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A Comparative Study of SVD, PCA and Clustering Techniques of Copy Move Forgery

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***Abstract*: Nowadays, several image manipulation soft-wares are available. Images manipulation has become a serious problem. There are many areas like medical imaging, digital forensics, journalism, scientific publications, etc, where image forgery can be done very easily and it's very difficult to find the original one. To determine whether a digital image is original or forged is a big challenge. To find the marks of tampering in a digital image is a very challenging task. The detection methods can be very useful in image forensics which can be used as a proof for the authenticity of a digital image as well as it reduce the risk of forgery. A copy-move image forgery is done either for hiding some image features, or adding more in a particular image. In both the case, image reliability is lost. Although this technology brings many advantages but it can be used as a tool for hiding original features and evidences of an image. In this paper we review and discuss SVD, PCA and clustering techniques for copy move forgery.**

Keywords: Copy move forgery, PCA, SVD, Clustering.

INTRODUCTION

Copy move forgery is region duplication[1]. It is a simple and effective operation to create digital image forgeries, where a continuous portion of pixels in an image are copied and pasted to a different location in the same image. Digital image forgery detection techniques are classified into active and passive approaches. In active approach, the digital image requires some pre-processing such as watermarking, signature, etc. Passive approach is different to active approach; this approach does not need any watermark embedded in advance. The copy move forgery is one of the difficult forgeries. This is the most common kind of image tampering technique used, where one needs to cover a part of the image in order to add or remove information. Copy-Move is a special type of image manipulation technique in which a part of the image itself is copied and pasted into another part of the same image [2].

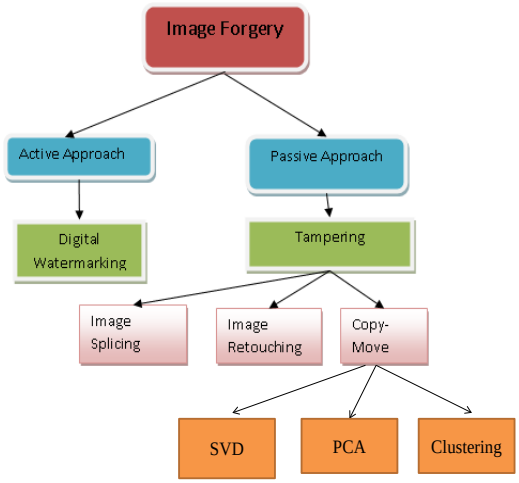

Fig. 1 Classification of Image Forgery

SINGULAR VALUE DECOMPOSITION (SVD) TECHNIQUE

The developed algorithm is computationally less complex and is robust to post-processing techniques. It used the correlation between the copied and pasted regions and searched for identical regions. In the first step, it divided the image into several small overlapping blocks. Then, it applied SVD to every block based on SVD formula in (1) where A is image matrix and U is a (m x m) orthogonal matrix, V is an (n x n) singular values on the diagonal.

$$A = USV^{T} \quad \text{..... Eq. (1)}$$

From SVD, singular values will extract and arranged in a matrix, then it needs to change features in each block into k-d tree and search for similar blocks for each query using (2) where u and v are values of orthogonal matrixes.

$$D(UN) = \left(\sum_{i=1}^{n} (u_i - v_i)^2\right)^{1/2} \quad \text{.....Eq. (2)}$$

At this time, blocks similarity matching will be done to find similar blocks. The main idea of this step is that a duplicated region consists of many neighbouring duplicated blocks. If two similar blocks can be fined in the analyzed space and if their neighbour hoods are also similar to each other, there is a high probability that they are duplicated and they are

tagged as duplication area, then the output of the method is a duplicated regions map which showing the image regions that are expected duplicated[3].

PRINCIPAL COMPONENT ANALYSIS (PCA)

It is efficient method to detect copy move forgery. This method is similar to DCT approach and better in capturing discriminating features. The given image is converted from color to grayscale. They divided the image into several small sized blocks, which are represented into vectors. Then they arranged it lexicographically before matching. This is much better than the brute-force method of finding matches. They used PCA method to represent the different blocks in an alternative way. PCA is capable of detecting even minor variations due to noise or lossy compression. This method is only for grayscale images. However, the method can be made to work for color images as well by processing the image for each color channel, which yields three duplication maps. Then PCA is applied to each map separately to detect the forgeries. This method has a good efficiency in detecting copy-move forgeries and also gives less number of false positives. However, the efficiency falls as the block size decreases and also if the quality of the image is low [4].

CLUSTERING TECHNIQUE

Clustering method to detect a copy-move image forgery of different image format. The process starts with reducing the color of the photos. Specifically, we study the color present in an image where one of its regions is replicated, which has almost the same color and detail, and then degrade the color of image. Split the image *f*, of size m_f x n_f, which is tiled as blocks of pixels selected by sliding, pixel by pixel from the top-left corner to the bottom-pattern for both the copied and pasted parts. We first blur the image f for eliminate noise right corner. We extract characteristic color with every block and categorize data of the image. Clustering the similarity of colors by Hausdorff distance. Finding the similarity data is the process to identify a duplicate position by measuring distance of information group by Hausdorff distance. Given two finite point sets $A= \{a_1 \ldots a_m\}$ and $B= \{b_1 \ldots b_n\}$, the Hausdorff distance is defined as

$H(A,B)= \max (h(A,B), h(B,A))$ ....Eq. (3)

When,

$h(A, B) = \max_{a \in A} \min_{b \in B} \|a - b\|$ .....Eq. (4)

The function *h (A, B)* is called the directed Hausdorff distance from *A* to *B*. It identifies the point a $\in A$ that is farthest from any point of *B* and measures the distance from a to its nearest neighbour in *B*. The function *h(A,B)* in effect ranks each point of A based on its distance to the nearest point of *B* and then uses the largest ranked such point as the distance [5].

CONCLUSION

Copy move forgery is the widest area in today's world. Forgery techniques are very useful to detect the forged image. In this review paper we discussed the SVD, PCA as well as clustering techniques to detect forgery in the existing image. With the use of these techniques we can detect any type of forgery in very short time and in efficient way. In the future, we would like to combine these three techniques, develop a new formula to work fast and provide reliable and optimal results in forgery field.

REFERENCES

[1] Cohon, Robert. Discovery & Deceit: archaeology & the forger's craft Kansas: Nelson-Atkins Museum, 1996

[2] Ashima Gupta, Nisheeth Saxena, S.K Vasistha, "Detecting copy move forgery using DCT", Vol. 3, Issue 5, 2013.

[3] Zhang Ting, Wang Rang-ding, "Copy-Move Forgery Detection based on SVD in Digital Image ", IEEE, Vol. 9, 2009.

[4] Popescu, A. C., & Farid, H.,"Exposing digital forgeries by detecting duplicated image regions", Department of Computer Science, Dartmouth College, Tech, 2004.

[5] Nattapol Chaitawittanun," Detection of Copy-Move Forgery by Clustering Technique", vol. 50, Issue 2, 2012.

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