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Hybrid 3dtv For Next Generation By Using Dvb-T2-Lite

CH.SIVA PATTABHI[1], M.SUNEEL[2], SK.IDRISH[3]

M.Tech Student, Department of ECE, Bapatla Engineering College, Bapatla, Andhra Pradesh, India[1]

Assistant, Professor, Department of ECE, Bapatla Engineering College, Bapatla, Andhra Pradesh, India[2,3]

Abstract: This paper presents the 3D video compression, 3DTV system design and 3DTV display on implement for DVB-T2 terrestrial 3DTV broadcasting services. The 3D video compression and its display is the advent of HDTV and the availability of the bandwidth for the same, 3DTV transmission has finally become possible. However it requires some efficient compression algorithms so that it can be transmitted using the bandwidth of HDTV. We have employed MPEG2 for 3D video compression. And the 3D TV system design proposed by AVC encoded additional view video through mobile/handheld service channel, simultaneously. The proposed system support stereoscopic 3D HD services by mixed quality base/additional view image processing technology. In this system we are using DVB-T & T2 Lite standard.

Index Terms: DVB-T2, T2-Lite, fixed and Mobile Hybrid 3DTV, Backward Compatibility.

I. INTRODUCTION

As stereoscopic terrestrial 3D digital broadcasting services have been rapidly developed in recent years, the interests for providing 3DTV services have been increased to add new revenue to the Broadcaster's business model. In a context of where there is a massive push for new digital channels and new digital content, the interest in 3D content and its delivery to consumer is growing exponentially. In parallel we have the second generation of the terrestrial Digital TV standard, known as DVB-T2, this is there for a great opportunity for broadcasters who want more transmission capacity for more value-added services based on HDTV content. But one of the major constraints is how much capacity a 3D service would require, and how 2D and 3D simulcast service could be broad cast in the most efficient way, as spectrum is a scarce resource.

II. SYSTEM DESCRIPTION

3D video compression we obtain the frames of left and right views. The original frame consists of combined form of left and right video. This because the film shot is form the same camera. Thus the first task is to separate the left image and right image and proceed to the next step. Using motion vector to estimate I, B, P Frames of left and right view. After obtaining two different images, we proceed for the compression. As we have discussed, we use MPEG-2, 4, 5 standard for the compression of the 3d-video. Calculating the error frame for the left view. The error frame is calculated by subtracting the predicted image from the original image and DCT, DWT based compression is carried out on it. Using motion vector and disparity vector to estimate right view. Motion vector estimation is done as suggested in the MPEG-2, 4, 5 compression standard. Disparity estimation is the correlation b/n the left and the right frame and it is used to calculate disparity vector. Calculate error frame for the right view. We thus obtain the error frame for the right sequence and it is also compressed using DCT, DWT. Due to independent coding monochromatic sequence can be broadcasted with the existing infrastructure. After 3D video compression multiple physical layer pipe (PLP) is introduced by DVB-T2, enable application of separate.

Code rates and modulation orders to each PLP. The proposed system incorporates fixed and mobile broadcasting services for 3D service. The proposed system uses the video streams from two different PLP as left and right eye videos to provide high quality 3D services. In the proposed system as shown in the figure 2 AVC encoded left-eye video is transmitted over the HD main channel (T2-Base) and AVC encoded right-eye video is transmitted over the mobile/portable channel (T2-Lite and/or NGH) simultaneously, and two videos are combined by the receiver for 3D. Both two streams are decoded by HD & mobile decoder with additional synchronization information, high quality 3DTV service is also available. To overcome mixture 3D video quality issues, due to a severe mismatch in the display sizes of the HD and Mobile video resolution, we adopt binocular suppression effect to solve 3D video quality issues. The effect insists that the perceived quality to the mixed resolution stereoscopic view depends on the better one between the left and right view.

The proposed system also fully guarantees backward-compatibility with the existing fixed/mobile 2D services by complying with the legacy DVB-T2 broadcast standards. Thus, left-eye video can be used for the legacy 2D HD service and the right-eye video can be used for the 2D mobile service. Using two existing broadcast services, the proposed system enables the DVB-T2 terrestrial broadcasters to provide 3DTV services without allocating additional bandwidth for 3D transmission. Consequently, it improves bandwidth efficiency and channel/service flexibility.

DVB-T2-Lite

DVB-T2, the technology standard that enabled High Definition on Free view now has a new profile which has

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been provisionally called T2-Lite. This new profile will allow simpler receiver implementations for very low capacity applications such as mobile broadcasting. This new profile can be mixed with conventional T2 signals in a single multiplex, to allow separate optimization of the individual components. The T2-Lite component could provide audiences with a reliable live 'broadcast' TV or radio experience on their handheld devices. Using this new profile live broadcasts can be delivered to multiple audience members at a fixed cost to the content provider.
The new T2-Lite profile is designed to make use of the same reliable features we are familiar with from DVB-T2, but by a careful selection of a sub-set of modes, allows for receivers to be implemented using much smaller and more efficient silicon chips. So T2‑Lite will efficiently deliver TV and radio to mobile devices such as phones and tablets (for which power consumption is an important issue) and in-car at the same time as providing services to existing fixed receivers. It's obviously early days but we are interested to find out how this new technology may play a part in delivering BBC content (and maybe one day content from other broadcasters) to an ever-growing 'mobile audience'.

In the existing DVB-T2 spec, different services can already been sent with different levels of robustness so that some services might be targeted at roof-top reception (e.g. HD) while others targeted at portable or mobile receivers. However, in the UK, we have chosen a mode (using 32K carriers) which maximizes the data rate for HDTV for stationary receivers. The close spacing of the carriers in this mode means that the signal cannot be received reliably by mobile receivers.

In the existing DVB-T2 spec, the signal can, if required contain periods of time which can be used to transmit something other than DVB-T2. This feature was included in the spec to future proof it against changes and allows improvements in modulation technology to be incorporated into the system. These periods of time are called future extension frames (FEFs).

However, in the new version of the spec, both the main part and the FEF contain valid DVB-T2 but with different modes (in terms of number of carriers) and varied levels of robustness, allowing both services to mobiles and fixed receivers to be transmitted as part of the same transmission on the same frequency. The system also permits the transmission of a service to mobile devices without a second DVB-T2 service being there.

- The new profile allows most of the flexibility of the DVB-T2 spec, but to maximize its effectiveness for mobile and minimize the requirements for the receiver, it has the following differences
- Limits the FFT size to exclude 1K and 32K
- Prohibits the use of rotated constellations in 256-QAM
- Allows only short FEC frames (Nldpc = 16200)
- Adds two new even more robust code rates (1/3 and 2/5),
- Limits the size of the time interleave memory to approximately half that of standard DVB-T2 And
- Reduces the number of permitted mode combinations, prohibits the use of PP8 and provides the capability of scrambling the L1 post preamble signaling bits.

As part of the digital switch-over programme, the UK has already rolled out a nationwide

DVB-T2 multiplex which provides several HD terrestrial channels. For this technical trial of T2‑Lite, we've combined an HD multiplex intended for reception on fixed receivers with a more robust mobile service which could be television, radio or data or any combination of these.

In the UK, we currently use the mode 32K 1/128 256-QAM 2/3 which gives a bit rate of 40.21 Mbit/sec in an 8 MHz multiplex. In our technical trial, we've used the same mode for the HD part of the multiplex but have added a Future Extension Frame (FEF) containing the mobile service. The HD part of the multiplex consists of a DVB-T2 frame which is 216.9 ms in duration followed by a FEF of 44.6 ms. This FEF contains the mobile service.

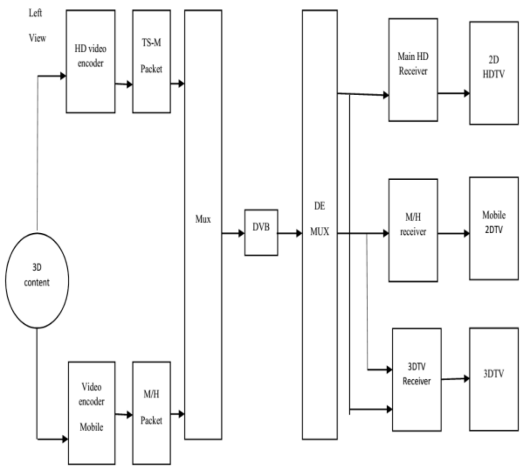

Fig:1 Block Diagram Of 3D TV

The mobile part of the service is transmitted in a more robust mode with a smaller FFT size. We have chosen 8K 1/32 QPSK ½ with L_DATA = 46. This gives a bit rate of 1.02 Mbit/sec for the mobile service. The HD part of the service is contained within a FEF of the mobile service. This means that the HD service and mobile service are both FEFs of each other.

III. PROTOTYPE SYSTEM DEVELOPMENT

The prototype system is presented in figure 3. This prototype has successfully demonstrated that the 2D HDTV, 2D mobile TV and 3DTV can be serviced simultaneously by using the proposed DVB-T2 fixed and mobile hybrid 3DTV system.

The tests are conducted UHF channel (8MHz bandwidth) and transmit one HD program (1080p) through 256-QAM PLP#1, channel, and additional view mobile program (480p) transmit through Mobile/Handheld 16 QAM PLP#2 channel.

Modulation type	Data Rate	Video Resolution	LDPC Code Rate
Ch1. 256-QAM (HD Main Service Channel)	7.9 Mbps	1080p	2/3
Ch2. 16-QAM (Mobile/Handheld service Channel)	1.9 Mbps	480p	3/5

Table 1.Configuration parameters of prototype system

The prototype test bed consists of hybrid 3DTV system generator, multiplexer, gateway, modulator and receiver. Stream generation and Multiplexer module are non-real-time module which is S/W implemented. It support elementary stream encoding for left and right view stereoscopic 3D video, HE-AAC audio stream encoding and stereoscopic 3D MPEG-TS stream multiplexing and remain parties support real time operation. Hybrid 3DTV gateway and 3DTV OFDM modulator are almost same modules as currently commercialized equipment.

Receiver is real-time party module which is consisted of demodulation. A/V decoder and 3D renderer module. The demodulator module can support two different profile, 256-QAM/16-QAM demodulation at simultaneously and it can extract PLP #0, PLP #1 and de multiplexing Left/right view MPEG-TS. The A/V decoder module support H.264 decoding 1080p resolution for left view, and also support H.264 decoding 480 resolution for right view from the output stream of demodulator module. 3D renderer support synchronization

Between left and right view stream and make HDMI 3D interface stream format (side by side or frame sequential format) for conventional 3DTV interface, Figure 4 shows the real-time S/W receiver module with side by side images on the screen. Table one shows system configuration parameters and hybrid 3D program information

Fig:2. DVB-T2/T2-Lite Hybrid 3DTV Prototype System

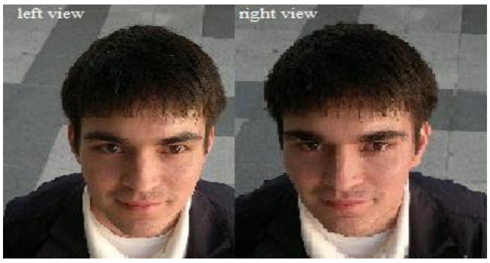

Fig:3. DVB-T2 Hybrid 3DTV Receiver Module

IV. CONCLUSION

In this paper, we proposed the DVB-T2 and T2-Lite hybrid 3DTV system which is provided 3DTV services scenario with band efficiency method. The system could support HDTV, 2D mobile TV and high quality 3DTV services without additional bandwidth for additional view transmission. The proposed system could allow maximum channel flexibility and extended service functionalities as well as fully backward compatible with current DVB-T2 &T2-Lite. Additionally. We have most investigated post image processing, temporal/spatial enhancement layer adoption for 3DTV video quality improvement

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