Ant Colony Optimization Technique is used to detect the Forgery in Digital Images

[1]Manpreet Kaur, [2]Priyanka Mehta,

[1]Mtech Scholar, [2]Assistant Prof.
[1]Computer Science Engineering Department,
[1]Universal Group of Institutions Lalru, Punjab

_____

Abstract-- **Digital images have become an integral part of almost every area. they are widely used in communication and it industry. So image authenticity and integrity is a major concern. And there must be techniques used to detect whether an image has been forged or not. Authenticity of images can't be taken for granted, especially when it comes to legal photographic evidence. A number methods have been proposed by different authors to detect copy move forgery. All techniques follow a common pipeline to detect the forged areas in an image. In this paper detection and classification by point base and block base features SIFT and SURF Respectively but use ant colony optimization in matching and feature selection phases ,in case of SIFT features and proposed SIFT with ACO features which also use in classification with support vector machine with Gaussian and polynomial kernel.**

Keywords—*ACO, Image Enhancing Image, SIFT, Forgery, Image Splicing etc .*
_____

I. INTRODUCTION

1.1 Digital Image Processing
Digital image processing deals with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing a computer system that is able to perform processing on an image. The input of that system is a digital image and the system process that image using efficient algorithms, and gives an image as an output.

1.2 Analog image processing
Analog image processing is done on analog signals. It includes processing on two dimensional analog signals. In this type of processing, the images are manipulated by electrical means by varying the electrical signal. The common example include is the television image.

1.4 Need for the detection of digital images
The availability of powerful digital image processing programs, such as Photoshop, makes it relatively easy to create digital forgeries from one or multiple images. An example of a digital forgery . As the newspaper cutout shows, three different photographs were used in creating the composite image: Image of the White House, Bill Clinton, and Saddam Hussein.
The White House was rescaled and blurred to create an illusion of an out-of-focus background. Then, Bill Clinton and Saddam were cut off from two different images and pasted on the White House image. Care was taken to bring in the speaker stands with microphones while preserving the correct shadows and lighting.

1.5 Copy Move Forgery
Because of the extraordinary difficulty of the problem and its largely unexplored character, the authors believe that the research should start with categorizing forgeries by their mechanism, starting with the simple ones, and analyzing each forgery type separately. In doing so, one will build a diverse Forensic Tool Set (FTS). Even though each tool considered separately may not be reliable enough to provide sufficient evidence for a digital forgery, when the complete set of tools is used, a human expert can fuse the collective evidence and hopefully provide a decisive answer.

1.7 Digital Image Forgery Attack
In this era due to presence of low-cost and high-resolution digital cameras, there is wide amount of digital images all over the world. Digital images play a very important role in areas like forensic investigation, insurance processing, surveillance systems, intelligence services, medical imaging and journalism .
But the basic requirement to believe what we see is that the images should be authentic . With the availability of powerful image processing software's like Adobe Photoshop it is very easy to manipulate, alter or modify a digital image.

1.18 Ant Colony Optimization

_____

Ant Colony Optimization (ACO) studies ant systems and is used to solve discrete optimization problems. Artificial Ant Colony System (ACS) is an agent-based system, which simulates the natural behaviour of ants. It is used to find good solutions to combinatorial optimization problems. The essential trait of ACO algorithms is the combination of a priori information about the structure of a promising solution with a posteriori information about the structure of previously obtained good solutions.

II. LITERATURE REVIEW

Pameli Mukherjee, SaurabhMitra(2015)
In today's digital world, authenticity and integrity of any image cannot be taken for granted. Gone are those days when image manipulation was limited to experts only. Researchers have developed various techniques to counter this kind of attack based on exhaustive search and block matching approach. However, block matching is the most adopted approach due to its speed of operation and cost effectiveness as compared to exhaustive search. In this paper, authors have reviewed some techniques based on Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT).

Leida Li, Shushang Li, Hancheng Zhu(2013)
In this paper author presents a new method for detecting the copy-move forgery. Focus of authors is to solve a main problem that many existing schemes fails to solve and the problem is when the copied region is rotated or flipped before being pasted.
In proposed method the image is first filtered and divided into overlapping circular blocks. The feature vectors are then compared and the forged regions can be located by tracking the corresponding blocks. Experimental results demonstrate that this method is robust not only to JPEG compression, noise contamination and blurring, but also to region rotation and flipping.

Anna Veronica Baterina, Carlos Oppus(2010)
In this edge detection technique that is based on ACO is presented. The proposed method establishes a pheromone matrix that represents the edge information at each pixel based on the routes formed by the ants dispatched on the image. The movement of the ants is guided by the local variation in the image's intensity values. The proposed ACO-based edge detection method takes advantage of the improvements introduced in ant colony system, one of the main extensions to the original ant system. Experimental results show the success of the technique in extracting edges from a digital image.

Er. Saiqa Khan Er. ArunKulkarni(2010)
This paper describes blind forensics approach for detecting Copy-Move forgery. Proposed technique works by first applying DWT (Discrete Wavelet Transform) to the input image to yield a reduced dimension representation. Then the compressed image is divided into overlapping blocks. These blocks are then sorted and duplicated blocks are identified using Phase Correlation as similarity criterion. Due DWT usage, detection is first carried out on lowest level image representation. This approach drastically reduces the time needed for the detection process.

S. Bayram, H. T. Sencar, and N. Memon(2009)
This defines the partition-based copy-move forgery detection methods was presented that may help researchers to seek new concepts and provide new solutions to the challenges in the field.An attempt has been made to clearly present each step of the different existing techniques. Each of the techniques presented here has some drawbacks and, consequently, there is still more work to be done to perfect them. Some of the main challenges are the reduction of the computational complexity.

Alin C. Popescu, H. Farid(2004)
The periodic patterns introduced by double JPEG compression depend on the quality parameters. As a result, it is possible to detect not only if an image has been double compressed, but also the compression qualities that have been used. The second parameter can be found from the quantization table stored in the JPEG file. The first parameter can be inferred from the location of the frequency peaks in the Fourier transforms of the DCT coefficient histograms.

H. Farid(2009)
In this paper, we presented and analyzed a digital check forgery attack that can be used against client check truncation systems. This attack is enabled by the delegation to untreated entities of critical operations performed by trusted entities. We demonstrate the feasibility of an instance of this attack with experiments on three banking applications running on Android smart phones. We also discussed countermeasures that can be employed against this attack.

Gajanan K. Birajdar and Vijay H. Mankar(2013)
Blind techniques and methodologies for validating the integrity and authenticity of digital images is one of the rapidly growing areas of research. Passive method do not require extra prior knowledge of the image content Most of the technique are developed to detect image tampering and some of also are available to localized the forged area.

Nick efford(2000)
Image enhancement (background, image enhancement by histogram modification techniques, image smoothing, image sharpening, enhancement based on an image model, pseudo-color image processing, concluding remarks). Image restoration (degradation model, diagonalization of circulate and block- circulate matrices, algebraic approach to restoration, inverse filtering, least-squares (Wiener) filter, constrained least-squares restoration, interactive restoration, concluding remarks), Image encoding (fidelity criteria,

the encoding process, error-free encoding, image encoding relative to a fidelity criterion, use of the mapped outputs as features, concluding remarks)

J.Fridrich(1999)
In this paper attempts has been made to discuss a background on the key algorithms of digital image steganography. It is to be known that the emerging techniques viz., DCT, DWT and adaptive steganography are not too prone to attacks, particularly when the hidden data is small in size. The reason behind this that they modified coefficients in the transform domain, by which image distortion is kept to a least. Particularly such methods tend to have an inferior payload compared to spatial domain algorithms. The paper gives a few clues and recommendations for designing the steganographic system. Steganography techniques generally struggle for achieving a high embedding rate. It is a good substitute channel for images; video files have several outstanding features for data hiding like large capacity and good imperceptibility.

J.A Redi (2011)
In this work, a forensic algorithm to localize copy-move forged regions in a digital image without any a priori knowledge about the location of the possibly tampered areas has been presented. In this work a hybrid approaches issued to localize the manipulated areas. Measurement of local fractal dimension issued to classify image into different texture regions. The concept of structural similarity index measure issued to extract the manipulated area. The experimental results how is that the proposed method can be available tool or detecting and localizing copy-move forgery in digital images. The inherent advantage of SSIM helps to detect forgery even when duplicated image is noise contaminated or blurred etc.The major drawback of fractal coding systems is the high encoding time requirements. Future work of this method can be to use a different measure instead of SSIM to localize forged regions. Since SSIM is not a good measure to compare regions that are subjected to post-processing region duplication such as scaling, rotation etc., an alternate estimate can be experimented instead of SSIM to localize forged regions. Use of hybrid measures can also be attempted along with fractal dimension can be experimented as the future work to efficiently detect copy-move forgery.

R. E. J. Granty, T. S. Aditya, and S. Madhu(2010)
In this paper, attention has been focused on copy-move forgery that one region is copied and then pasted onto other zones to create duplication or cover something in an image. A novel method based on HSV color space feature is proposed and experimental result will be given and it shows the effectiveness and accurateness of proposed methodology.

BesteUstubioglu, GuzinUlutas ., Mustafa Ulutas, Vasif V. Nabiyev(2016)
In this paper authors proposed a method to calculate threshold automatically. Threshold is value that is used to compare similarity between feature vectors. The method uses element-by-element equality between the feature vectors instead of Euclidean distance or cross correlation and utilizes compression history to determine the threshold value for the current test image automatically. Experimental results show that the method can detect the copied and pasted regions under different scenarios and gives higher accuracy ratios/lower false negative compared to similar works.

III. PROBLEM FORMULATION

Image authenticity has been an important issue now these days. Copy move forgery is very easy tampering method of detection copy and move forgery. Each approach uses different features, feature matching. Typically feature extraction is perform during DCT, DWT etc . and matching is performed for detection . To detect the copy paste forgery , we divide the image into blocks as the basic feature for detection, and transfer every block to a feature vector with lower dimension for comparison.

Proposed method uses Ant colony optimization technique to detect copied region in a digital image. ACO agents can help finding the solution in a optimized way . It would speed up the process of forged images detection parallel processing agents would speed up the process of solution. Agents would help in converging to an optimal solution with increase accuracy and neglect positive detections.

Inspiration from SWARN intelligence has led to some highly successful optimization algorithm – one of those algorithms is ANT colony algorithm. It is a way to solve optimization problems based on the behavior of ants searching for food. There is an indirect coordination between agents or actions. Ants communicate using pheromones. ACO algorithm consists of two parts that is edge selection and pheromones update.

ACO is an optimization technique proposed by Marco Dorigo in the early '90. It has become more interesting and fruitful research area. The inspiring source of ant colony optimization is the forging behavior of real ant colonies.

The main features include:
The proposed work is basically scanning an image to detect copy-moved regions.
1. Input an Image containing copy-moved region as an input.
2. Convert colored image into grayscale.
3. Divide image into overlapping blocks and to store blocks in a matrices.
4. Extract image features from each block using Ant Colony Optimization.

IV. PROPOSED METHODOLOGY

Many researchers shaved one a lot of research in copy move forgery detection. Their research mainly includes show features extraction using basic features extraction method.No one used ANT colony optimization for this purpose.
Beste ustubiogluet. Al has worked on automatic threshold determination, which gives good results. But I have used ANT colony optimization for this purpose which will give optimized results.

Main focus of researchers is always to find a method that is less time consuming and efficient. So, the proposed method will be less time consuming and will also give better results
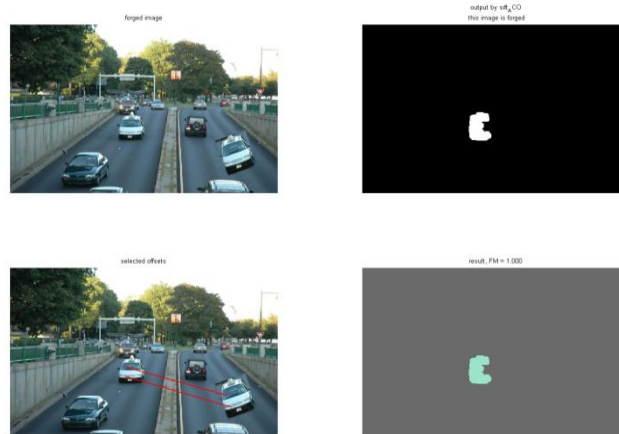
Proposed Solution
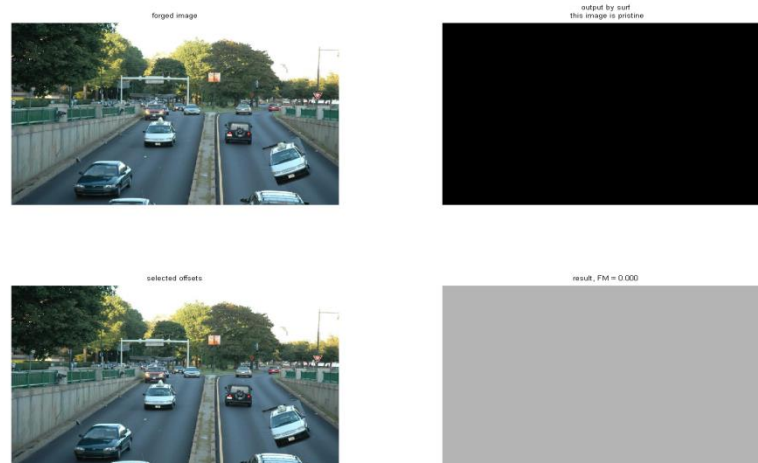This dissertation performs following tasks to implement SIFT- ACO algorithm for optimized.

- Study of SIFT and ACO algorithm.
- Implementation of SIFT and ACO algorithm.
- Compare the results in MATLAB.

V. SIMULATION RESULTS AND DISCUSSION
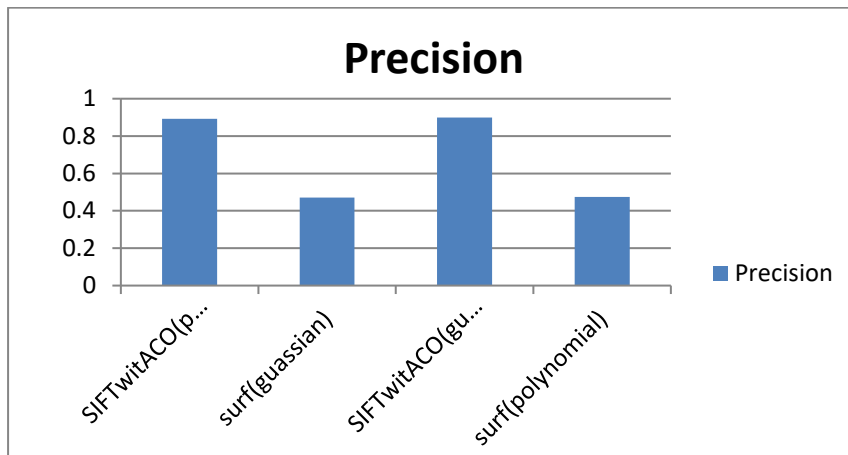
Analysis of SIFT ACO features Detection

Analysis of SIFT ACO features Detection

Above given figure 1 and figure 2show the experiment on two types of feature SIFT with ACO and SURF feature but results show SURF features not able to detect forgery part in image but ACO optimization features detect.
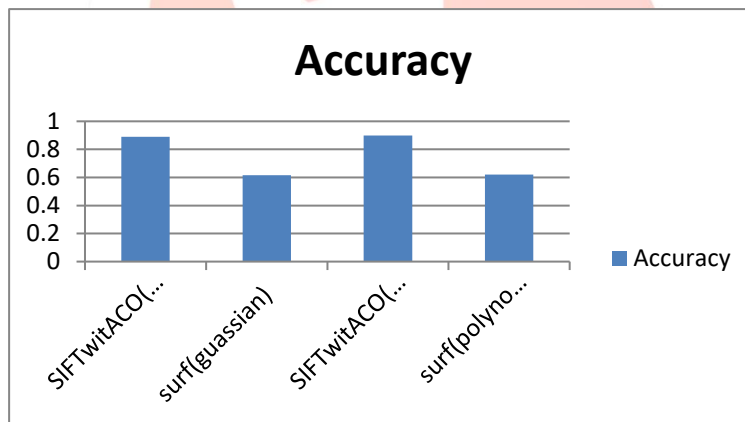
Precision Graphs of different classifier

Accuracy of different classifier

| classifier	Accuracy
SIFTwith ACO(polynomial)	0.8896
surf(Gaussian)	0.6153
SIFTwith ACO(Gaussian)	0.8979
surf(polynomial)	0.6193

Accuracy Graphs of different classifier

Recall of different classifiers

Recall graph of different classifiers

Classifier	Recall
SIFTwith ACO(polynomial)	0.888
surf(Gaussian)	0.4703
SIFTwith ACO(Gaussian)	0.8963
surf(polynomial)	0.4726

Recall
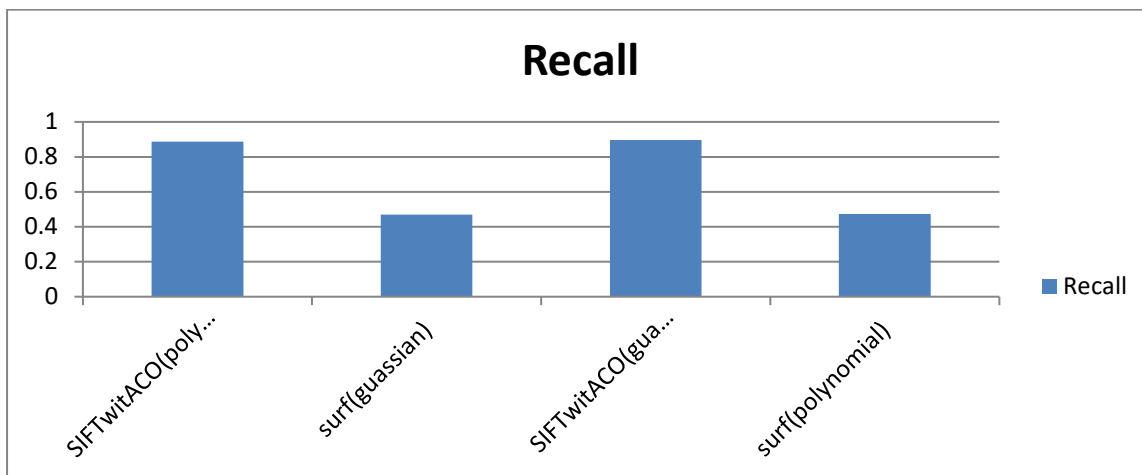
Different classifiers with all the parameters
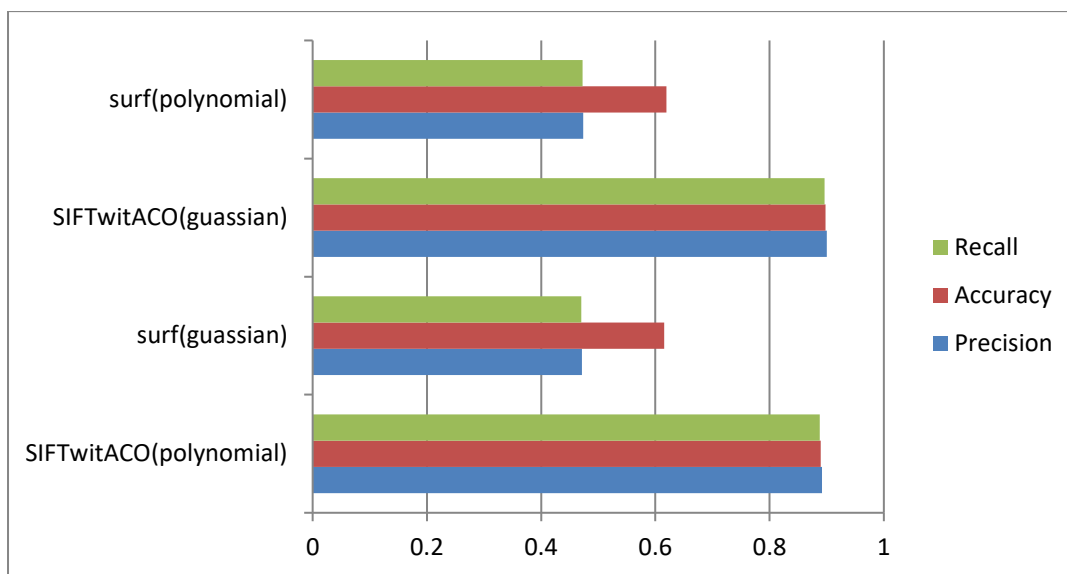
VI.Conclusion and Future Scope

The proposed versatile over division calculation sections the host picture into no overlapping and sporadic blocks adaptively. Then, the element focuses are removed from each block as block elements, and the block components are coordinated with each other to find the named highlight focuses; this technique can around show the presumed forgery districts. In past few years, Copy-move forgery is a very common way to tamper an image. Many researchers have proposed various schemes to detect the tampered images. Sometimes the copied regions are rotated or flipped before being pasted. In this paper propose Detection and classification method by machine learning and optimization method. In our experiment detection and classification with sift ACO

REFERENCES

[1]. B. Mahdian and S. Saic, "A bibliography on blind methods for identifying image forgery," Signal Processing: Image Communication, vol. 25, pp. 389-399, 2010.

[2]. Bayram, S., Sencar, H. T., & Memon, N. (2009). "An efficient and robust method for detecting copy-move forgery". Paper presented at the Acoustics, Speech and Signal Processing, IEEE International Conference on,2009.

[3]. BesteUstubioglu, GuzinUlutas ., Mustafa Ulutas, Vasif V. Nabiyev," A new copy move forgery detection technique with automatic threshold determination",Elsevier- International Journal of Electronics and Communications Volume 70, pp. 1076–1087,2016.

[4]. Bolun Chen , Ling Chen , Yixin Chen, "Efficient ant colony optimization for image feature selection", Volume 93, Elsevier - Special issue on Machine Learning in Intelligent Image Processing, Issue 6, pp. 1566–1576,2013

[5]. Cao Y, Gao T, Fan L, Yang Q: "A robust detection algorithm for copy-move forgery in digital images", Forensic Sci Int. 2012.

[6]. Chi-Man Pun, Xiao-Chen Yuanand Xiu-Li Bi, "Image Forgery Detection Using Adaptive Over-Segmentation and Feature Point Matching", IEEE Transactions on Information Forensics and Security, Volume 10 , Issue 8, pp. 1705 – 1716,2015.

-- C. L. Jing, "Image copy-move forgery detecting based on local invariant feature," Journal of Multimedia, volume7, 2012.

[7]. D.A. Brugioni. Photo fakery: the history and techniques of photographic deception and manipulation. Virginia :Brassey's publishers, 1999.

[8]. David G. Lowe., (2004), "Distinctive Image Features from Scale-Invariant Key-Points", International Journal of Computer Vision 60(2), pp.91-110.

[9]. DavideCozzolino, Giovanni Poggi and Luisa Verdoliva, "Efficient Dense-field copy-move forgery detection", IEEE Transaction on information forensics and security, vol. 10, No. 11, november 2015

[10]. Devanshi Chauhana, Dipali Kasatb, Sanjeev Jainc, Vilas Thakared, "Survey On Key point Based Copy-move Forgery Detection Methods On Image", Elsevier –International Conference on Computational Modeling and Security (CMS 2016),pp. 206 – 212.

[11]. Dongmei Hou, Zhengyao Bai and Shuchun Liu, "Image copy-move forgery detection based on crossing shadow division," International Conference on Electric Information and Control Engineering (ICEICE), Wuhan, 2011, pp. 1416-1419

[12]. E. Ardizzone, A. Bruno, and G. Mazzola" Copy-Move Forgery Detection by Matching Triangles of Keypoints", IEEE Transactions on Information Forensics and Security ,Volume 10 , Issue 10,pp 2084 – 2094,2015.

[13]. EmreGurbuz, "Rotation Invariant Copy Move forgery Detection Method", International conference on Electrical and Electronics Engineering, pp.202-206(2015).

[14]. Er. Saiqa Khan Er. ArunKulkarni, "An Efficient Method for Detection of Copy-Move Forgery Using Discrete Wavelet Transform" International Journal on Computer Science and Engineering, Vol. 02, No. pp.1801-1806(2010).

[15]. Elmagarmid, A.K., Ipeirotis, P.G.: Duplicate Record Detection: A Survey. IEEE Transactions on Knowledge and Data Engineering ,2007

[16]. Ethan Rublee Willow Garage, Menlo Park, "ORB: An efficient alternative to SIFT or SURF", IEEE International Conference on Computer Vision, pp. 2564-2571(2011).

[17]. G. H. Li, Q. Wu, D. Tu, and S. J. Sun, "A sorted neighborhood approach for detecting duplicated regions in image forgeries based on DWT and SVD," in Proceedings of IEEE International Conference on Multimedia and Expo, Beijing, pp. 1750–3,2007.

[18]. G. Li, Q. Wu, D. Tu, and S. Sun. 2007. "A sorted neighborhood approach for detecting duplicated regions in image forgeries based on DWT and SVD". in Multimedia and Expo,IEEE International Conference on, pp. 1750- 1753,2007.