Quality modeling for 6DoF immersive video

I. Motivation

Recently, 6DoF (Six Degrees of Freedom) immersive video streaming become more popular. Reducing bandwidth and maintaining high view quality is a bottleneck of 6DoF real-time streaming. MPEG (Moving Picture Expert Group) developed a standard called MPEG Immersive Video (MIV) for 6DoF video compression [8]. The Test Model for Immersive Video (TMIV), the implementation refers to MIV, provide a integrated pipeline for encoding, decoding and rendering. It is a challenging work to adapt the performance by adjusting the TMIV parameters. We are going to design a quality model to predict performance of 6DoF immersive video in common situation.

II. Problem statement

Because of the limitation of bandwidth, performing the best quality by adaptive quality model for 6DoF immersive video is a quite a challenging work. There are many existed rate control algorithms for video compression [1] [2] [3]. Based on the existed rate control algorithms, it is possible to optimize those models to predict the 6DoF video performance. Although, there are still many effects that could impact the 6DoF video quality, e.g., tile sizes [4], camera placements, complexity of scenes [5], number of groups, synthesizer and quantization parameter. The model will design in empirical way and aim on some vital TMIV parameters. The main goal of this model is generate a relevance between TMIV parameters and quality metrics, e.g., PSRN, SSIM and VMAF. Once the model generate, it is possible to use on estimate the 6DoF immersive video performance in different camera placements and also use on real-time 6DoF streaming.

III. Relate work

A. 360° Video

B. Performance

Yangang Cai [6] compressed the depth map by AVC, HEVC, and AVS3. Their results show that using AVS3 encoder to compress depth map can provide better the virtual view performance and less bitrate. Basel Salahieh [5] evaluate the performance on object-based solution. Their results show the pixel rate saving and bitrate distortion in object-based situation. Xavier Corbillon [7] implemented a 6DoF VR application with multi-camera system and analysis two extreme optimal algorithms. Their results show that tiling is able to improve the service performance and the high cost for the proactive optimizing strategies By the previous experiments, both 6DoF video quality and bitrate have negative correlation with QP.

References

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I wrote a R-D paper around 2008. Check my CV. It is a journal paper.

① Google a bit to see if you can understand what is R-D modeling. Discuss with me if you can not.

① I'm not sure if ~~quality~~ performance should be covered here. To me, your term project is about quality modeling. Maybe discussing

- ① 2D video { Quality model, Bitrate
- ② 360° video { Quality model, Bitrate
- ③ Synthesized video { Quality, Bitrate } model

would work better?

③ I encourage you to reuse the ICME testbed, procedure, results writeup here. I will work on revising them, both for ICME submission and for your final report.

Let me know if you have any concerns.