Review of Video Stabilization Techniques

Prof. Asmita Deshmukh
HOD,Assistant Professor, KCCOE, Thane.

Ms. Patil Sampada Dattatrey
ME Scholar, Dept. of Computer Engg, SLRTCE, Mira Road

Abstract: The paper discusses varied techniques used for video stabilization. Video stabilization is a vital technique within the present day. With the introduction of the video camera as associate degree integrated a part of mobile instrumentality creates the necessity for video stabilization'

.***Keywords :*** *Stabilization, Motion Estimation.*

*****

I. INTRODUCTION

Recently, the market of hand-held camera has increased speedily. Video capturing by non-professional user unremarkably can result in unexpected effects. Putting of the system plays a crucial role, particularly to the output video. If the camera is placed in someone's hand or on moving object (car, tank etc.) then the ensuing video stream is of terribly poor quality. Associate best answer is to put the camera on the stable holder, however if the peak of the holder is simply too massive, the camera are going to be exposed to the influences of the encircling i.e. wind, waves of the ocean etc. The unwanted motions can disturb the perception of captured scene. Therefore, video stabilization become important and should be enforced to enhance the frame look quality of the hand-held mobile devices. The goal of video stabilization is to get rid of annoying shaky motion from a video sequence [1]. However, it plays a crucial role in several applications, like video compression, satellite imaging, video writing, background estimation, and moving objects detection. It's additionally essential for information fusion tasks in medical imaging.

II. TECHNIQUES FOR VIDEO STABILIZATION

Video Stabilization techniques are broadly divided into three categories [3] –

1. Mechanical Video stabilization
2. Optical Video Stabilization
3. Digital Video Stabilization

These techniques are discussed below.

1. Mechanical Video stabilization

Mechanical stabilization could be a quite video stabilization methodology wherever stabilization is realized automatically. That is, mechanical equipments area unit wont to estimate and proper unintentional motions to get stabilized video.

In mechanical stabilization, motion is calculable by motion sensors. Counting on the applying, kind and range of used motion sensors might amendment. as an example, if camera is exposed to motions solely within the x direction, it's enough to use only one motion sensing

In mechanical stabilization, camera movements area unit obtained by measurement the acceleration or speed of the camera and manipulating a series of mathematical operations over these information. Acceleration and speed area unit measured by accelerometers and gyros severally that area unit the foremost usually used mechanical phenomenon motion sensors for not solely stabilization systems however additionally guidance systems, automotives, etc.

Accelerometer could be a quite motion sensing element that live the linear acceleration in x , y and z directions. to get linear movements of the camera, acceleration information should be regenerate into displacement information. Accelerometers live the acceleration solely in one preset direction that is mostly indicated on the measuring instrument. If it's placed on x axis, acceleration on the x axis is obtained. Therefore, the amount of measuring instrument during a system depends on the amount of needed acceleration information in several directions.

Gyro could be a quite sensing element that measures the angular speed in roll, pitch and yaw directions. Since speed is that the computation of displacement, displacement is obtained by taking one integration over the speed.

In mechanical video stabilization, it's aimed to stay the position of the camera stable with reference to its reference position. Therefore, all the calculable movements to that camera is exposed area unit taken as unintentional motions. Since stabilization is to get rid of solely unintentional motions, there's no have to be compelled to have motion correction half in mechanical stabilization

2. Optical Video Stabilization

The Optical Image Stabilization (OIS) system, in contrast to the DIS system, manipulates the image before it gets to the CCD. once the lens moves, the light rays from the subject are bent relative to the optical axis, leading to associate unsteady image as a result of the light rays are deflected. By shifting the IS lens cluster on a plane perpendicular to the optical axis to counter the degree of image vibration, the light rays reaching the image plane is steady . Since image vibration happens in each horizontal and vertical directions, 2 vibration-detecting sensors for yaw and pitch arewont to find the angle and speed of movement then the mechanism moves the IS lens cluster horizontally and vertically therefore counteracting the image vibration and maintaining the stable image [3].

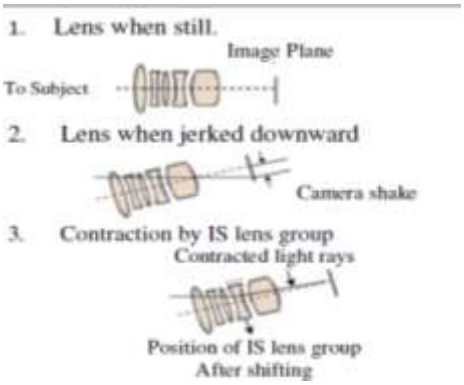

Figure 1 : Optical Video Stabilization [2]

The Shift-IS component is located within the lens groups and is most effective for lower frequency movements caused by platform vibration or wind effect without increasing the overall size and weight of the master lens. Figure 1 shows an illustration of this type of image stabilization

3. Digital Video Stabilization

Digital video stabilization technique takes account of motion estimation and motion smoothing. But, this systemdepends on motion estimation that is heart of any digital video stabilization. higher the motion estimation performed higher are the results [5].

Various motion estimation approaches are employed in the video stabilization algorithms. It includes direct technique and have extraction technique. Direct approaches calculate frame alignment considering image intensity values.

1. Direct Methods

Due to its a lot of correct and sturdy performance direct strategies are preferred over feature based mostly strategies for motion estimation. Direct strategies are classified as:

1. Phase Correlation Method And Its Extension To Subpixel Registration
2. Block Based Method

Phase Correlation technique And Its Extension To Subpixel Registration Subpixel registration is predicated on interpolation approach. Though there are subpixel registration that are supported non-interpolation approach .The extension to section correlation lies in interpolation approach. The principle of operation of this technique is fourier shift rework. The fourier two pictures between two frames are computed. The shift in abstraction domain is nothing however section distinction of frequency domain of fourier transform of that two pictures. section correlation is then obtained by taking inverse fourier transform.

Block based approach divides each frame of video sequence into 16*16 blocks called macroblock and then macroblock of current frame is compared with that macroblock of previous frame to calculate motion vectors.The matching between macroblock of current and previous frame is done on the basis of block matching criteria.Lesser the value of matching criterion better is the match between macroblock.

2. Feature Based Motion Estimation

In Feature based motion estimation, searching of points is not done over all pixel points. But, specific points called feature points are extracted using SIFT(Scale Invariant Fourier Transform). But, the usual method have lack of robustness that it gives no feature points in moving things. Also feature points may have different Depth of Field.The first disadvantage can be tackled by using RANSAC and other one by using SFM (Structure From Motion). But, RANSAC too has disadvantage that it fails when object is moving slow.This problem can also be tackled by weighting the feature points and using weighted least square algorithm.[5].

III. COMPARISON

Three different categories of video stabilization is discussed in this paper. Image correction is the third and final step in video stabilization. Realization of image correction may change with respect to the video stabilization methods. That is, if mechanical or optical video stabilization is considered, image correction is realized by motors and a kind of mechanical structure. But,

in digital video stabilization, image correction is realized only by software. Therefore, digital video stabilization is the most cost effective among all methods.

REFERENCES

[1] Hany Farid and Jeffrey B. Woodward, " Video stabilization & Enhancement" TR2007- 605, Dartmouth College, Computer Science, 1997.

[2] Canon Digisuper 100xs, Product Manual, [online] URL http:// www.canon.com/bctvproducts/pdf/1 00xs.pdf [Accesses 20 May 2009]

[3] Paresh Rawat and Jyoti Singhai, "Review of Motion Estimation and Video Stabilization techniques for hand held mobile video" signal & Image Processing , SIPIJ, June 2011.

[4] G. Pang and H. Liu, "Evaluation of a Low-cost MEMS Accelerometer for Distance Measurement", Journal of Intelligent and Robotic Systems archive, vol. 30 , iss. 3, pp. 249 – 265, March 2001

[5] Ajay P. Jagtap and Prakash V. Baviskar, "Review OF Block Based Video Stabilization", International Advanced Research Journal in Science, Engineering and Technology Vol. 2, Issue 4, April 2015