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Pre-/Post-processing to Improve the Coding Performance of Multiview Plus Depth Map

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Abstract — *This paper presents pre- and post-processing schemes to improve the coding performance of a multiview plus depth map (MVD) system, which is one of the key frameworks for next-generation 3D video systems. In previous work, depth maps have been considered as a different type of video, and a conventional coding scheme is simply applied. The scheme proposed here instead focuses on the unique properties of depth maps and utilizes them to improve the coding performance of MVD systems. In detail, the pre-processing stage selectively filters the input depth map to reduce the bit-rate cost while minimizing quality degradation, and the post-processing restores the reconstructed depth map as much as possible. Additionally, we propose an optimal filter parameter selection scheme obtained using a theoretic and experimental analysis of the rate-distortion relationship. The experiments show that the proposed approach improves the performance of an MVD system.*

Keywords: Multi-view plus depth, 3D video, Depth map, Video coding, Pre-processing, Post-processing.

1. INTRODUCTION

Nowadays, many video system technologies are being developed to present more realistic scenes to viewers. One group of approaches increases the fidelity of the scene by increasing the resolution or bit-depth, such as 4K and 8K ultra-high-definition (UHD) and high-dynamic-range (HDR) resolutions. Another group of approaches increases the number of viewpoints, using technologies such as stereoscopic, multi-view, and light-field images. Multiple viewpoints can present a three-dimensional (3D) effect to viewer, so these systems are called 3D video systems, and they have become popular for next generation video systems.

Stereoscopy, which uses two offset images, is the simplest technology that provides perceptional depth in space. However, it is technically limited because it can only provide fixed-viewpoint images to viewers. To overcome this limitation, multi-view systems, which can provide multiple viewpoint images, have been introduced. Owing to the high number of views, more realistic scenes can be delivered, but the huge data size leads to many technical issues, such as for compression, transmission, and multi-view adjustments. Therefore, during the last dozen years, multi-view plus depth map (MVD) systems, which drastically reduce the source