Video Forgery Recognition Using SIFT, SVD And DWT

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Abstract: **Due to the development of technologies, videos are generated and copied easily. And the Copied videos are distributed over an internet easily. Video forgery recognition is very important in multimedia application. Here Video forgery recognition is proposed by using SIFT, SVD and DWT techniques. Here first the copied and original videos are converted into frames and frames are stored. In this project, to detect the key point in the frames a very efficient SIFT technique, that is Scale Invariant Feature Transform is proposed. SIFT is an effective technique which is chosen here, because of it robustness to invariance of scale and rotation illumination changes. It searches all the key points in the image that is frame. For matching the SIFT Key point sets of both Query image and reference image we propose a Singular Value Decomposition [SVD] algorithm. To find the frames which are involved in color or contrast changes, Discrete Wavelet transform is used.**

Key words: Video Forgery identification, Singular Value Decomposition, Discrete wavelet transform, SIFT technique

I. INTRODUCTION:

Development of broadcasting of digital video content on different media brings the search of copies in huge video databases to a new critical issue. Copying of video increases with the rapid development of multimedia application. Therefore, no general solution can be proposed to video fake identification problem. Secondly, the problem space is extremely large, which often needs real-time solutions. In this paper we propose Video forgery Identification method by using SIFT and DWT techniques. Due to increase of multimedia technologies and media streaming, videos can be easily copied, stored, and distributed over the Internet. Because videos are existing in different formats, it is more efficient to do the video copy detection process on the content of the video rather than its name, description, or binary representation. This situation, aside from enabling users to access information easily, causes vast piracy issues. Video copy detection is one of the challenging problems in a computer vision. It is challenging problem in computer vision due to the following reasons. First, the problem domain is extremely broad. Depending on a video forgery recognition system, there are different solutions available. For example, a simple frame-based color histogram similarity approach could be enough for detecting exact duplicates of video segments or discovering commercial breaks. On the other hand, the matching news story across the different channels (camera viewpoints) is a totally different problem, and will probably require interest point matching techniques.

II. PROPOSED SYSTEM:

II.1. FORGERY VIDEO:

The video V_f is said to be forgery video, if it undergoes addition, deletion, or any modification (such as varying color, contrast, hue) or any transformation such as Cam cording, Picture in picture, insertion of pattern, Change of gamma Decrease in quality, blur, and change in gamma value, Frame dropping, contrast, compression, white noise, Strong re encoding, Post production: crop, contrast, shift, captain, flip , Combination of random five transformations.

The main objective of this project is to decide whether the query video (forgery video) is copy of video or not.

In the above transformation the picture in picture is very difficult to detect. In our proposed system, We propose SIFT technique for keypoints or interest points selection, SVD technique for similarity matching and for feature extraction in color modified images by using DWT technique.DWT extracts the features as coefficients.

Fig.1.shows that the video forgery identification by using SIFT & DWT techniques. Here first the Query video and Reference video can be converted into key frames. Frames consist of several features. Then the features can be extracted from the frames by using SIFT technique. The features of both query image and original image can be given SIFT points. Then the proposed SVD technique is used to map the point set of query video and reference video.Fig.4. shows that the algorithm of SVD for similarity matching, After that the proposed DWT technique can be used for detecting the copy due to color or contrast changes. Fig.8. shows that the DWT technique. By using the proposed DWT technique, the computation time of Video forgery identification can be reduced.

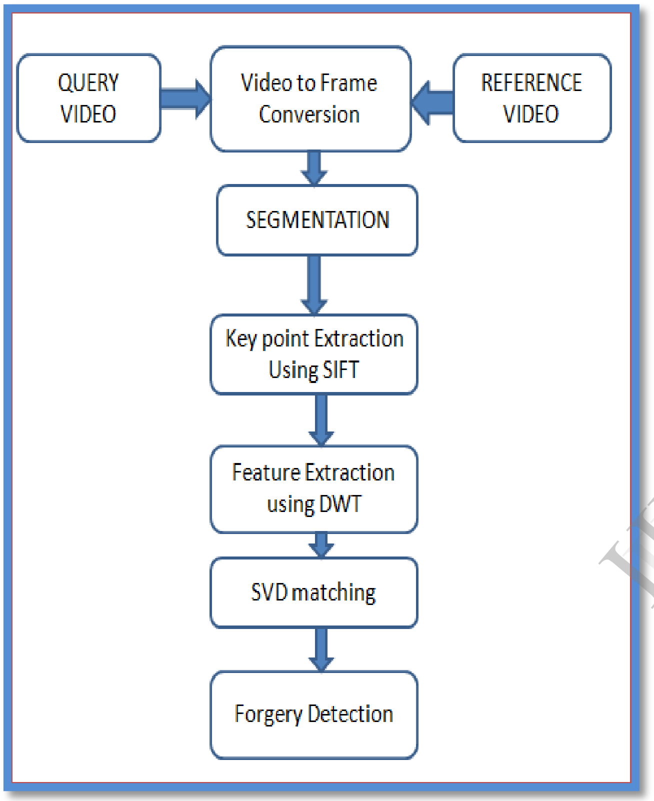

Fig.1. Video forgery Identification

II.2.1 VIDEO TO FRAME CONVERSION:

First both Query video and reference video can be converted into frames. Frame in the sense that the still images. And they are stored in one database.

II.2.2. SEGMENTATION:

Segmentation is the process of partitioning the continuous video frames into segments. Here the segmentation is done by dual threshold method. In this segmentation process, there are two thresholds are utilized. One threshold value is for detecting the abrupt changes in the visual information in the video content. Another one is for detection the gradual changes in the visual information of the video content.

$$T_h=\mu+\alpha\sigma$$

μ= Mean for difference values between consecutive frames.

σ= Standard Deviation for difference values between consecutive frames.

[α=5 to 6]

$$T_l=b*T_h \quad \& \ [b=0.1 – 0.5]$$

T_h - High threshold

T_l – Low threshold

After segmentation process, from each and every segment one key frame is selected. It will be a center frame of a segment. Then this key frame is given as input to SIFT. Key points are extracted from the key frame.

II.3 KEYPOINT EXTRACTION USING SIFT:

The proposed system uses SIFT technique for key point selection. There are four steps in SIFT Key point selection. They are given below

Step1: Free space extrema detection:

This is first stage of computation. It will search all the scales as well as image location by using the difference of Gaussian function. The scale space can be defined as

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

$G(x, y, \sigma)$ – variable scale Gaussian function

$I(x, y)$- input image

To detect the stable scale space Different of guassian function is used scale-space extrema, $D(x, y, \sigma)$ is given by

$$D(x, y, \sigma) = L(x, y, k\sigma) - L(x, y, \sigma)$$

Step 2: Key point localization:

This is used to eliminate more points from the list of key points by finding those that have low contrast. Here D(x,y,σ) is interpolated. The result is D(x). If the value of D(x) is lesser than 0.03, then those key points are eliminated , because of their unstability.

Step3: Orientation assignment:

In this step one or more orientations are assigned to each key point location based on local image gradient directions. We can compute orientation by

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

Step4: Key point descriptor:

The local image gradients can be calculated at the selected scale in the region around each interest point.

Fig.2.Input Frame

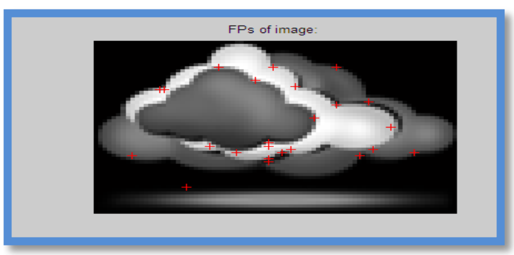

Fig.3. SIFT point set of input frame

Here the SIFT descriptors are used to represent the local contents in the video frames in efficient way. For matching the picture in picture image the SIFT is the better choice. In our project the two SIFT feature point sets can be matched and the temporal information in the video frames can be utilized.

II.3 SVD ALGORITHM:

SVD method has proposed in many applications such as data compression, pattern recognition, signal processing etc.. In [5] not only used for matching the SIFT point descriptors, It is mainly used for reducing the wrong match and correcting the wrong one. But in our project SVD is focused on the one point to one point correspondence. Here we are using the SVD method to measure the similarity between two SIFT feature sets. The Singular Value Decomposition can be described as follows

$$A=U\lambda V^T$$

Here A =Rmxn where m>n Rank (A) = r;

U, V=orthogonal matrix

Singular value has following characteristics. They are **Transposition & Replacement invariance**: Even transposition or row column replacement in matrix, here will not be any change in singular value.

Energy concentricity: The matrix is reconstructed by using the first K largest singular values of A

In our project first the video can be converted into key frames. From the key frames the SIFT feature can be extracted.

SVD technique is to match the two SIFT point sets. SIFT point sets comprise of many local feature points. Each and every point can be described by the 120D vectors.

Here the SIFT feature point sets can be represented by matrix form. SIFT matrix satisfies the above two characteristics. According to the characteristic 1, the singular value of the image SIFT matrix is not related with the position of the SIFT feature point. And from the characteristic 2, Energy concentricity of the first K largest singular value of SIFT matrix to reduce the matching cost. In our project we use both the above characteristics of the image SIFT matrix as well as singular value for matching SIFT feature point sets of two images.

Consider A& B two images. The main objective of the algorithm is to match SIFT feature point sets of A & B.

Fig. 4. Shows that the Flowchart for an SVD algorithm . Here first the feature point set can be assigned. Consider A is a Feature point set of a Query frame. B is a Feature point set of a reference frame. Then orthonormal basis function is detected according to SVD algorithm as given below. Then the features of Query and Reference image can be matched .

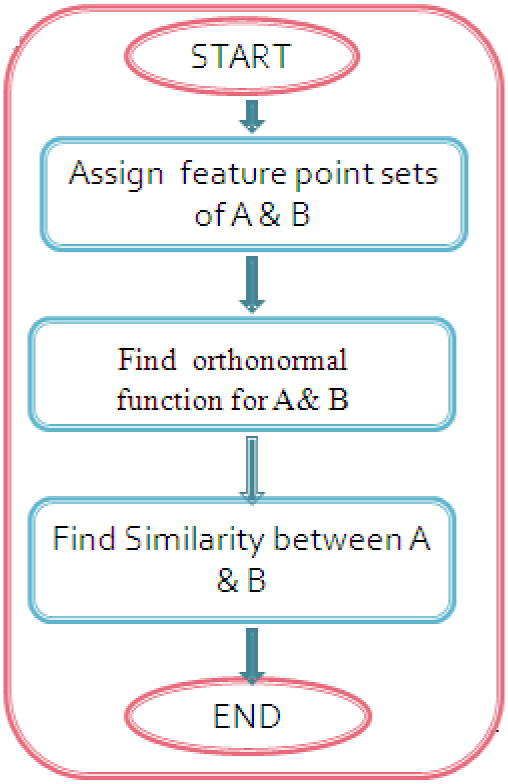

Fig. 4. SVD algorithm for similarity matching

As shown in Fig.2.The SVD algorithm for matching is given by

Step1: matrix A_{Nxm} = (A1, A2……..Am) is SIFT feature point set A ; matrix B_{Nxm} = (B1,B2……..Bn) is SIFT feature point set B

The dimension of A & B is N (N=128).

Step2: A orthonormal basis matrix of A is $P_A \in A_{Nxm}$

And A orthonormal basis matrix of B is $P_B \in A_{Nxd}$

$AA^T \approx P_A \lambda_A P^T A$

$BB^T \approx P_B \lambda_B P^T_B$

Λ_A, Λ_B=Eigen value of matrices A & B respectively.

Step3: Make the SVD for $P_A^T P_B \in R^{dxd}$ Therefore the similarity between matrix A & B can be expressed as, Sim(A,B)=trace(S)

Consider a Query image given in below figure.

Fig. 5. Query image

Fig.6. Original Frame

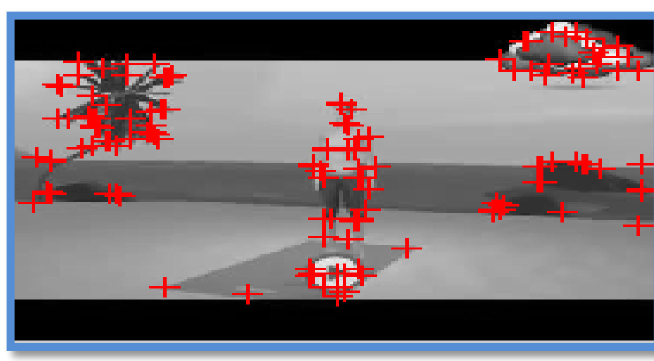

Fig.7. SIFT feature point set of Query image

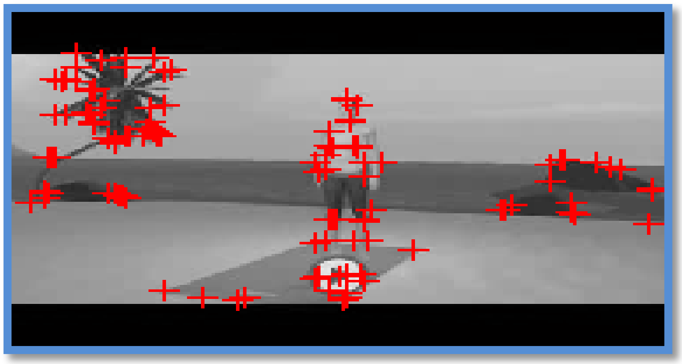

Fig.7. Feature point set of original image

Fig. 5 shows the query image and Fig.6. shows that the Key points of the corresponding query image. Fig.7. shows that how the key points of query image and false original image are matched by using SVD technique. By using SVD each and every key points of an image is matched with corresponding same key point.

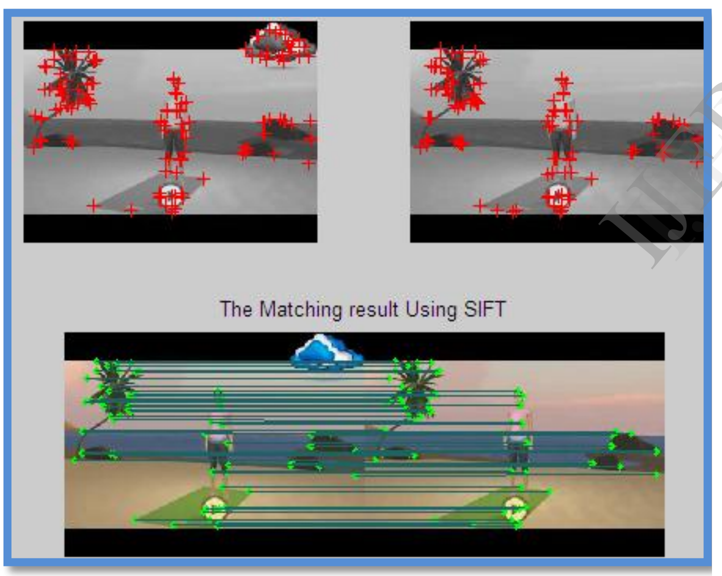

Fig.8. Mapping SIFT feature point set of original image with SIFT feature point set of query image .

Above figure shows that the Query image is a copy of original image

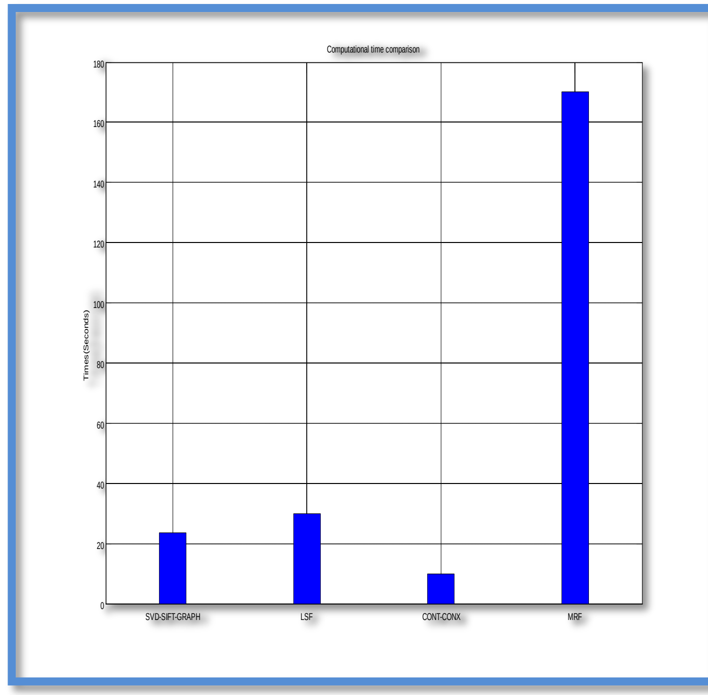

Fig.9. Computational time comparison

This Fig. 8 is the graph for computational time comparison. Here x axis represents different techniques and y- axis represents the computational time. Computational time is the time taken for detecting for single frame whether it is forgery or not. If it has less computational time then it has greater efficiency. Comparing other techniques SIFT-SVD technique [first one in above graph] has less computational time.

III.FUTURE WORKS:

III.1. FEATURE EXTRACTION BASED ON DWT TECHNIQUES:

In TIRI DCT-DWT approach the video copy detection is done by DCT and DWT technique. However DCT can be applied in frequency domain. So it can’t be used for detecting when the particular event takes place. Therefore our proposed approach uses the DWT technique for feature extraction purpose. It will be very efficient in extracting approximation and detail features from an image. DWT technique can be applied for both time and frequency domain.

Wavelet means small waves. DWT is the effective technique for feature extraction. It is very efficient in determining changes in brightness, color or contrast of images. By using DWT forgery can be detected in approximation, horizontal, vertical & diagonal manner as shown in Fig.9.

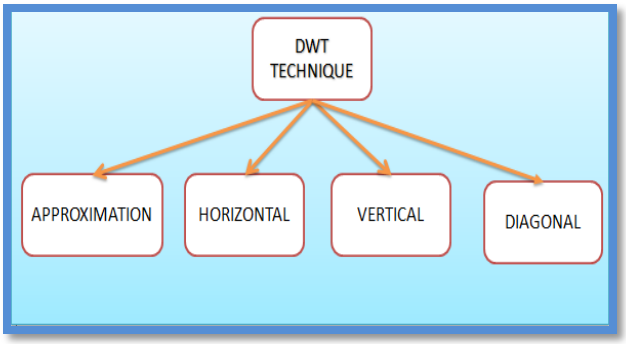

Fig.10. DWT for Feature Extraction

CONCLUSION:

The main objective of this video forgery recognition is to detect whether the query video, is copy of original video or not. Our proposed video forgery identification method will well work in detect the copy in picture in picture frames due to an efficient proposed SIFT technique.

Here an efficient method is proposed for video forgery recognition. To describe video content, we use SIFT technique. Thus SIFT feature is extracted from the images. Then for matching SIFT feature sets we use Singular Value Decomposition technique. Discrete Wavelet transform is for extracting features in color or contrast modified images.

IV. REFERENCE:

[1].A multimodal video copy detection approach with sequential pyramid matching-2011
Yonghong Tian1, Menglin Jiang1, Luntian Mou2, Xiaoyu Fang1, Tiejun Huang1

[2]. Detection of Video Sequences Using Compact Signatures-2006 T. C HOAD and J. ZOBEL, RMIT University

[3]. Real-Time Near-Duplicate Elimination for Web Video Search with Content and Context -2009
Xiao Wu, Student Member, IEEE, Chong-Wah Ngo, Member, IEEE, Alexander G. Hauptmann, Member, IEEE and Hung-Khoon Tan

[4]. Dwt - Based Feature Extraction from ecg Signal . V.K.Srivastava1, Dr. Devendra Prasad21Research Scholar, Deptt. of Electronics & Comm. Engg., JJT University, Jhunjhunu, Rajasthan, India 2Associate Professor, Deptt. of Computer Sc.& Engg., M.M. University, Ambala, Haryana,India

[5]. Video copy detection using multiple visual cues and MPEG-7 descriptors-2010
Onur Kucuktunc 1, Muhammet Bas_tan , Ugur Gudukbay , Ozgur Ulusoy

[6]. Efficient Near duplicate Detection and Sub image Retrieval-2004 Yan Ke , Rahul Sukthankar, Larry Huston

[7]. Segmentation and Graph-Based Video Sequence Matching Method for Video Copy DetectionHong Liu, Hong Lu, Member, IEEE, and Xiangyang Xue, Member,

[8]. A robust video copy detection using TIRI DCT and DWT Finger prints.
[9]. .Accuracy oriented video copy detection using wavelets.

[10]. Dual Digital image water marking technique.

[11]. An image –adaptive watermark based on redundant wavelet transform.

[12]. Singular value Decomposition based scale invariant image matching. Department of Electrical and Electronic Engineering, The University of Hong Kong, PokfulamRoad, Hong Kong.

[13]. A STUDY OF THE SCALE-INVARIANT FEATURE TRANSFORM ON A PARALLEL PIPELINE by Phaneendra Vinukonda B.TECH., JNTU University, 2007

[14]. A Singularly Valuable Decomposition:The SVD of a Matrix
Dan Kalman