

Chapter 20

An Efficient System for Video Stabilization by Differentiating between Intentional and Un-Intentional Jitters

Kamran Manzoor

University of Engineering and Technology, Pakistan

Umar Manzoor

The University of Salford, UK

Samia Nefti

The University of Salford, UK

ABSTRACT

Video stabilization is one of the most important enhancements where jittering caused by un-intentional movements is removed. Existing video stabilizer software and tools cannot differentiate between intentional and un-intentional jitters in the video and treats both equally. In this paper, the authors propose an efficient and practical approach of video stabilization by differentiating between an intentional and un-intentional jitter. Their method takes jittered video as input, and differentiates between intentional and an un-intentional jitter without affecting its visual quality while producing stabilized video only if jitter is found to be un-intentional. While most previous methods produce stabilized videos with low resolution, this reduces quality. The proposed system has been evaluated on a large number of real life videos and results promise to support the implementation of the solution.

INTRODUCTION

In the current modern world, video enhancement is steadily gaining importance because of the increasing dominance of digital media. One of the most important enhancements is video stabilization in

which jitters caused by un-intentional movements are removed. Today we are in the world where mobile phones are in the access of almost every person. Even a layman has his personal cell phone and video cameras are becoming an integrated part of mobile phones. Almost every cell phone has a video camera integrated on it. Due to the lack of stability in human anatomy, the video filmed

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by cell phone camera will naturally be a jittered video. For example, if a person is making video from his mobile camera in a moving car or if he is running then the corresponding video will be a jittered video due to unstable platform (his hand). Video stabilization is not only required for mobile equipment but has very vast applications like video cameras mounted on the vehicles in motion (as in the case of small unmanned aerial vehicles) experience severe jitters due to different hurdles or wind pressure. The corresponding videos taken from these cameras will be shaky and have to be preprocessed before analysis. So an efficient video stabilization system is required which can produce good quality stabilized videos and should be cheap in the context memory usage and processing power.

A major problem of current software video stabilizers is that they cannot differentiate between an intentional and an un-intentional jitter in the video. Therefore, they treat both the intentional and the un-intentional jitters equally. Another major problem is of missing image areas that appear in compensating the jittered frames. Many methods had been proposed to tackle this problem like one proposed method was to trim the video frames but this approach is not good as it reduces the original video resolution.

In this paper, we propose an efficient and practical approach of video stabilization that produces stabilized videos by compensating the loss of information in the jittered video frames. Most previous methods produces stabilized videos but with low resolution thus reduces quality of the video sequence, our method without affecting the quality of the video can produce full-frame stabilized video by *temporally* filling missing frame parts. The method works by gathering required missing information from the neighboring frames and then locally aligning it to complete the lost information in the jittered frame. In addition our system can also differentiate between an intentional and an un-intentional jitter so that only the un-intentional jitters can be operated.

Experimental results are included from real life situations and result shows the efficiency of the proposed system.

The proposed algorithm can be used in real time applications, due to the low memory usage and low computational complexity. To achieve full frame video stabilization with compensation to the lost information in the jittered frame, rudimentary replication is proposed and background segregation is proposed to differentiate between an intentional and an un-intentional jitter. These techniques are explained in the coming sections.

BACKGROUND

In the last decade, many methods for video stabilization have been proposed. There are three types of image stabilizers currently available (Robert, n.d.): Digital Image Stabilization (DIS), Optical Image Stabilization (OIS), and Mechanical Image Stabilization (MIS). Digital Image Stabilization (DIS) systems controls image stability by using electronic processing. But this system is not efficient because if there is a large motion of object in any frame then the system becomes fool in believing it as camera vibration so attempt to stabilize it and thus cause blurring and distorts picture quality.

The Optical Image Stabilization (OIS) system, manipulates the image before it gets to the Charge Coupled Device (CCD), unlike to the above explained Digital Image Stabilization (DIS) system, where image first hits the CCD. But this system makes the lens very complex and very susceptible to damage (Canon Digisuper 100xs, n.d.).

Mechanical Image Stabilization (MIS) not just stabilizing the image but involves stabilizing the entire camera. A device called “Gyros” is used in this type of stabilization (iMultimedia, n.d.; Kimura, 1985). But they are not suitable for energy sensitive imaging applications because they are heavy and consume more power.

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