

Chapter 23

3D DMB Player and Its Reliable 3D Services in T-DMB Systems

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ABSTRACT

This chapter introduces a 3D DMB player which can provide realistic 3D services to consumers in terrestrial-digital multimedia broadcasting (T-DMB) systems. This chapter also provides a parameter approximation method which can create auto-stereoscopic images reliably in the 3D DMB player. Since the bit-budget for the transmission of additional data stream is strictly limited in current T-DMB systems, depth-image-based rendering (DIBR) techniques have been studied to provide 3D services in mobile devices. In order to create the auto-stereoscopic images reliably in the 3D DMB player, exact parameters such as convergence distance, scale factor, and far/near clipping plane should be given in contents. However, some contents contain unknown or inappropriate parameter values in a real environment. This makes it extremely difficult to create auto-stereoscopic images and provide consumers with reliable 3D services. Therefore, we explain how to approximate the rendering parameters by taking mobile display size into consideration. Experimental results show that the parameter approximation method can create auto-stereoscopic images reliably in the 3D DMB player.

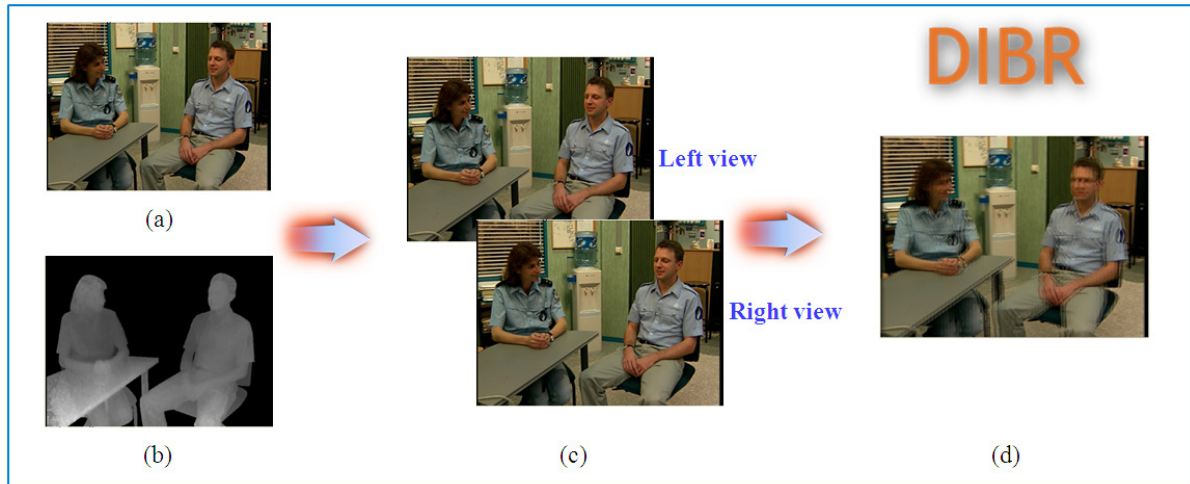
INTRODUCTION

At present, three dimensional television (3D TV) is being considered as one of the next generation broadcasting technologies because it can provide consumers with more realistic and life-like

visual home entertainment experiences. Up to now, many researchers have paid much attention to the development of 3D TV broadcasting technologies. Consequently, auto-stereoscopic 3D displays based on different perspective views have been developed and their related 3D services have been provided. Above all, 3D services over

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Figure 1. The general process of depth-image-based rendering (DIBR). (a) Reference image. (b) Depth image. (c) Virtual two views. (d) Auto-stereoscopic image.



T-DMB are very attractive because the single user environment of T-DMB is suitable for glassesless 3D viewing with mobile displays. However, the T-DMB system has limitation of the bit budget for the transmission of additional video streams because of its limited bandwidth (Park et al., 2009; Schreer et al., 2005; Jung et al., 2008; Yun et al., 2009; Jung et al., 2010c). Actually, the bit-budget for the transmission of additional data stream is strictly limited in the current state of T-DMB. The T-DMB system supports about 2Mbps of useful data rate in the 1.536MHz channel. The additional data stream should be served in bitrates below about 64Kbps, which are insufficient to compress the additional color video stream efficiently. Therefore, the ATTEST project, which started in March 2002 as part of the European Information Society Technologies (IST), has proposed a DIBR technique because depth information as the additional data can be compressed efficiently below 64Kbps (Park et al., 2009; Fehn, 2004).

In DIBR, left and right virtual views, which form auto-stereoscopic image, are rendered by reference image and its corresponding depth image in auto-stereoscopic displays as shown in Figure 1. To maintain the backward compatibility with

traditional 2D broadcasting, regular 2D color video in digital TV format is used in the reference image (Figure 1(a)). Its corresponding depth image, which stores depth information of 8-bit gray values with 0 at the furthest place and 255 at the nearest place, is just added with the same spatiotemporal resolution (Figure 1(b)) (Lee et al., 2007; Zhang & Tam, 2005; Hur et al., 2005; Lee et al., 2009). The two virtual views are shown in Figure 1(c); and their auto-stereoscopic image is shown in Figure 1(d). The auto-stereoscopic image is produced by interleaving the two virtual views as shown in Figure 2(a), and the glassesless 3D services from the auto-stereoscopic images can be provided to consumers in the displays by the parallax barrier as shown in Figure 2(b).

Many researchers have studied on the DIBR techniques for 3D data services over T-DMB (Park et al., 2009; Fehn, 2004; Zhang & Tam, 2005; Choi et al., 2009; Oh et al., 2009). Fehn (2004) provided the detailed descriptions of the 3D TV system introduced by the ATTEST project including compression and transmission. Also, the high-quality DIBR technique using the shift-sensor camera setup was introduced in Fehn's work (2004). Zhang & Tam (2005) proposed the

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