Robust Performance Comparison of Unstable Videos and their Quality Improvement Implementing Block-Based Frame Matching Technique for Obtaining Digital Video Stabilization

Abhishek Pratap Singh, Manoj Gupta

Abstract— In the context of Digital Image stabilization (DIS), based on morphological frame division and comparing, to estimate matching between local and global motion vectors by the means of averaging pixel information of frames; surprisingly proposes an indispensable Digital video stabilization (DVS) technique which can enhance the quality of an input video stream. Videos captured by hand-held devices (e.g. Cell phones, portable camcorders etc.) sometimes appear remarkably shaky hence Digital video stabilization technique can be implemented to refine the video quality by removing unwanted jitters. It's an important step for several video processing amenities to acquire video stream without intervening jerkiness, eliminating unnecessary camera movements and withdrawing the superfluous inter frame motion between two successive frames. In order to get the stabilized video sequence, first promising step is to check the validity of local motion vector (LMV), and finally global motion vector (GMV) is obtained by averaging to further enhance the reliability. Here low pass filters and moving average filters are used for smoothing estimated motion vectors to get a stabilized sequence. Experiments show that this video stabilization technique is an efficient method to stabilize the input unstable video stream. In this paper we study the digital video stabilization technique with the use of keen motion estimation and finally performance comparison and conclusion of un-stabilized and stabilized video sequence with the efficacy of our technique of digital video stabilization.

Keywords— Digital Video Stabilization (DVS), Digital Image Stabilization (DIS), Inter Frame Motion, Local Motion Vector (LMV), Global Motion vector (GV).

I. INTRODUCTION

A keen approach of Digital Image Stabilization (DIS) is a process to abolish the unsought camera fluctuations caused by hand-held recording devices, which can produce a pleasant result of image sequences. Digital image stabilization system integrated with video codec provides better visual quality with assured promotion of performance of video compression for the applications in the environment of a mobile video communication, (DIS) system is mainly composed of two subsystems, motion estimation and motion correction. The duty of motion estimation is to acquire camera movements perfectly by finding their local and global motion vectors, And the motion correction system is implied to withdraw annoying camera shake or jiggle while preserving the user intentional panning. [9]**.** The conflict of image stabilization dates since the outset of photography era, and it is basically caused by the reason that any known image sensor needs to have the image projected on it during a period of time called integration time. Any nonsense motion of the camera during this particular time leads a shift in the image projected on the sensor resulting in the deterioration of the final image, called motion blur. Here the main adversity lies in restoring motion blurred images which consists a fact that the motion blur is peculiar in any deteriorated image, depending on the camera motion at the time of exposure. The current advancement and miniaturization of consumer devices that have image acquisition liabilities and reliabilities tends to increase the need for booming dynamic image stabilization solutions. [6]**.** A**s** we have discussed earlier that the DIS system is mainly composed of two steps which are motion estimation and motion compensation. Motion estimation helps to estimate the reliable camera motion through three transforming steps on input video stream sequences: 1) To evaluate local motion vectors; 2) To estimate the global motion vector including the intentional and the unintentional motion vectors; and 3) To estimate the un-intentional motion. Further Motion compensation is implied to compensate the unintentional motion. Also the camera global motion estimation is very critical to the leading success of stabilization of video sequence. Here several methods are used for the motion estimation which can be divided into two classes: intensity based motion estimation and feature based motion estimation. Generally the feature based motion estimation methods is more accurate but less robust compared to intensity based motion estimation method. [14]**.** In fact video stabilization is an important step for several video processing works. It can be implemented in the domain of various fields including, surveillance, tracking, situational awareness and diverse hand-held video recording devices. Digital video stabilization is surprisingly very useful and favorable to boost up the viewing experience of quivery videos and helps in further processing such as segmentation, encoding and restoration. [17].

Manuscript published on 30 August 2016.
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whereas digital video stabilization concede to attain video sequences without disturbing jerkiness, eliminating non-essential as well as redundant camera movements. [7]. Moreover the peculiar inventions of hand-held devices, such as digital camcorders and cell phones with video capturing adequacies, has facilitated conventional users to capture high-quality videos. The procurable video quality using small hand-held devices is fundamentally affected by the transience of the user's hands; therefore, without any correction, the acquired video will definitely display enough tweaks and flicks. [8].

Figure 1.1: Left: Professional videos are often captured by expensive equipment's

Right: Digital video stabilization improves video quality captured by hand-held devices. (Cell-phones, DVs, tablets)

Whether the ejection of redundant camera tremors is a fundamental element to be considered. The video imagery can be refined as an array of still images, where each and every frame is processed separately. However, the implementation of existing temporal redundancy by means of multi-frame processing let us to generate more effective algorithms, such as Digital Video Stabilization. Hence digital video stabilization is becoming an indispensable technique in reconstructing the design of these mobile cameras with due concern Stabilization tends to become an impeccable video processing technique which can integrate the overall quality of input video stream that can be further achieved by synthesizing a new stabilized video sequence; by estimating and removing the undesired inter frame motion present between the successive frames. [15].

Now inspecting the efficient techniques with the means of stabilizing video which can be done by two kinds of video stabilization approaches, one is hardware assisted and other one is digital image processing approaches. [18]. In hardware stabilization approach which can be further classified as Mechanical or Optical stabilization, the mechanical stabilizer uses gyroscopic sensor to counterbalance entire camera, whether in optical stabilization some optical system gets activated to adjust camera motion sensors. This intensive approach is really expensive and also it has several limitations to process different kind of motions simultaneously.

Whereas the leading software based stabilization is very much cost-effective and it depend exclusively on image processing techniques, which perfectly avoids the cost of mechanical approach. The efficient software solutions generally depends on the estimation of the global motion between respective frames so that the relative opposite motion can be applied to counteract image tweaks and shakes for getting realigned frames. So the purposeful estimation of the global motion vector is one of the vital part of the system as this vector is capable to correctly describe the amount of undesirable motion between the respective frames.

Figure 1.2: A general pipeline for video stabilization.

Here above the general pipelining model for digital video Stabilization which is composed of three continuous techniques as above already discussed: local motion estimation, global motion estimation followed by motion correction and image motion compensation. Among them the global motion estimation followed by motion correction is most important as its incisiveness and instantaneity directly affects the particular outcome of stabilization. [13]. There are several algorithms proposed by different researchers for stabilizing videos which are taken under different environment from different camera systems by modifying these above three stages. [21]. Here after the prior processing of original video images which are distributed into small blocks, the size of small sub blocks depicts the evaluation average and preciseness of projection. Also if the sub-block size is very small, the content of info into sub-block is also very small to evaluate the global vector exactly. Whereas if the sub-block size is large enough, the sub-blocks counts is also less, and preciseness of global vector calculation also get reduced. So it's really vital to choose an apt size for small sub-blocks. The info content, size of sub-blocks and the count of sub-blocks is really needed as the important considerations at the time of sub-blocks division. Also after providing compensation amount in the edges, the sub-blocks are further correlated as a structured array. The main cause for providing compensation amount is due to the reason that when trembling occurs pixels which are surrounded by the image try to shift outside the image plane just after compensating motion, and a sudden empty undue area arrive along the borders of image. To get rid of this demerit, a compensation amount of area can be provided in the borders of images prior video stabilization, and the pixels amount in the compensation area will not be processed at the time of video stabilization. The compensation amount can be evaluated by the means of maximum threshold of estimated motion. In general, the compensation amount capture 10% to 15% size of the image along the border of image. [23]. So above introduction is all about the concept of Digital Video Stabilization and its emergence with the context of being reviewed with the help of several research papers regarding video stabilization approaches. We have gone through the structure of video stabilization technique and its other introductory part that DVS is a prolific technique used to reduce the impact of unintentional camera motion such as high frequency motions called jitters, tweaks, jiggle, and other unbalanced motions. These unexpected shakings reduce visual quality of videos and deteriorate the performance of subsequent processes such as video compression. This paper focuses on the stabilization approach by the means of proper motion estimation to implement video stabilization and computing Scatter Plot between cumulative sum of X and Y axis motion Vectors.

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In this paper performance comparison for Un-stabilized and Stabilized Video with the help of performance measurement using various criteria's like MSE, RMSE, PSNR and ITF has been performed efficiently.

II. THEORY

Among the several perpetual amenities of the video processing, there is an awful requirement to determine alterations between consecutive sequences of images in a video. Actually, it performs with demonstrating and estimating the motions of object and other several effects, such as illumination changes or camera motion. A sequence of video is composed of continuation of images. An image is composed of pixels and between two images, we can decompose the motion of any pixel into global and local motion. Mostly, global motion is concerned by the camera motion whereas local motion concerns with the motion of object. Local or object motion is the relative movement of several pixels or blocks in the frame but not all of the pixels of the image. With the relative motion estimation we can determine that for example:

- ✓ To understand the content of an image sequence (video analysis).
- ✓ To reduce temporal redundancy of video (video compression)
- ✓ To stabilize video by "removing" noisy global motion (video stabilization)

Here we will focus on estimating camera motion. Therefore in the following sections, the use of the term global motion refers to camera motion.

III. MOTION ESTMATION

Digital Video Stabilization includes Motion Estimation as one of the initial process. The key role of motion estimation is to reckon global motion vector from several local motion vectors. The current video frames can be neutralized by estimated global motion vector. The motion estimation plays a significant role in the whole stabilization process, as the effect of motion estimation directly determines the attribute of video compensation, for this induction, many innovations have been intended to obtain fast or precise motion vectors, such as block matching, direct optical flow estimation, edge pattern matching , bit-plane matching (BPM), representative point matching (RPM) ,etc. But here Block Based Method is used which comprises that each video frame is divided into four parts or small equal blocks according to size of video frame and then matching is done between previous frame and current frame on the behalf of exhaustive block matching search technique or full search method (FSA/EBMA). As shown below in fig:1.3 (FSA / EBMA) technique the small blocks are matched from top to bottom, left to right and this method allows to get best quality video with better PSNR for calculating Inter-frame fidelity (ITF). By the means of plotting PSNR and ITF the adaptability of block based technique for stabilizing a video sequence can be proved. Moreover FSA tends to be really precise, easier and specific in application but computational level is more as it calculates each and every pixel. [22]

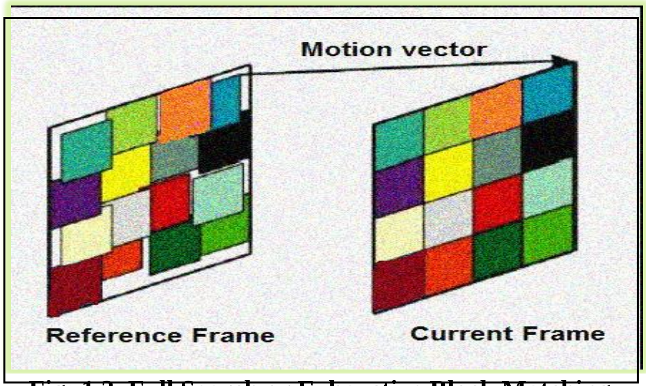

Fig: 1.3. Full Search or Exhaustive Block Matching Method.

Moreover motion estimation is the basic part of video stabilization because as better the motion estimation is done the results will be far better than expectations. We have divided the estimation of global motion vectors in several steps which has been described in the following sections.

IV. FULL IMAGE TO SUB IMAGE CONVERSION

Simple frame to frame matching technique is having one important drawback that it cannot provide precise results when the flow of the acquired scene become complicated, within the presence of ample moving objects. In these situations, the different and an accurate alignment shape of the curves, even between following frames, becomes very difficult to obtain. So to tackle this problem we divided the image frame into 4 sub images frame or small blocks and compare the performance with the process of full image stabilization. Considering an image of K rows and L columns, divided into 4 equal subsequent images with k rows and l columns each as shown in fig 1.4. There are two sample video taken by us, for video 1 there were 320 rows and 240 columns for one image with total of 248 images (no. of frames). On division 4 sub quadrants were obtained with 160 rows and 120 columns, and for video 2 there were 720 rows and 1280 columns for one image with total of 248 images (no. of frames). On division 4 sub quadrants were obtained with 360 rows and 640 columns.

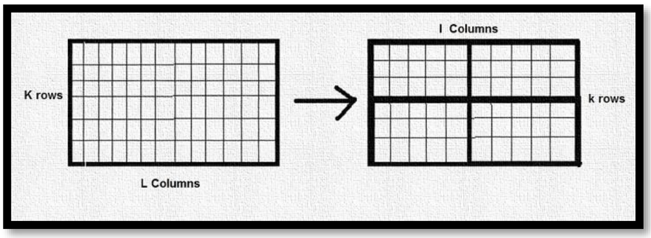

Fig: 1.4: Image to sub image conversion

V. SUB IMAGE SIGNATURE CURVE THEORY

Before revealing full approach, sub-image signatures are introduced; these are simply calculated by processing the rows and the columns of each subsequent image. General technique used to evaluate subsequent image signatures is termed as integral projections. Simply we can say that this method contributes in adding up the pixel values of each row and each column generating two characteristic curves for each subsequent image.

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The summation values can be normalized for avoiding too big values. Generally, given a frame F with k rows and l columns, two curves Tx and Ty are determined, according to the following equations (1) and (2):

$$T_x\,(j) = \frac{1}{k}\sum_{i=1}^{k} P(i,j), j = 1,2 \ldots l \qquad (1)$$

$$T_y\,(i) = \frac{1}{l}\sum_{j=1}^{l} P(i,j), j = 1,2 \ldots k \qquad (2)$$

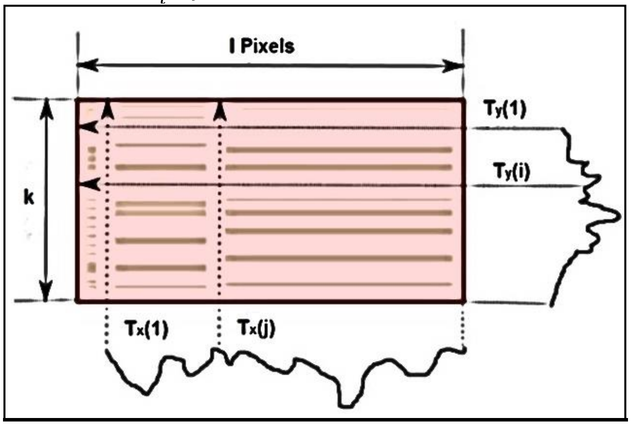

Fig: 1.5 Integral projection curves for T_x and T_y

The integral projections method allows estimating the local motion between two consecutive sub images by shifting their Tx-Ty values in order to find out the best alignment. According to this approach an area comprising 'l-2p' region is used to match between two following subsequent images, where 'l' is the length of integral projection vector and 'p' is number of elements excluded from the search region to fulfil matching feature of images. Sum of Absolute Differences between two following integral projection vectors can be simplified as in given equations.

$$U_x\,(a) = \sum_{j=1}^{l-p} |T_x\,(j+a) - T_{x\text{-}1}\,(a+j+p)|,$$
$$a = 0, 1\ldots\ldots (l\text{-}p) \qquad (3)$$

$$U_y\,(b) = \sum_{i=1}^{k-p} |T_y\,(i+b) - T_{y\text{-}1}\,(b+i+p)|$$
$$b = 0, 1\ldots\ldots (k\text{-}p) \qquad (4)$$

Here above U_x, U_y are the vectors of those elements which contains sum of absolute differences between two following subsequent images. The minimum value of U_x and U_y brings the absolute closeness between subsequent images, which can further estimate local motion vectors for all subsequent images.

$$H_x = \text{argmin}\,(U_x) \qquad (5)$$

$$H_y = \text{argmin}\,(U_y) \qquad (6)$$

VI. GLOBAL MOTION ESTIMATION

For any frame it depicts the movement of that frame relative to the consecutive movement of previous frame whereas a local motion vector shows the movement of corresponding sub image relative to the movement of sub image of previous frame. That's why global motion vectors are constituted from local motion vectors. Even though it's really important to remember the previous frame motion for including global motion vector from previous frame to calculate global motion vector for current frame. Whereas global Motion vector for any frame 't' can be computed by taking the median of all local motion vectors for that frame along with Global Motion vector for 't-1' frame as shown in equations 3 and 4. Here 'FG_x' and 'FG_y' represent global motion vector for 't-1' frame. The real benefit of taking median instead of mean is to gain more and more contribution from that sub image which is maximum displaced to attain motion vector estimation. For calculating global Motion vector from first and second frame global Motion from previous was taken '0' as reference. Global Motion vectors are denoted by 'GV' where subscripts are indicating horizontal or vertical directions.

$$GV_X = \text{median}\,\{FGx, H_{x1}, H_{x2}, H_{x3}, H_{x4}\} \qquad (7)$$

$$GV_y = \text{median}\,\{FGy, H_{x1}, H_{x2}, H_{x3}, H_{x4}\} \qquad (8)$$

VII. MOTION COMPENSATION

The main role of motion compensation is to hold some kind information of the estimated motion in order to form a stabilized sequence without removing the ego-motion of the camera. The motion compensation can be performed in several ways. One always uses two following frames from the input image sequence to evaluate the motion parameters, which can be said as frame-to-frame algorithm, and another one holds a reference image which is further used to get the motion between the reference and the current input image, which can be called as frame-to-reference algorithm. Although the most perpetual and vastly used technique is the frame to frame algorithms because in frame-to-reference algorithms the reference frame become obsolete quite fast, even when a mosaic is built it is used as reference. This is mainly due to the forward translations, when the reference becomes obsolete as soon as the current frame does not share enough overlap area with the reference frame.

VIII. SMOOTHED GLOBAL MOTION ESTIMATION

As already discussed Motion compensation is a really important and final step of image stabilization. Its role is to utilize estimated global motion vector and compensating the relative position difference between the two successive frames. Let 'X' and 'Y' are sets of all cumulatively added global motion vectors for x and y-directions where 'nof' is total no. of frames in video.

$$X = \{X1, X2, X3\ldots\ldots\ldots X_{nof}\} \qquad (9)$$

$$Y = \{Y1, Y2, Y3\ldots\ldots\ldots Y_{nof}\} \qquad (10)$$

$$SG'\,(X', Y') = \text{mean}\,\{SG(X, Y)\} \qquad (11)$$

Fig 1.6 shows the scatter plot diagram with X and Y vectors plotted along x and y axis. Motion shown by blue dots represents global motion along with unwanted or un-stabilized jittering motion. Undesired movement of camera makes the motion random and ambiguous, but in reality motion captured by camera should be smooth. Therefore we estimate the smoother motion by taking the mean as described below.

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Consider SG(X,Y) is a vector of dimension 'n' represent the points for all frames shown by blue dots in fig 1.6.Then Smoothed Global Motion vector SG'(X',Y') be a vector representing curve shown by red dots is estimated by as in equation 11.

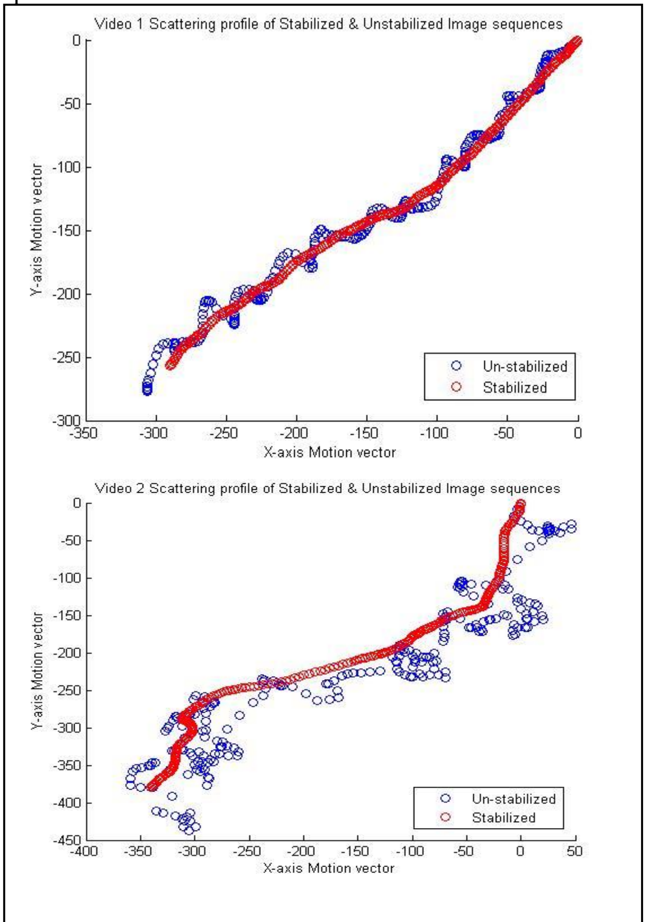

Fig: 1.6. Scatter Plot between cumulative sum of X and Y axis motion Vectors

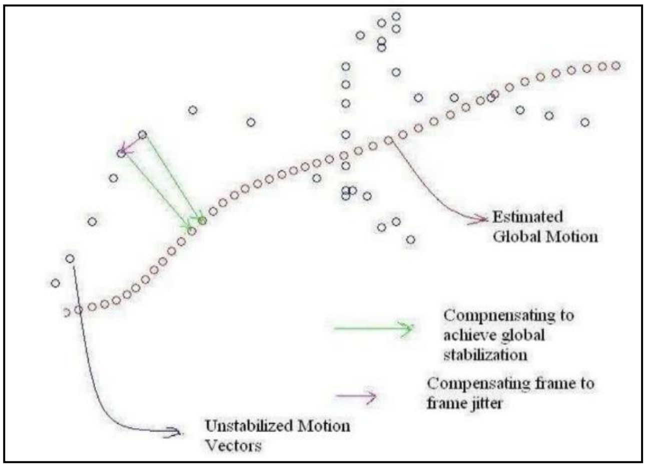

Fig: 1.7. Magnified view of Scatter Plot explaining frame to frame motion compensation.

IX. FRAME MOTION ESTIMATION

Here the motion compensation frame by frame is performed using SG' (X', Y') which is called "Global Smoothed Motion Vectors" or "Estimated Global Motion Vectors" which is explained in magnified view of fig 1.7.

In fig 1.7 curve represented by blue dots is depicting cumulative sum of all global motion vectors and curve represented by red dots is Smoothed Global Motion computed by taking mean of blue dots curve. Blue dots represent the cumulative sum of global motion vectors and red dots represents cumulative sum of estimated global motion vectors. Whereas the difference between Un-stabilized and Smoothed or Estimated motion vectors gives motion Vectors free from sudden or undesired movements, then subtracting the Global Motion Vector computed in Section 2.3 gives from these gives overall stabilized frames as shown in equation in 12 where G, G' and GV denote Cumulative global motion vector, Estimated or smoothed motion vector and Global motion vector for frame't'.

Therefore Frame Motion Vector is given by

$$FM\ (t) = G\ (t) - G'\ (t) - GV\ (t) \qquad (12)$$

Also if FM(X, Y) represents an Un-stabilized frame where 'X' and 'Y' are coordinates for frame't-1'. Then Stabilized frame't' is given by

$$FM(X, Y) => F\ \{(X+x), (Y+y)\} \qquad (13)$$

Here 'x' and 'y' being finally computed Frame Motion Vector (FM). In this way we compensate all frames to get sequence of stabilized frames.

X. SIMULATION RESULTS AND DISCUSSION

Performance is evaluated on the basis of several factors which are described as follows:

A. Mean Square Error (MSE)

It's a measure of the total average departure of each pixel from the desired stabilized consequence. It can be represented as follows:

$$MSE = \frac{\sum [\sum_{i=1}^{k} \sum_{j=1}^{l} \{x(i,j) - y(i,j)\}^2]}{E * F} \qquad (12)$$

Where x (i, j) and y (i, j) represents particular pixel values at the following location, no. of rows are k and columns, E and F are normalization constants.

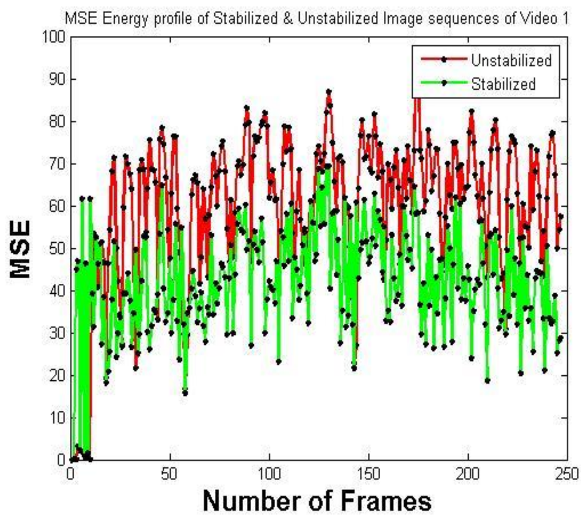

Fig: 1.8.1. Performance Comparison for Un-stabilized and Stabilized Video

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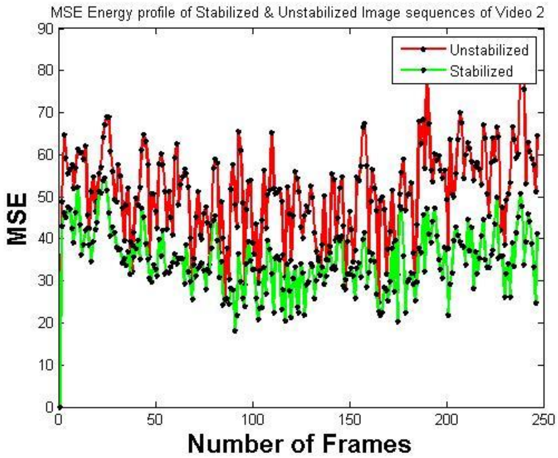

Fig: 1.8.2. Performance Comparison for Un-stabilized and Stabilized Video

Figure 1.8.1 and figure 1.8.2 for video 1 and video 2 respectively is showing performance based on MSE values for the following frames from stabilized and un-stabilized video. The red curve represents MSE for un-stabilized video sequence whereas green curve represents stabilized video sequence. Mean values for stabilized video are much lower than the mean values for un-stabilized video in both graphs which depicts considerable improvement in results as expected theoretically.

B. Root Mean Square Error (RMSE)

It simply depicts the differences between the stabilized and un- stabilized video sequence which can collectively estimate the magnitude of errors corresponding to the reference frame and processed frames. It serves an awesome contribution of accuracy and preciseness.

$$\mathrm{RMSE} = \sqrt[2]{\frac{\sum\left[\sum_{i=1}^{k}\sum_{j=1}^{l}\{x(i,j)-y(i,j)\}^{2}\right]}{E*F}} \qquad (15)$$

In above equation x (i, j) and y (i, j) represents corresponding pixel values at the following location, where no. of rows are k and columns l , E and F are normalization constants.

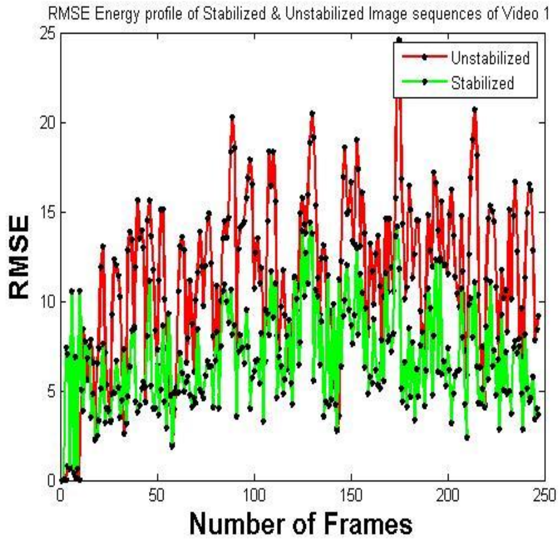

Fig: 1.9.1. Performance Comparison for Un-stabilized and Stabilized Video

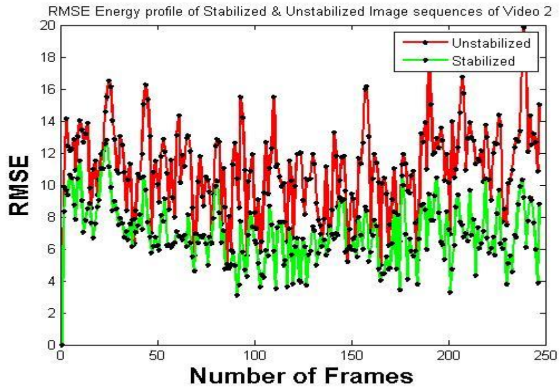

Fig: 1.9.2. Performance Comparison for Un-stabilized and Stabilized Video

The figure1.9.1 for video 1 and figure 1.9.2 for video 2 respectively shown above is depicting the performance based on RMSE values for the following frames from stabilized and un-stabilized video. The red curve represents RMSE for un-stabilized video sequence whereas green curve represents stabilized video sequence .Root Mean values for stabilized video sequence are much lower than un-stabilized video in both graphs which confirms desired improvement in results as expected. Smaller mean for the stabilized video sequence brings more accuracy and preciseness in stabilization process.

C. Peak Signal to Noise Ratio (PSNR)

It represents the conjecture of one's perception for refurbishing video quality because higher PSNR indicates that refurbishing a video sequence is of good quality and better precision. Hence the exactness of a video stabilization process is calculated by the means of peak signal-to-noise ratio between stabilized frames. So between consecutive frames it can be defined as:

$$\mathrm{PSNR}\,(W_i, W_{i+1}) = 10\log_{10}\frac{I^2 max}{MSE(Wi,Wi+1)} \qquad (16)$$

Where W_i denotes any frame 'i' and I_{max} is the maximum intensity corresponding to the pixel. Peak signal to noise ratio represents an alliance between desired throughput and residual image with respects to their powers. As defined above, the greater PSNR between two corresponding frames; better is the exactness of technique.

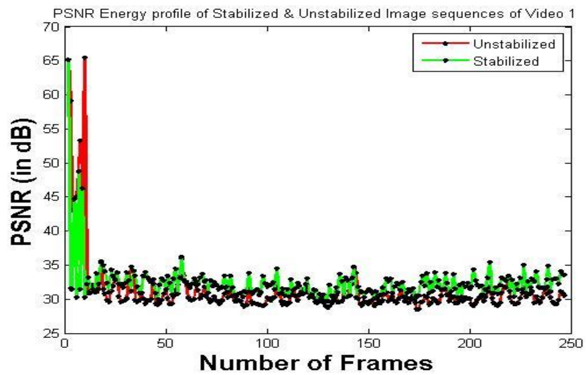

Fig: 1.10.1. Performance Comparison for Un-stabilized and Stabilized Video

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International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-5 Issue-6, August 2016

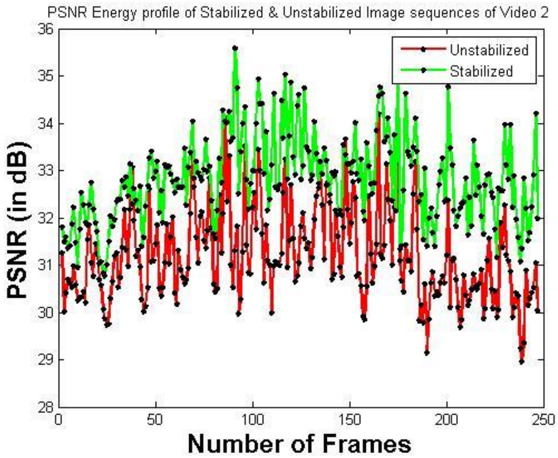

Fig: 1.10.2. Performance Comparison for Un-stabilized and Stabilized Video

The figure1.10.1 for video 1 and figure 1.10.2 for video 2 respectively shown above is depicting the PSNR of the un-stabilized and stabilized video sequence where the bottom curve which is denoted by red color is for un- stabilized video sequence and the above curve which is denoted by green color is the PSNR of stabilized video sequence and both are between two consecutive stabilized frames. And as per the figure shown below obviously the above curve is higher than bottom one in both graphs, which demonstrates clearly that this technique is effectual for video stabilization process.

D. Inter-frame Transformation Fidelity (ITF)

It's a measure of precision and constancy between successive frames, or we ca say PSNR between two following stabilized video frames. Mostly the stabilized sequence gives a higher value of ITF than the un-stabilized video sequence. It can be evaluated by the given equation 17 and also the given table 1 depicts evaluated values for un-stabilized and stabilized video sequence. As higher the value of ITF for stabilized video sequence than the un-stabilized video brings better precision and exactness for stabilized video between its succeeding frames. Here nof represent number of frames and PSNR W_i denotes its value at any frame 'i' and further consecutive frames.

$$ITF = \frac{\sum_{i=1}^{nof} .PSNR\ (W_i, W_{i+1})}{nof - 1} \qquad (17)$$

TABLE I

TYPE	Inter Frame Transform Fidelity (ITF)	Inter Frame Transform Fidelity (ITF)
	Video 1	Video 2
Un-Stabilized	31.0350 dB	31.0329
Stabilized	32.1834 dB	32.6629

TABLE II. COMPARISON RESULTS

Video Quality	Un-Stabilized	Stabilized	Un-Stabilized	Stabilized
Parameter	Video 1	Video 1	Video 2	Video 2
Accuracy	Poor	Good	Poor	Very Good
Scatter Plot Approximation	Random	Linear	Randomly Distributed	Linear
Mean Square Error Estimation	Much	Less	More	Very Less
Root Mean Square Error Estimation	Much	Less	More	Very Less
Peak Signal-to-Noise Ratio Estimation	Less	Much	Less	Effectively very Much
Inter Frame Transform Fidelity (ITF)	Less	Better	Less	Much Better

XI. DISCUSSION

In the above digital video stabilization the purposeful evaluation of global motion vectors followed by the estimation of local motion vectors leads to success in full video stabilization. After effective simulation of achieved motion vectors portray a stabilized sequence which is further implemented with the help of various parameters such as MSE, RMSE, PSNR, and ITF. The overall consequences obtained by the pre-processing of the two reference videos taken here for stabilization process possess a scenario of preciseness and certifies a better stabilization approach with the ease of refined results in each case. Further implementation of this approach in stabilizing higher quality videos is a real challenge which can be sorted out to a great extent by this approach of stabilization. Here above we have taken two videos with 248 frames and 240x320 and 720x1280 resolution each. After stabilizing each video with our approach leads better PSNR values in both cases, even in the case of video 2 very good result is obtained for RMSE and PSNR off-set values which clearly depicts the efficacy of our approach up-to a great extent. Moreover in this state of stabilization approach the area of compensation is also reduced up-to 5 % to 10 % which is itself a great achievement in the clarity of stabilized video.

XII. CONCLUSION

In this paper we have used conventional integral projection and sum of absolute difference method followed by Sub image conversion of full image to calculate local motion vectors. After that we further calculated global motion vectors and compensated the global motion by estimating the smoother curve instead of curve obtained due to undesired motion of camera. Then we have evaluated final motion vectors. For the need of performance measurement criteria Scatter Plot between cumulative sum of X and Y axis motion Vectors are used which determines the throughput following with the theoretical aspects. Hence a new approach for the estimation of global motion between frames has been implemented. The solutions can be implemented in a system for video-stabilization considering in handheld devices.

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Experimental results show the precision of our algorithm. Hardware and software development are making efficient video stabilization techniques affordable for an ever-increasing range of network cameras. This technique not only secures smooth, comfortable video monitoring in real time but it can also enhance image re-usability, improves camera operability which makes installation more flexible and, finally, improves the overall cost efficiency of a network camera surveillance system.

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