Prototype Based Image Forgery Detection Based on Clustering and DWT Transform

Ashish Kumar Sharma, Shiv Kumar Sahu, Amit Mishra

Abstract: ***In this paper proposed a image forgery detection method. The proposed method is a combination of prototype of clustering and transforms function. The prototype clustering technique gives the patch pattern and wavelet transform gives texture feature. For the texture extraction of image used wavelet transform function, these function is most promising texture analysis feature. For the selection of feature generation of pattern used clustering technique. Clustering technique is unsupervised learning technique process by iteration. The proposed method achieves 100% accuracy in just copy-move forgery (without any change in the size or characteristics of the object) forgery without post-processing and 98.43%, 86.58%, and 95.12% accuracies in copy-move forgery with rotation, scaling, and reflection, respectively.***

Keyword: Image forgery detection, Digital images, Photography, Haar Transform, Wavelet, SBD.

I. INTRODUCTION

Digital image processing play vital role in the field of social engineering and processing of information. The content of digital image is tempered by someone and broadcast it. The tempered image changes the actual content of digital image. For the validation and verification of digital content in image used image forgery detection technique. The image forgery detection technique well knows method for digital image analysis of forensics. Now a day's various authors and researcher focus on the improvement of detection ratio of image forgery method. Now the combination of image forgery method is used transform function such as DCT, wavelet and some other transform function. The process of verification is necessary to check the authenticity and the integrity of the image by using modern and digital methods; they contribute to analysis and understanding of the images' content, and then make sure of their integrity.

There are many types of image forgery, the most important and popular type is called copy-move forgery, which uses the same image in the process of forgery. This type of forgery is used for one of two things, first to hide an object or scene by copying the area of the image and pasting it on another area of the same image. The second is the repetition of object or scene with change in some qualities "such as size" by copying this object and pasting it on another area of the same image. By the survey of American government the alteration rate of digital color image is 10% in public issue. The alteration of image creates serious issue and creates negative impact in society. In this paper proposed a digital image forgery detection method based on prototype of clustering technique.

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The prototype of clustering technique create the similar pattern of block in terms of original image and forged image. For the extraction of feature from the raw image used wavelet transform function. The wavelet transform function well knows technique for the extraction of feature. The extracted feature passes through the clustering technique and creates block matching pattern. In section In discuss about proposed method. In section V discuss comparative result finally, in section-VI conclusion and future scope.

II. RELATED WORK

In this section discuss the some related work in the field of image forgery detection. Some authors used transform based method and some authors used pixel based technique for the processing of forgery detection.

[1] In this paper authors used SIFT transform function for feature extraction for original and forged image. The SIFT transform function gives the value of key feature point value for the processing of data. After the extraction of key feature point authors used image segmentation technique. the image segmentation technique gives the patch area of segmented image for the processing of forged image. For the matching of patch used two different matrix and estimate the area of forged image.

[2] In this paper authors proposed a hybrid method of image forgery detection. The hybrid method used geometrical invariant function for the matching of pattern. The geometrical function gives the different shape and size process for original image and forged image. The performance of hybrid method is better than conventional technique and also reduces the false acceptance ratio.

[3] In this paper authors used a method of image localization for the processing of copy and move. The copy and move process used the density based area localization of original image and forged image. The given transform function extracted the key feature point of the different location. Here also used restoration process of forgery detection.

[4] In this paper authors used different method of image forgery detection in terms of pixel based operation and transform based operation. They try to enhance the performance of image forgery detection process. It also focus on importance of digital image data in terms of official record.

[5] In this paper authors discuss the image copyright protection system using different method of watermarking and stenography. The watermarking and stenography is well knows technique for the protection and authentication of digital data. It's also describing the process of some geometrical attack in concern of damage control in digital image record.

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III. WAVELET TRANSFORMS FUNCTION

The feature extraction and processing of feature is very important phase of image forgery detection. For the processing of feature extraction used wavelet transform function. The wavelet transform function gives the texture feature data. The texture feature data is important feature of image. Basically the wavelet transform function is composition of frequency component of low pass filter and high pass filter. The derivation of transform function describe here.

The 2D-DWT represents an image in terms of a set of shifted and dilated wavelet functions jf LH ,jf HL ,jf HH and scaling functions LL that form an or thonormal basis for $L^2(R^2)$. Given a J-scale DWT, an image x(s,t) of NxN is decomposed as

$$x(s,t) = \sum_{k,i=0}^{Nrl} uJ,k,i\ LLJ,k,i(s,t) + \sum_{B\,E\,B\,j=l}^{L} \sum_{k,i=O}^{N-1} w\ E\ J,k\ ,i\backslash jf\ E\ J\ ,k\ ,;\ (s\ ,t\ ) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

with

$$LLj,k,i\ (s,t) = \mathbf{r}\ J\,l2\ \ (\mathbf{r}\,j\ s-\mathbf{k},\mathbf{r}\,J\,t-i),\ jf\ E\ J,k,i\ (s,\ t),jf\ E\ J,k,i\ (s,t)$$

$$=\mathbf{r}\ \ i^{12}jf\ E\ (\mathbf{r}\ J\,s-\mathbf{k},\mathbf{r}\ i\,t-i),B\ E\ B,B\ \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

{LH, HL, HH}, and NJ = N I 2 J . In this paper LH, HL and HH are called wavelet or DWT sub-bands. uJ ,k,i = **J J** x(s,t) J.k,; dsdt is a scaling coefficient and w E J,k,i = **J J** x(s,{w E J,k,; dsdt denotes the (k,i)th wavelet coefficient in scale j and sub-band B. Fig. 2 shows the scaling concept in wavelet transform.

IV. PROPOSED METHODOLOGY

In this paper proposed a cluster based image forgery detection technique. The cluster based image forgery detection technique is very efficient instead of single transform based method such as wavelet transform and DCT transform. The detection of forgery in color image is very difficult due to high intensity of pixel value. Here we used clustering technique by graph prototype collection of data for the process of clustering. For the generation of cluster for the process of detection feature extraction process are required. For the extraction of feature used wavelet transform function.

In this section describe the process of proposed model. The proposed model contain with wavelet transform function and clustering technique. The clustering technique generates the local pattern of block.

Step 1. Initially put the original image and forged image for the processing of feature extraction

Step 2. After processing of image discrete wavelet transform function are applied for the texture feature extraction

Step 3. After the texture feature extraction apply k-means technique for local pattern generation

Step 4. The pattern matching block selects the all local pattern of cluster algorithm of both original and forged image

Step 5. Measure the distance between original image and forged image.

Step 7. If the value of d is 0 images are block is original else image block area is forged.

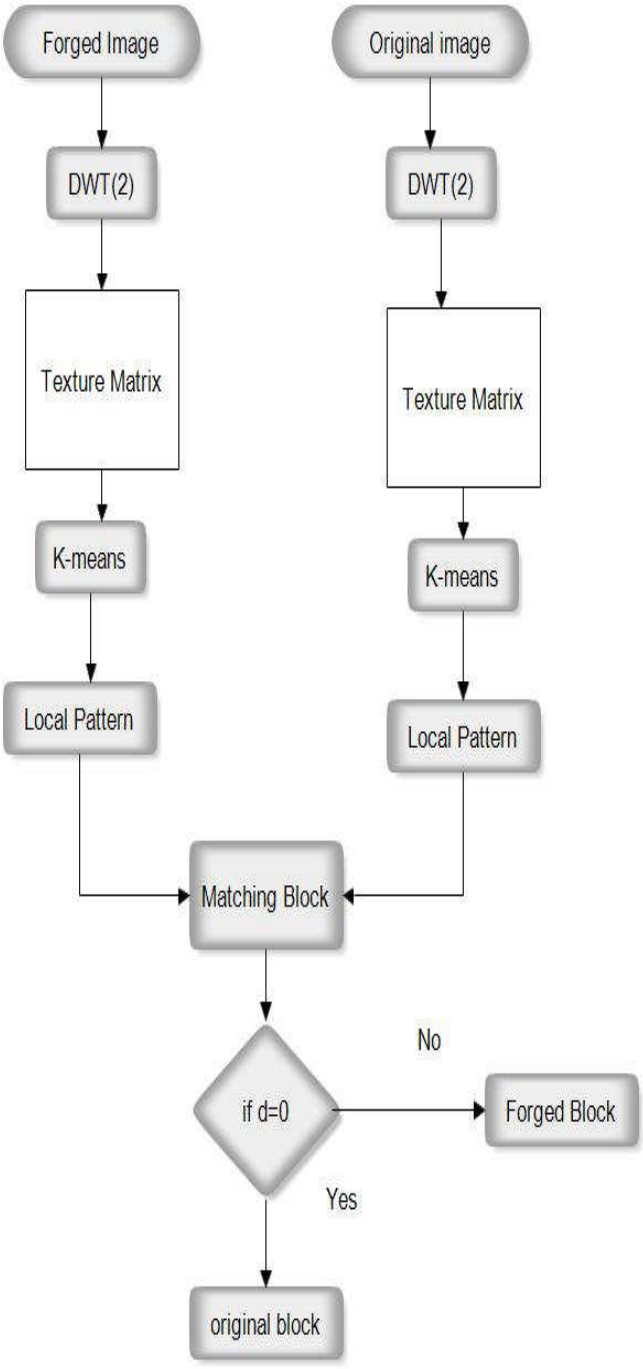

Figure 1: proposed model for image forged image .

V. COMPARATIVE PERFORMANCE EVALUATION

In this section we define the experimental results analysis with existing and proposed methods, the simulation environment is mat lab, and all software the performance parameters are calculated with this software using existing

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as well as proposed method methods. Here the detection error at the image level is measured by the ratio of the missing detection to the forged images (i.e. false negative rate, FN), and the ratio of the false alarm to the original images (i.e. false positive rate, FP). Mathematically,

$$F_N = \frac{|\{\text{forged images detected as original}\}|}{|\{\text{Forged Images}\}|}$$

$$F_P = \frac{|\{\text{Original images detected as forged}\}|}{|\{\text{Original Images}\}|}$$

We also used some dataset for the result analysis the MICC-600 this dataset is composed by 600 high resolution images containing realistic and challenging copy-move attacks; 160 are tampered images and 440 are originals.

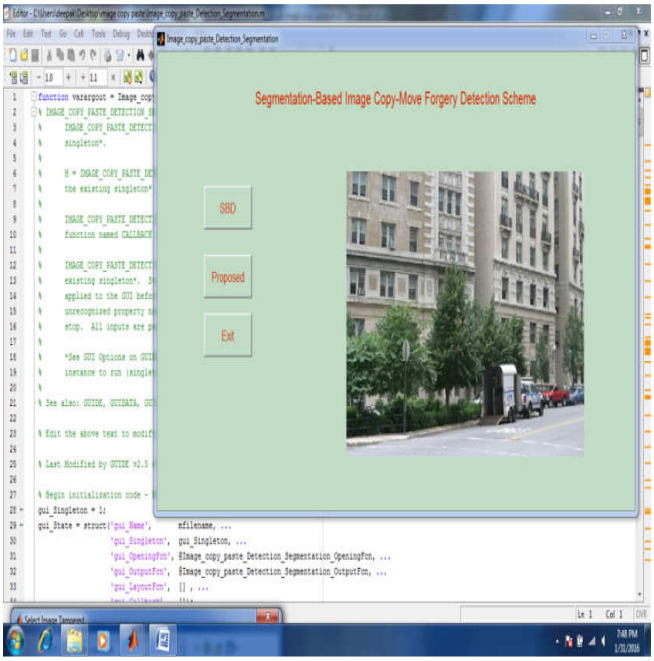

Figure 2: Shows that the selected image window for implementation.

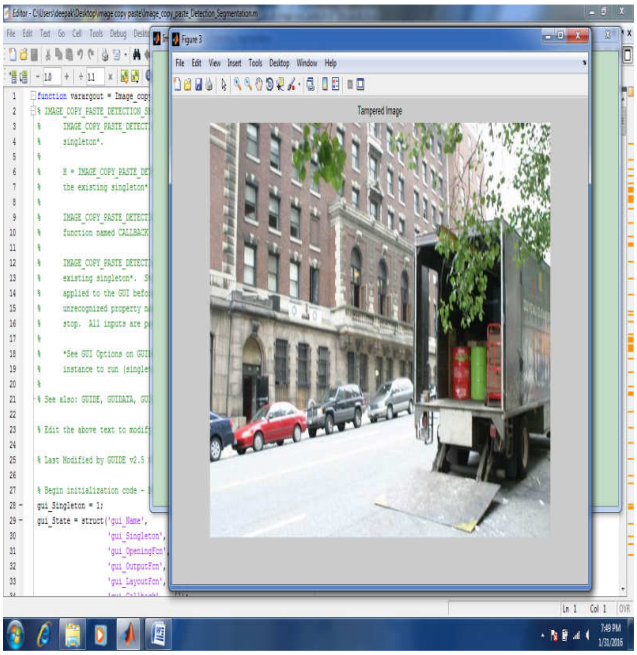

Figure 3: Shows that the tempered image window for detection using SBD methods.

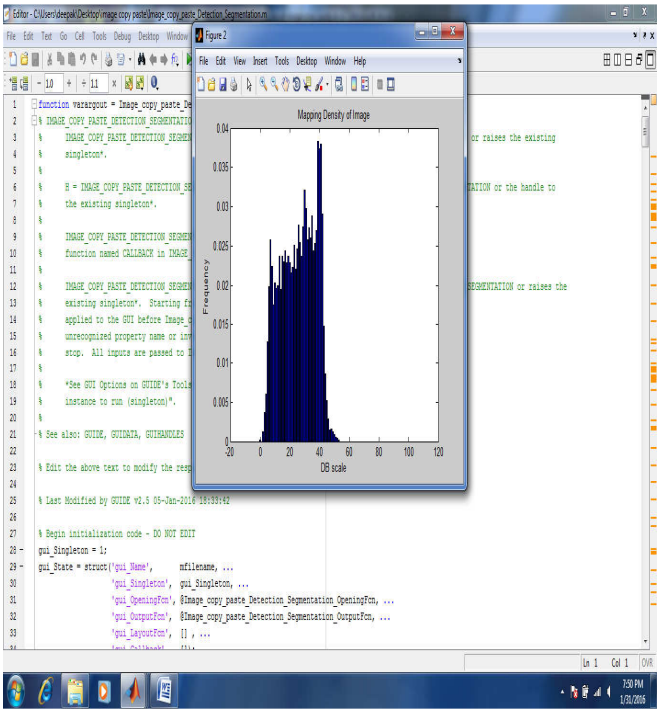

Figure 4: Shows that the mapping density image window for detection using SBD methods.

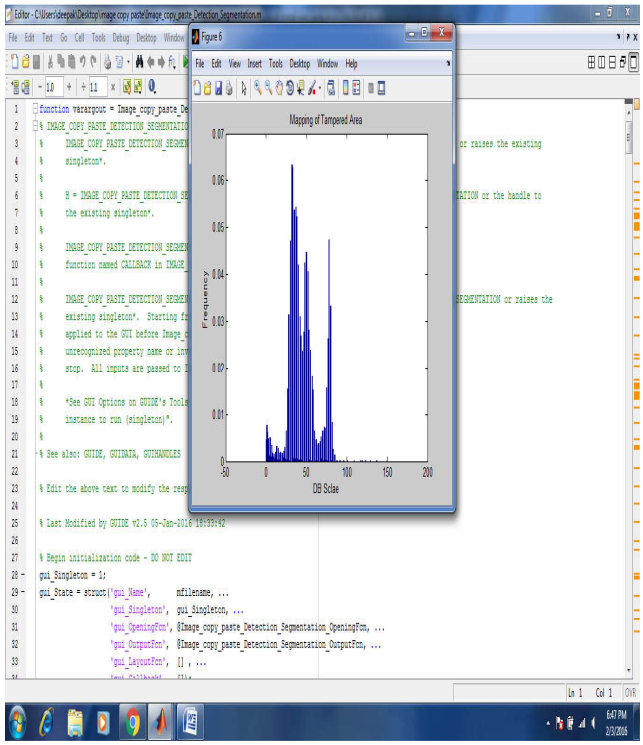

Figure 5: Shows that the select of mapping area image 2 window for detection using proposed methods.

Table 1: Shows that the performance evaluation using SBD and proposed methods.

Types of Image	Method Name	FN	FP
Image-1	SBD	17.40	35.06
	Proposed	14.02	32.06
Image-2	SBD	6.86	37.6
	Proposed	5.40	34.6

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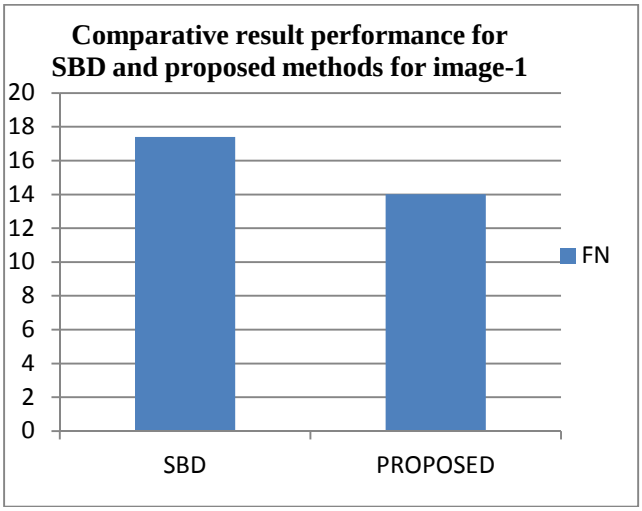

Figure 6: Shows that the comparative performance evaluation graphs for FN with using SBD and Proposed methods with using image-1.

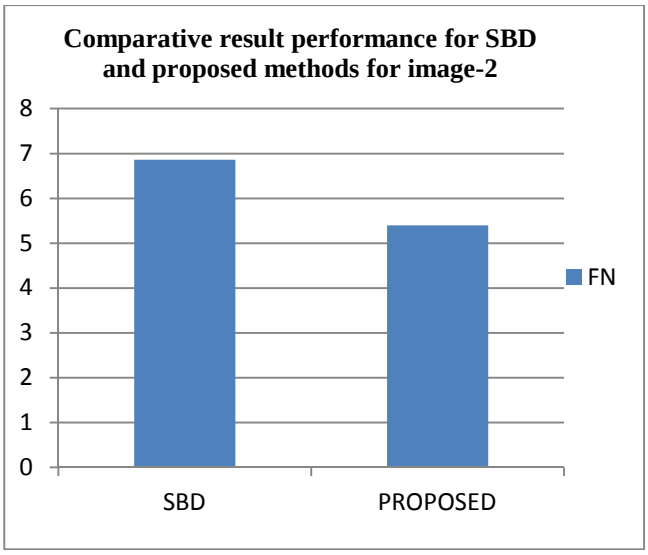

Figure 7: Shows that the comparative performance evaluation graphs for FN with using SBD and Proposed methods with using image-2.

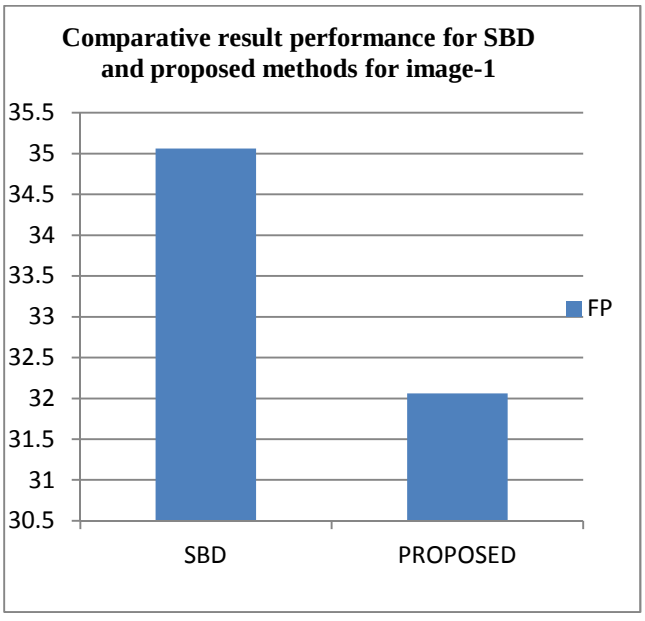

Figure 8: Shows that the comparative performance evaluation graphs for FP with using SBD and Proposed methods with using image-1.

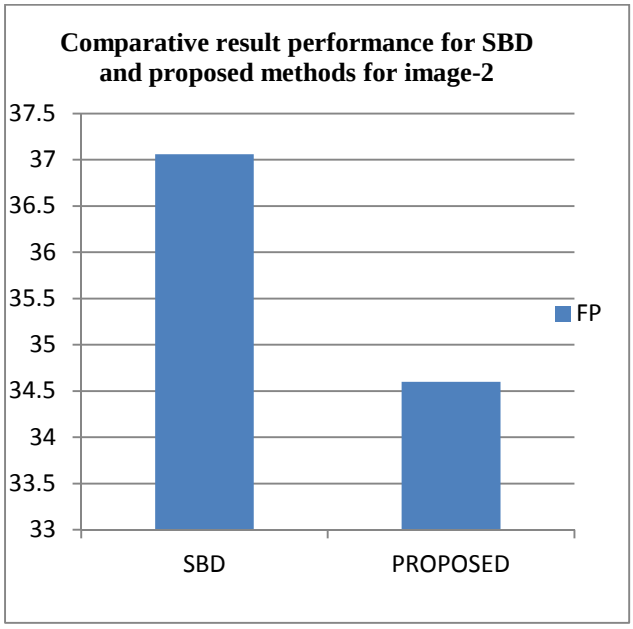

Figure 9: Shows that the comparative performance evaluation graphs for FP with using SBD and Proposed methods with using image-2.

VI. CONCLUSION AND FUTURE WORK

In this paper proposed an image forgery detection technique based on clustering technique. The proposed image forgery used wavelet transform function for the extraction of feature of original and forged image. The extracted feature passes through clustering technique for the generation of local pattern. The local pattern passes though matching block and measure distance of two similar and dissimilar blocks. The proposed image forged detection technique is very efficient in compression of local pattern and transform function based technique.

The proposed methods are evaluated on a number of original and forged images. According to our experimental results the proposed methods are quite attractive. The forgery is done with just copy-move, copy-move with rotation, with scaling, and reflection. In this process, an image database that consists of original and forged images is also developed. The proposed method achieves 100% accuracy in just copy-move forgery (without any change in the size or characteristics of the object) forgery without post-processing and 97.43%, 66.58%, and 99.12% accuracies in copy-move forgery with rotation, scaling, and reflection, respectively. Also to ensure more efficiency, we have added some random noise on the images, the detection accuracy achieved 98.23%. While the proposed method performs well even with additive white Gaussian noise post-processing.

For the evaluation of performance of copy-move forgery detection in digital images, in future, we commend the following improvements.

a. Some sophisticated constraints on the feature selector genetic can be applied to make the system more robust.

b. Detecting small target area and big size image using optimization technique.

c. Applying different classification technique for pattern generation process.

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