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Rate Control Schemes for Panoramic Video Coding

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Abstract

The popularity of multi-view panoramic video has been considerably increased for producing Virtual Reality (VR) content, due to its immersive visual experience. We argue in this paper that PSNR is less effective in assessing objective visual quality of compressed panoramic video than Sphere-based PSNR (S-PNSR), in which sphere-to-plain mapping of panoramic videos is considered. We also argue that S-PSNR is less effective in assessing perceptual visual quality compared with Perceptual PSNR (P-PSNR), which considers the front-center-bias prior of human viewing direction. The conventional Rate Control (RC) schemes of 2-Dimensional (2D) video coding are optimized on PSNR, and thus they are not suitable for panoramic video coding. To optimize S-PSNR and P-PSNR, two novel RC schemes are proposed for panoramic video coding. In particular, we develop objective and perceptual RC formulations, corresponding to optimization on S-PSNR and P-PSNR, respectively. Then, solutions to these two fomulations are provided, such that bits can be allocated to each coding block for achieving optimal S-PSNR or P-PSNR in panoramic video coding. Finally, the experiment results validate the effectiveness of the proposed RC schemes in improving S-PSNR and P-PSNR of panoramic video coding.

Keywords: Virtual reality, panoramic video, rate control, video coding

1. Introduction

Panoramic videos, as a form of Virtual Reality (VR) content, offer 360-degree viewing direction when playing videos. Recently, panoramic video has been increasingly popular due to its immersive visual experience. On the other hand, high resolution (4K or beyond) is required in panoramic

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