DESIGN OF STEREOSCOPIC CAMERA AND CHANNEL ENCODING USING WAVELET TRANSFORM

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Abstract: With the growing demand for 3D video, efforts are underway to incorporate it in the next generation of broadcast and streaming applications and standards. Several 3D video sequence are encoded and transmitted simultaneously. In stereo video encoding/streaming, best rate allocation between views can be addressed by reduction of the spatial resolution, frame rate, and/or quantization parameter. We first propose a motion compensation scheme. The proposed scheme does adaptive bit allocation between views to obtain high compression efficiency and better quality. Experimental results show that the proposed framework higher perceived quality in each video as compared with the existing system.

Keywords: Motion compensation (MC), Three dimension (3D), Rate Distortion (RD), Group Of Pictures (GOP)


1 Introduction

Several metrics have been proposed in literature to assess the quality of 2D images, but the metrics devoted to quality assessment of stereoscopic images are very scarce. Therefore, in this project, an objective assessment method is proposed to predict the quality level of stereoscopic images. This method assesses stereo images from the perspective of image quality and stereo sense. 3D video is foreseen to be the next natural step in the evolution of digital media. Among various representation formats available for 3D videos, stereoscopic is considered the most mature technology so far. The scalable format makes the rate control of each video as easy as bit-stream extraction. For the two views in stereo videos, the reference view is independently coded to provide backward compatibility, while the auxiliary view is coded using the reference view as a base layer to remove inter-view redundancy. Based on the well-known fact that the human visual system can compensate and conceal the degraded fidelity in one of the two views, provided the other view is encoded at a high quality. And the method is simple, rapid, convenient and practical. The channel bandwidth then can be allocated to different videos dynamically over time depending on the relative R-D behavior of each video.

II. Related Work

2.1 Linear Rate Model

Linear relationship between overhead information bitrate and number of non zero motion vectors. The bitrate of each encoder actually controlled, so that bandwidth is efficiently allocate between videos. After that the overall video quality get maximized. Method adopted in Linear rate model are 1.feedback approach 2. Lookahead approach. In feedback approach, coding representation of previous frame to predict the encoding of current frame. But in look ahead, preprocessing procedure is applied to future encoded video frame. Mostly look ahead is preferable.

2.2 Adaptive Streaming

It explains briefly about the art in 3D video format, coding methods and streaming architecture. Mostly IP is preferred because it is more flexible. The method adaptive streaming which is to optimize the received video quality by using Assymetric stereoscopic video coding. When the video is streamed, average transmission rate is used to determine available bandwidth.

2.3 Mixed Resolution Coding

It is to provide high compression ratio and to reduce the complexity. In MR, one of the view is low pass filtered and has a small amount of spatial details which is sampled with sampling grid represented by fewer pixels. By chroma sampling, picture is represented by fewer samples. Through quantization sample values of 2 videos are quantized with different step size. 2.4 Joint video/depth coding

Besides the adaptation of compression algorithms to the individual video and depth data, some of the block-level information, such as motion vectors, may be similar for both and thus can be shared. In addition, mechanisms used in scalable video coding can be applied, where a base layer was originally used for a lower quality version of the 2D video and a number of enhancement layers were used to provide
improved quality versions of the video. In the context of multiview coding, a reference view is encoded as the base layer. Adjacent views are first warped onto the position of the reference view and the residual between both is encoded in further enhancement layers.

III. Proposed Methodology

To broadcast the video sequence, compression is needed through which better quality is achieved. The video sequences are converted to frame. In that images, multi objects are chosen that are encoded by reducing the bitrates so that bandwidth get reduced. So quality is achieved easily. The output bitrate matches the allocated channel bandwidth.

3.1 Quality Assessment

By using this approach, the effect of the distortion of each reference view is not overemphasized by being considered more than once. In multi-view video coding, disparity compensated prediction exploits the correlation among different views. The efficiency of the prediction process has a direct impact on the overall quality. Hence, the disparity between frames of various views can provide a good estimate for the overall perceived quality.

3.2 Motion Compensation Algorithm

In MC based compression, if we considered that single video contains 30 frames. The first frame is encoded which is considered to be lossless. Motion details of all frames are noted from 2 to 29. After find the motion details fedup on the first frame. So we can calculate the total motion details. Bits are generated at the motion place by comparing corresponding bits and the input bits small bits are generated. MC prediction is performed by following steps:

1. Compute motion vectors (correlation between pixels using the decoded block)
2. Do variable length coding to it
3. Transmit the result with the encoded data stream as its completing part

3.2.1 MC Prediction

In forward direction
\[ S(x, y) = s(x + FMVx(x, y); y + FMVy(x, y)) \]

In backward direction
\[ S(x, y) = s(x + BMVx(x, y); y + BMVy(x, y)) \]

IV. Experimental Results

To assess the performance of the proposed system, we carried out a number of experiments with 4 stereo videos, namely “Street,” “Fountain,” “Lake” and “Rollerskate,” in the system for joint rate allocation. The resolution of each view is 640 × 480 and screenshots of the four stereo videos. The proposed algorithm was implemented on JPG but the software has been modified such that the auxiliary layer is only predicted from the base layer of the reference view in order to avoid drift. The bitstream extraction and decoding process of JPG have also been modified. The decoder creates two separate reconstruction videos for the two views of each stereo video. The videos are coded on GOP basis with a GOP size. The joint bit allocation is updated at GOP boundaries. The minimum guaranteed channel bandwidth is set to 5MB/s in the experiments. We tested the proposed algorithm under two channel bandwidths of 20MB/s and 40MB/s, respectively. To evaluate the performance, we recorded both PSNRs of the two views and also computed a perceived PSNR based on the quality metric. However, the metric in does not consider the JNT.

V. Conclusion

A MC based compression coding scheme that inherited some of the features was proposed in this section. The reference view of stereo video was independently coded to provide backward compatibility, while the auxiliary view was coded using the reference view as a base layer to remove interview redundancy. The scalable format made the rate control of each video as easy as bitstream truncation. For broadcast applications with multiple stereo videos, the minimum video quality fluctuation should be achieved when switching from one video program to another. Targeting for this purpose, a joint bit allocation scheme was proposed to dynamically distribute channel bandwidth among stereo videos. Experimental results have shown that the proposed scheme achieve higher perceived quality in each video and smaller quality variation among all videos.

References


