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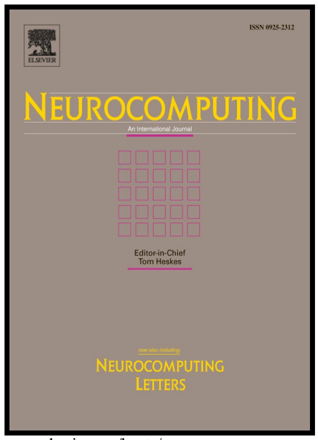

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A depth video processing algorithm based on cluster dependent and corner-ware filtering

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Abstract

In free viewpoint video system, color video and the associated depth video are utilized to synthesize arbitrary virtual viewpoint. Hence, high quality of depth video is a necessity for virtual view rendering. However, depth video estimated by depth estimate software is inconsistent and inaccurate which decreases the quality of virtual views. To solve the problem, a depth video processing algorithm is proposed in this paper. Firstly, depth video is divided into five clusters adaptively by Fuzzy C-means clustering method. Meanwhile, the edges of depth video are detected and expanded into 8×8 block-wise. Secondly, for pixels in non-edge regions of depth video, a cluster dependent filtering method is adopted according to the feature of each cluster. Finally, corners in corresponding texture video are detected. For pixels in edge regions of depth video, a corner-aware filtering method is used. Experimental results show that the proposed algorithm enhances the depth video and significantly improves the quality of the virtual views. The peak signal to noise ratio of virtual views rendered by using the proposed algorithm is 0.43 dB higher than that of the virtual views rendered by using the original depth video. The proposed algorithm also outperforms Martin′s algorithm in terms of virtual view rendering performance.

Keywords: depth video; virtual view; Fuzzy C-means clustering; corner detection

1. Introduction

In recent years, 3D video technology has been widely applied in virtual reality, consumer entertainment devices, and so on. Free viewpoint video (FVV) [1] system enables users to watch 3D scenes from arbitrary viewpoints. Hence, it has promising application prospect. Continuous viewpoint transition is a fundamental requirement in FVV system. In practical application systems, it is impossible to set cameras on arbitrarily viewpoints. So far, multi-view video plus depth (MVD) is mainstream representation method of 3D scene [2] and can be used to realize FVV systems. Virtual views can be generated by using depth image based rendering (DIBR) technique [3]. MVD signal includes multiple color videos and associated depth videos of the same scene. Depth video is the geometric information of 3D scene. Each pixel of depth video represents the distance between camera and corresponding object. During the DIBR process, depth video aids to map the pixels from real view to virtual view.

Capturing, compression and transmission of depth video are critical for an MVD-based FVV system [4]. Currently, depth video can be obtained by using time of flight (ToF) based depth camera [5][6], Kinect

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