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Abstract: In the field of practical three-dimensional (3D) applications, blind measurement of the perceptual quality of distorted 3D images remains a challenging research topic. In this paper, we propose a completely blind 3D image quality measurement (IQM) metric that utilizes a binocular vision mechanism to better align with human perception. As its primary focus, this study is inspired by the visual processing in the primary visual cortex (V1) and the higher visual areas (V2) of binocular vision to facilitate blind 3D-IQM. Furthermore, the proposed metric does not require distorted samples or human subjective opinion scores for training. More specifically, the binocular quality-predictive features of areas V1 and V2 are first extracted from a corpus of pristine natural 3D images. Subsequently, a pristine multivariate Gaussian (MVG) model is trained from the extracted features. Finally, with the trained MVG model, the quality of distorted 3D images is measured using a Mahalanobis distance. Experimental results using two public benchmark 3D databases show that in comparison with current state-of-the-art IQM metrics, the proposed metric achieves excellent prediction performance.

Keywords—3D image quality measurement, binocular vision, completely blind, pristine multivariate Gaussian model.

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