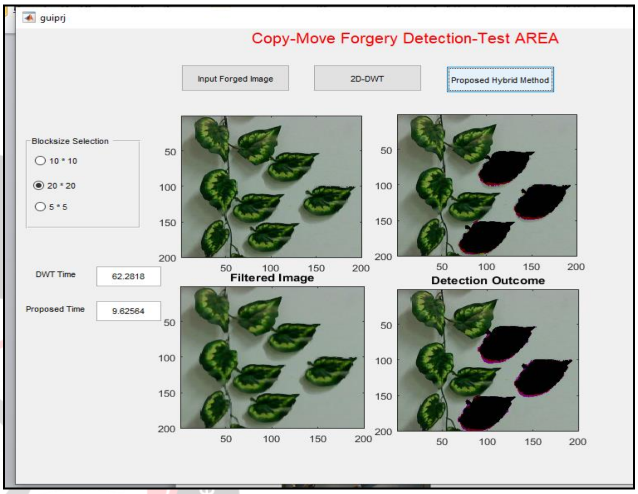

Fig.16.Comparison between DWT and SWT

Fig 16 shows the Copy Move Forgery Detection Test Area.It is divided into 4 subplots.They are [1 1],[1 2],[2 1],[2 2].The original Image selected is displayed on the [1 1] subplot.The forgerey detected by using the DWT method with 20x20 block size is displayed on the [1 2] subplot.The original forged image is diplayed on [2 1] subplot .The

forgery detected image by using the SWT method is diplayed on [2 2] subplot.The time taken by the existing DWT method to detect the forgery is 62.2818 seonds.Where as the time taken by the proposed hybrid method SWT SVD is just slighlty more that is 9.62564seonds for this particular image

Fig.17. Forgery Detection in the image by DWT method.

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The detection of the forged region by DWT Number of pixles identified are comparatively less.

Fig.18 Copy Move Forgery Detection by SWT method

The detection of the forged region by SWT no of pixles identified are comparatively more..

Fig.19Original Image

Fig 19 shows another test image from the MICC F220 dataset. The dimension of the original image is 800x532.Type is jpg,size is 31.7KB.It is the image without any forgery.

Fig.20.Forged Image

Fig 20 shows that the forger has copied and pasted the particular portion once on the same image. Originally there was no sticker present on the front side of the white colored mug .The forger coped the sticker from the white colored bowl and pasted it on the mug. Hence more number of stickers are visible on the image.

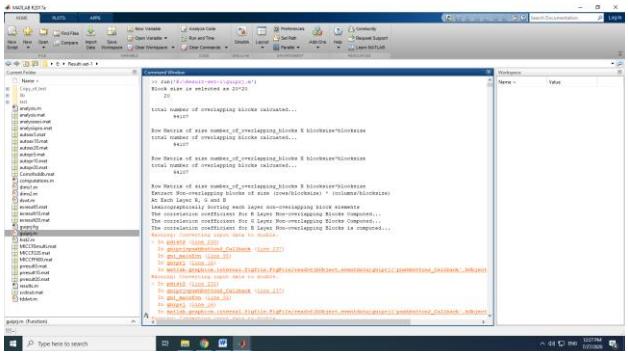

Fig.21.Command Window For The Number Of Blocks In The Test Image

Fig 21 shows the command window for the number of blocks for the above forged image. It has 94107 number of overlapping blocks.

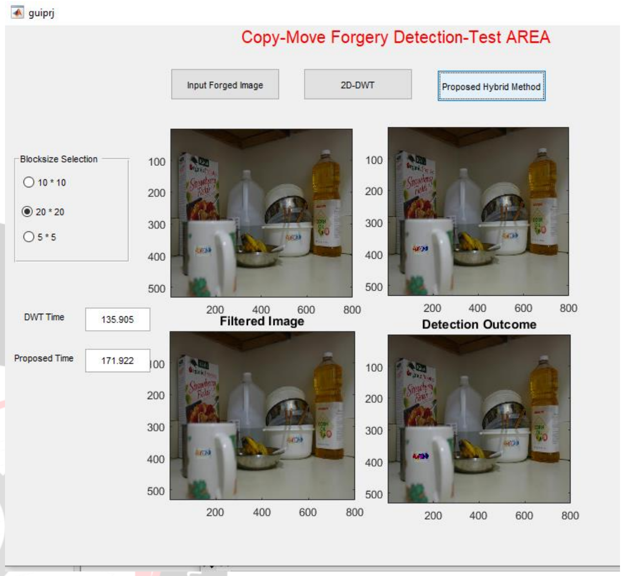

Fig.22.Comparison between DWT and SWT

Fig 22 shows the Copy Move Forgery Detection Test Area.It is divided into 4 subplots.They are [1 1],[1 2],[2 1],[2 2].The original Image selected is displayed on the [1 1] subplot.The forgerey detected by using the DWT method with 20x20 block size is displayed on the [1 2] subplot.The original forged image is diplayed on [2 1] subplot .The

forgery detected image by using the SWT method is diplayed on [2 2] subplot.The time taken by the existing DWT method to detect the forgery is 135.905 seonds.Where as the time taken by the proposed hybrid method SWT SVD is just slighlty more that is 171.922seonds for this particular image

Fig.23.Detection By Using DWT method.

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The detection of the forged region by DWT Number of pixles identified are comparatively less.

Fig.24.Detection By Using DWT method.

The detection of the forged region by SWT no of pixles identified are comparatively more..

IV. CONCLUSION

This paper discusses the comparison between DWT and SWT-SVD algorithm for the copy move forgery detection. The datasets used were MICCF600, MICCF220,MICC F8 Multi.The results show that SWT-SVD algorithm outperforms existing DWT algorithm. The number of pixels detected by the SWT-SVD algorithms is more than the existing method. It can also be compared with the benchmark datasets. This novel algorithm can be used to detect the copy move forgery effectively on the forged images.

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