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Image Forgery Recognition using SWT Method

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Abstract: ***Using SWT (Stationary Wavelet Change) & SIFT (Scale Invariant Feature Transformation) we attempted to increase the number of features recognized & matched with digital image for forgery identification. Digital image received preferable match for forged area. We collected the forgery area using SIFT& SURF for identification of forgery. We used DWT (Discrete Wavelet Transform) w.r.t. SIFT & SW to subdue absence of translation invariance..***

Keywords: SIFT, SURF, Image data, Copy-move, passive technique, features based detection. Image forensics

I. INTRODUCTION:

Through incredible improvement in digital image has turned out to be inborn piece of individuals' exposure. Forgery detection has turns into a trifling part just as a noteworthy examination in digital image. Some substance can be erratically damaged and at times picture fraud can have unfavorable repercussion. Fraud location framework can utilize either Active approach or passive approach. In latent methodology dazzle fabrication discovery is productively conceivable dissimilar to in dynamic phony location approach.

Copy-Move is among most straightforward and promptly connected forgery techniques. Here, explicit piece of a picture is copied on same picture on different place. Because of presence of various hardware & software fraudulent image through copy-move. So we reproduce the area from the picture & find the components like; patterns, noise, color etcs.

Much of the time, tasks like; Enlargement, reflection, contraction, blurring could be connected with copy-move to image in a particular environment. So, it is not possible to identify the forgery part always.

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Fig.1: Depicts a typical instance of Copy-Move Forgery.

When the image is passed through different place by copying, so here we have tried to recognize the forgery with the features block through SIFT, SWT & SURF.

The paper is divided in to various segments; segments 2 to give overview of algorithm, segment 3 explains detection of fraud, for application segment 4 & analysis of result & for conclusion segment 5.

II. ALGORITHM:

A. SIFT(Scale Invarient Feature Transform)

Filter was distributed by D.Lowe in 1999.The given image content is changed in to nearby attributes facilitates not varying to turn, scale, revolution, interpretation & imaging basis. Through these nearby attributes in picture SIFT descriptors are removed after which a coordinating methodology is arraigned to get duplicate move region in picture.

SIFT Algorithm consists of 4 main stages:

1) Scale – Space Identification:

Let the input image I, then scale of the images is;

$$L(x,y,\sigma) = G(x,y) * I(x,y) \quad (1)$$

In input image, if I(x,y) scale could be expressed as:

Here, we convolution operation between y & x.

$$G(x,y,\sigma) = \frac{1}{2\pi\sigma^2} e^{\frac{-(x^2+y^2)}{2\sigma 2}} \quad (2)$$

G is a Gaussian function & σ is Scale Space factor.

$$D(x, y, \sigma) = (G(x, y, k\sigma) - G(x, y, \sigma)) * I(x, y) = L(x, y, k\sigma) - L(x, y, \sigma) \quad (3)$$

To search extreme points we do comparison between 8 neighbors & 9 neighbors & we use the various keys for particular pixels to find the max. & min. among the 26 neighbors.

2) Key Point Localization:

Location alongwith the Scale of key is computed by quadratic function.

3) Orientation Assignment:

To calculate gradient for every key point m(x,y);

$$\sqrt{(L(x+1,y)-L(x-1,y))^2+(L(x,y+1)-L(x,y-1))^2} \quad (4)$$

$\theta(x,y)=$

$$\tan^{-1}((L(x,y+1)-L(x,y-1))/(L(x+1,y)-L(x-1,y))) \quad (5)$$

Formation of rotated histogram is seen with every in every bin covering 10^0.

4) Key point descriptors:

The magnitude of gradient for every point trigger the region around the key features, we applied 4x4x cluster of histogram in 8 directions for every features point.

B. SURF (Speeded Up Robust Feature):

Integral image is key feature for obtaining outcome of SURF recognition algorithm.

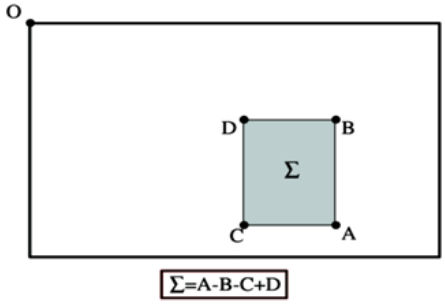

Fig 2. Through rectangular region integral image is computed

Hessian Matrix judged at scale of σ for image point co-ordinates x = (x,y);

$$H=\begin{bmatrix} L_{xx} & L_{xy} \\ L_{xy} & L_{yy} \end{bmatrix} \quad (6)$$

The 2nd order derivative convolution with image L_{xx} (x,y, σ) is Laplacian of Gaussian of image.

Hessian Matrix is:

$$\text{Det}(H_{approx}) = D_{xx}D_{yy} - (0.9D_{xy})^2 \quad (7)$$

Orientation Assignment:

Circular Area is made close key focuses & Haar wavelets dole out direction.

Reproducible direction for likely point is distinguished. Hover section of 600 is pivoted around the plausible point. Predominant cardinal for that specific intrigue point is greatest worth.

Feature Descriptor Generation:

We make square district around likely point for producing descriptors & intrigue point is picked as focus point. Square is later on isolated into 4×4 sub square area with 5×5 normally dispersed example focuses. At that point, we get Haar wavelet reaction Hx and Hy. As every Sub locale has commitment of 4 esteems descriptors is {4x4x4 = 64}

III. INTRODUCED TECHNIQUE (SWT-SIFT)

Here, explain presented strategy for key focuses to obtain copied region in produced picture. SWT & SIFT is two techniques presented in this paper.

SWT computation control shortage of interpretation invariance of DWT. Here, image is allowed to go by scaling function & wavelet work; at that point it is down examined to get guess and nitty gritty coefficients of picture.

Yet, on the off chance that picture is interpreted, these coefficients would modify, hence in SWT examining from DWT is expelled to accomplish move invariant wavelet coefficients of picture. LL segment is chosen since it is less recurrence area comprising most extreme data of picture without commotion.

Proposed Algorithm:

Step-1	Image to be identified as fraud is applied as data
Step-2	Gray scale discussion of data image is finished
Step-3	SWT is actualized to gray scale image. SWT up to level-1 with original wavelet a Haar wavelet is connected.
Step-4	LL part of SWT dis-integrated image is picked.
Step-5	SIFT key focuses is chosen for LL part of SWT deteriorated image.
Step-6	Filter descriptors for same image are broke down
Step-7	Descriptor matching based on Euclidean distance
Step-8	To obtain fraud region in image for matched key features Agglomerative Hierarchical clustering is performed

Smallest Euclidean separation between articles is perfect competitor coordinate for every Key focuses xi got by perceiving its adjacent neighbor from every other (n - 1) key purposes of picture.

An employable manner is search proportion between separations to closet neighbor to that of 2nd nearest & comparing with limit (T = 0.6).

Key features remains coordinated if;

$$d1/d2 < T \quad (8)$$

Here, d1 & d2 are sorted Euclidean distances w.r.t. other descriptors.

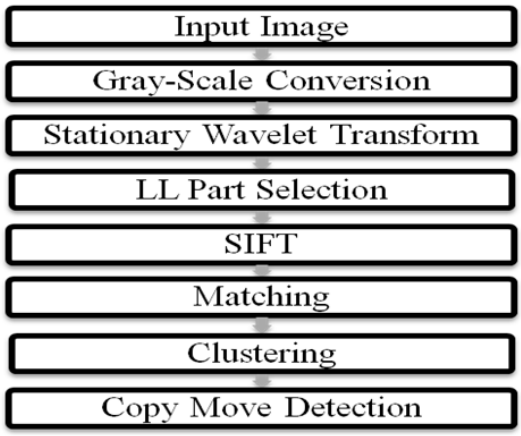

Fig 3. Block Diagram for introduced Method

IV. IMPLEMENTAION & RESULT

We have discussed implementation & result evaluation. For our study, we have found that MATLAB 2013b is perfectly suitable for our study. Through SURF, SIFT, SWT-SIFT copy-move fraud identification.

Fig. 4 (a) orginal Image to be checked for forgery

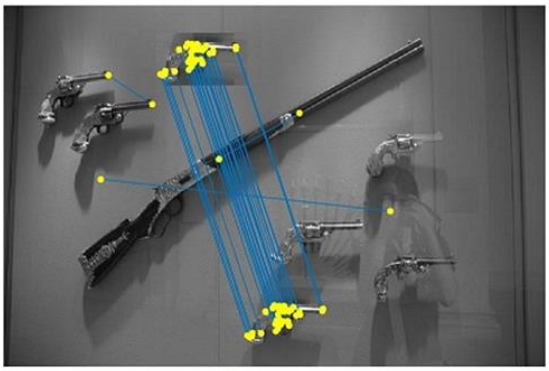

Fig. 4 (b) Key Points Detected in SIFT

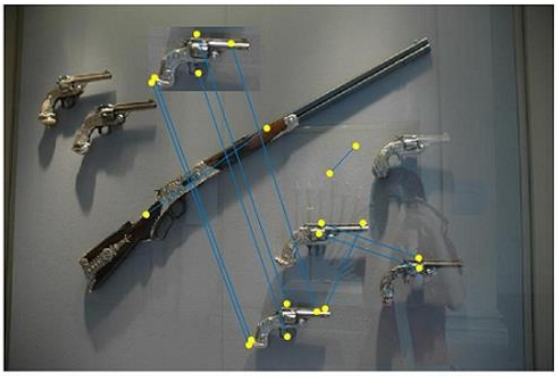

Fig. 4 (c) Key points identified in SURF

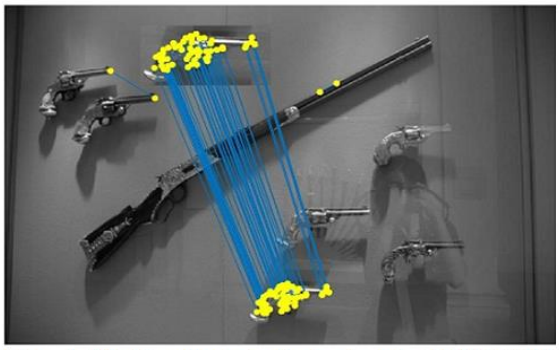

Fig. 4 (d) Key Points Detected in SWT-SIFT

Result Analysis:

Introduced method pass earlier techniques simliar to numbers of matching features of fraudelent zones in picture in contrast with SIFT & SURF. In this way, it is conceivable to recognize individual and different cloning with higher accuracy or more noteworthy proficiency.

Discovery execution is assessed as far as 2 noteworthy criteria; True Postive Rate(TPR) & False Positive Rate. TRP speaks to definitely perceived altered pictures. FPR is section of unique pictures that are erroneously perceived.

	Time(s)	TPR %	FPR %	Key point Matched
SIFT	6.9	100	11.56	27
SURF	4.09	59.09	10.00	7
SWT-SIFT	7.09	100	12.72	38

Table-I. Compares Processing time (average per image), TRP, FPR(% values), & Avg no. of keypoints matched.

TPR (True Positive Rate): Forged Image recognised as forged

$$TPR = \frac{\#\text{images detected as forged being forged}}{\#\text{forged images}}$$

FPR (False Postive Rate): Authentic Image recognised as Forged

$$FPR = \frac{\#\text{images detected forged being original}}{\#\text{ Original images}}$$

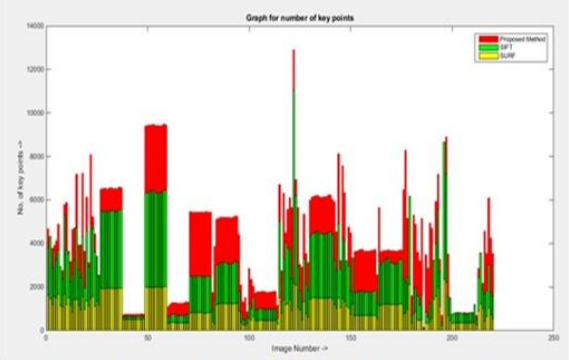

Fig. 5. KeyPoints identified by SWT-SIFT, SURF & SIFT

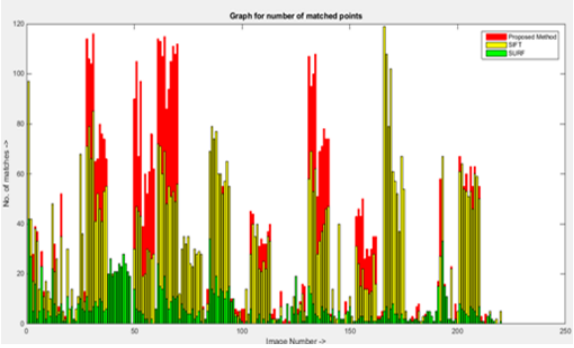

Fig. 6. Matched Keypoints identified by SWT-SIFT, SURF & SIFT

V. CONCLUSION

It is anticipated that Key Point based technique for distinguishing fabrication of computerized pictures is projected. It is based on SWT-SIFT & analysis of SIFT, SWT-SIFT, & SURF calculation comprising its correlation is finished. With this methodology we could distinguish immense number of key focuses, this leads to coordinating by SWT-SIFT progressively exact. Large number of key points could be identified through this approach making SWT & SIFT precise. Results demonstrate that acquainted procedure is not varying with various potential pieces of scaling & revolution. Its lone impediment is its minor increments in false positive rate.

REFERENCES

1. Hao C.H. & Shi M. (2012). Detection of Copy Move forgery image Gabor descriptor. Anti-counterfeiting, security & identification. IEEE conference.
2. Lu L. & Rongrong N. & Yao Z.S.L. (2014). Improved SIFT based copy-move detection using BFSN Clustering & CFA features. Intelligent Information Hiding & Multimedia Signal Processing. 10th IEEE conference.
3. Caldelli R. & Amerini I. & Ballan L. & Serra G. (2012). On the effectiveness of Local warping against SIFT based copy move forgery detection. 5th International Symposium on Communications Control & Signal Processing.
4. Christlein V. & Riess C. & Angelopoulou E. (2010). On rotation invariance in copy-move forgery detection. IEEE International workshop on Information Forensics & Security.
5. Matlab Programming language, www.mathsworks.com

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