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ETSIP045 - Quality Assessment of Stereoscopic 3D Image Compression by Binocular Integration Behaviors

Abstract— The objective approaches of 3D image quality assessment play a key role for the development of compression standards and various 3D multimedia applications. The quality assessment of 3D images faces more new challenges, such as asymmetric stereo compression, depth perception, and virtual view synthesis, than its 2D counterparts. In addition, the widely used 2D image quality metrics (e.g., PSNR and SSIM) cannot be directly applied to deal with these newly introduced challenges. This statement can be verified by the low correlation between the computed objective measures and the subjectively measured mean opinion scores (MOSs), when 3D images are the tested targets. In order to meet these newly introduced challenges, in this paper, besides traditional 2D image metrics, the binocular integration behaviors—the binocular combination and the binocular frequency integration, are utilized as the bases for measuring the quality of stereoscopic 3D images. The effectiveness of the proposed metrics is

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verified by conducting subjective evaluations on publicly available stereoscopic image databases. Experimental results show that significant consistency could be reached between the measured MOS and the proposed metrics, in which the correlation coefficient between them can go up to 0.88. Furthermore, we found that the proposed metrics can also address the quality assessment of the synthesized color-plus depth 3D images well. Therefore, it is our belief that the binocular integration behaviors are important factors in the development of objective quality assessment for 3D images.

Index Terms—Stereo 3D image, HEVC, color plus depth 3D images, binocular frequency integration, PSNR, SSIM, MS-SSIM, VIF, VSNR, WSNR, UQI, frequency integrated metric (FI-metric), quality assessment, human visual system (HVS), stereopsis, binocular vision, ventral stream, dorsal stream