Surf Technique for Copy Move Forgery Detection

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ABSTRACT
In modern era, digital images are widely used in various fields like medical manipulation, in journalism and digital forensics. Digital images can be easily tampered with the image editing tools. So one of the major problem in image forensic is that a particular image is authentic or not. Different types of image forgery detection techniques are there. In this paper, the SURF technique for the detection of copy move image forgery to check the image is authentic or not is discussed. For this, MATLAB platform is used to analyze the performance of copy move forgery detection technique for different resolution images. Results shows that forged or non original regions have been identified correctly for still images.

Keywords
SURF, Copy-move, MATLAB, Key point based, Block based.

1. INTRODUCTION
With this increased assurance on digital images for information, the need to ensure their authenticity increases as well. The manipulation of images through forgery influences the perception an observer has of the depicted scene, potentially resulting in ill consequences if created with malicious intentions. There have been various methods used for forging an image. Based on the techniques used to create forged images, digital image forgery can be categorized into three main classes: Copy-Move forgery, Image splicing, and Image Re-sampling[9].

2. COPY-MOVE FORGERY
In copy-move forgery (or cloning), portion of the image of any size and shape is copied and pasted to another location in the same image to hide some important information or to duplicate portions of the image .As the copied part came from the same image, its important properties such noise, color and texture do not change and make the detection process difficult[9][5].

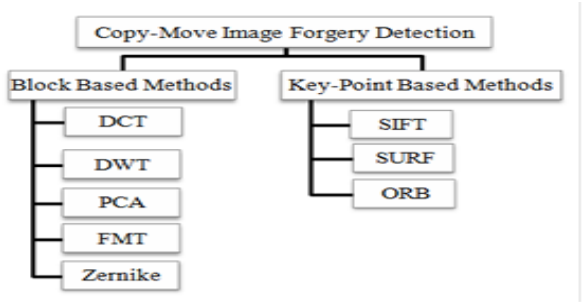

Fig 2: Types of copy move forgery detection techniques

2.1 Block Based Methods
In block based techniques, an image is segmented into rectangular or circular overlapping small blocks; feature vectors are derived and then these are lexicographically sorted to check whether beside blocks are similar or not. In the end, matching similar blocks leads to forgery detection. The most commonly used block based methods are DCT (Discrete Cosine Transform)[1][6], PCA (Principal Component Analysis), DWT (Discrete Wavelet Transform)[11], DyWT (Dyadic Wavelet Transform), FMT (Fourier Mellin Transform), Zernike etc[5]. Block based methods can generally deal with post operations like compression or noise in the copied part but cannot handle geometrically transformations like high degree rotation and scaling. Moreover, these methods are found to be computationally inefficient, hence take more time.

2.2 Key-point Based Methods
Key-point based methods figure out the feature vectors for regions with high entropy in an image and compare them for forgery detection. SIFT (Scale in-variant Feature Transform), SURF (Speed Up Robust Features), ORB (Oriented FAST and Rotated BRIEF) are the examples of key-point based methods . Key-point based methods can easily tackle the geometrical transformations but cannot deal with compression or noise addition in the cloned region efficiently. However these methods are faster than block based methods due to their computational efficiency. To combine the advantages of both methods, a hybrid method can be implemented by combing block and key-point based methods. Experiments results are presented to prove that the hybrid method is able to precisely individuate the tampered image and quantify its robustness and sensitivity to image post-processing [13].

Fig 2(a): Original image

Fig 2(b): Forged image

3. IMAGE FORGERY USING SPLICING

Image splicing uses cut-and-paste approach from one or more images to produce a new fake image. When splicing is performed carefully, the borders between the spliced regions can visually be imperceptible. Splicing, however, disturbs the high order Fourier statistics such as the bispectrum; these statistics can subsequently be used in detection.

Fig 3(a): Original image **3(b): Forged image**

4. IMAGE RESAMPLING

To create a high quality forged image, some selected regions have to undergo geometric transformations like rotation, scaling, stretching, skewing, flipping etc the image on the left is the original scene while the one on the right is the forged image obtained by rotation and scaling.

Fig 4(a): Original image **4(b): Forged image**

5. SURF TECHNIQUE

SURF is proved to be comparable to or even better than other detectors and descriptors[2]. SURF is explained in the following section.

Pre-processing

Normally, interest points which are detected under illumination change in an image. Therefore, the first step is to convert the color image into a gray scale image. Moreover, gray scale image are simple to enhance and interpret.

Interest point detection

After the image is transformed into gray scale, the next task is to confined the interest points. The SURF detector is based on integral image and Hessian matrix approximation [8].

In copy-move forgery the copied part has basically the same representation as of the original one; therefore, key points extracted in the forged region will be quite similar to original ones. The matching among SURF features can be adopted for the task of determining possible tampering.

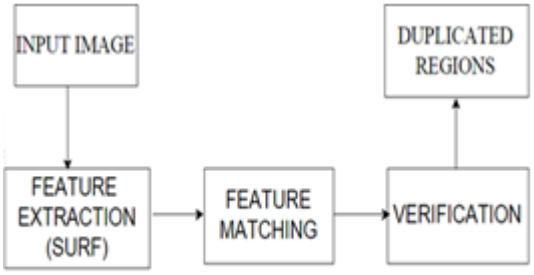

Fig 5(a): Steps performed in SURF Technique

After detecting features of the images then features of both the original and the forged images are matched and then verification of forged region will takes place.

6. RESULTS

The proposed method has been implemented using MATLAB R2013a computer of CPU 2.13 GHz with memory of 2 GB. The SURF algorithm is used to detect the key points and get the descriptors. In the experiment the extended descriptor mode is used to get the 128-d SURF descriptors.

Fig 6(a): Original image **6(b): Forged image**

Here in first image 6(a) original image is shown and in 6(b) image forged is shown in which one truck is covered with foliage which is copied from other part of the image. so here copy move forgery is done.

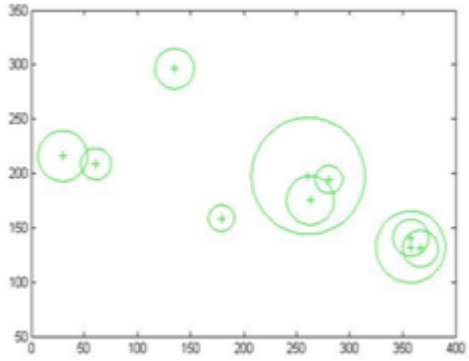

Fig 6(c): Features of original image

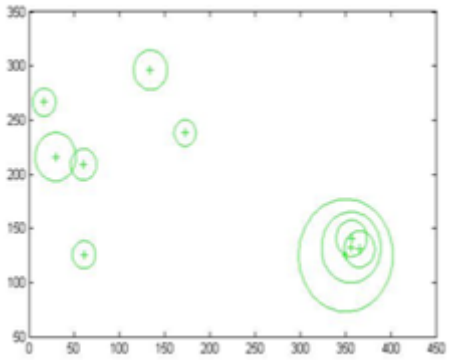

Fig 6(c): Features of forged image

In the following figures (a) and (b) images have been shown in which features of both the images are extracted.

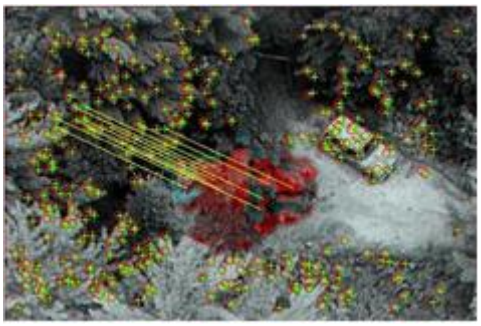

Fig 6(e): Final image showing forged area

Final results have been shown after matching the figure's key points. We will see that features of both copied and pasted region get matched by implementing our algorithm we have detected the forged part.

7. CONCLUSION

This project work presents a robust copy move forgery detection method based on SURF, which detects duplication region of different sizes. The experiment was performed on a still image to analyze the performance of copy move forgery detection technique using MATLAB platform. Results show that forged or non-original regions have been identified correctly. Future work will be done on detecting forgery in flat regions using SURF technique and also detect forgery after applying various geometric transformations.

8. REFERENCES

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