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# A COMPARATIVE ANALYSIS OF ADVANCE THREE DIMENSIONAL VIDEO CODING FOR MOBILE THREE DIMENSIONAL TV

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## ABSTRACT

Study on various techniques pertaining stereo video compressions for mobile three dimensional services are presented in this paper. Efficient compression is required for mobile services because of various limitations like memory, bandwidth and processing power. There are various techniques exist for encoding of three dimensional video content for three dimensional mobile Television are examined and compared. These techniques are H.264/MPEG-4 AVC simulcast coding, H.264/MVC technique and mixed resolution stereo coding (MRSC). The first and second techniques are based on a full left and right video content encoding, the third includes full left and a sub-sampled right video content encoding for improved coding efficiency and reduced decoding complexity. Using professional three dimensional video content, each method was tested. A comparison amongst three techniques at different bit rate is presented. The comparative results are shown between two parameters that is peak signal to noise ratio (PSNR) and bit rate.

**KEYWORDS:** H.264/AVC Simulcast, H.264/MVC, Mixed Resolution Stereo Coding (MRSC), Video Plus Depth

## 1. INTRODUCTION

It has been observed that three dimensional video technology is going to capture the entertainment industry of three dimensional mobile television in near future. Since the three dimensional mobile technology creates certain challenges like receiver complexity and limited bandwidth for transmission and encoding. On mobile devices, display area and number of viewers are very limited due to small screen size [1]. This paper gives the comparison amongst three techniques for three dimensional video on mobile devices. In the section second and third, the three dimensional video coding methods like h.264/AVC simulcast and h.264/MVC technique have been discussed. Mixed resolution stereo coding (MRSC) is discussed with diagram in section fourth [2], and section fifth provide the summery and conclusion.

## 2. H.264/AVC SIMULCAST

H.264/AVC is a modern and most acceptable coding standard of ITUT video coding expert group and moving picture expert group, Where H.264 Simulcast is specific application of H.264/AVC and normally follows in many video sequences. H.264/AVC exists in all the applications like three dimensional mobile TV services, video conferencing to Internet Protocol TV and High Definition TV. Diagram (Figure 1) shows the H.264/AVC Simulcast stereo video coding.

Since left and right view captured by the individual camera and coded with H.264/MPEG-4 AVC generate separate bit stream (BS) are transmitted independently in the c hannel. At the receiver, two bit streams (BS) are decoded separately. Hence there is no need of any pre processing before the encoder or post processing after decoder. So the complexity in the circuitry at transmitter as well as receiver side is comparatively lesser. But the independent encoded and decoded bit stream results the generation of huge amount of distorted stereo video data. Therefore redundancy is maintained and thus the coding efficiency is not optimized

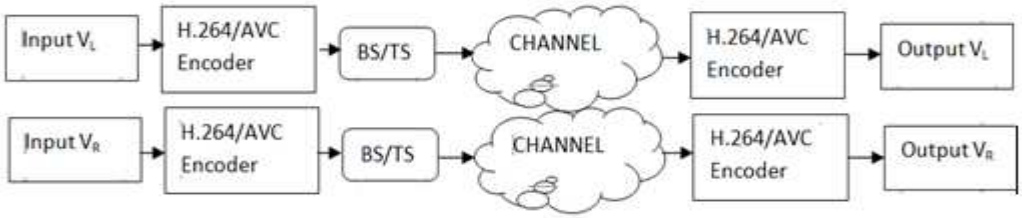



**Figure 1: Shows H.264/AVC Simulcast [3]**

## 3. H.264/MVC MULTIVIEW VIDEO CODING

The extended form of Video plus Depth is multi video plus depth i.e. MVD. In multi video plus depth, multiple video cameras used to capture multiple views i.e. more than two views and equipped with the generated depth map for each view. Therefore observer has the facility to view the scene from different angle. Due to this reason, MVD is popular to use in three dimensional television and video applications also. Depth map of each view contains valuable information like deeper content in a view captured by camera will become darker than near similarly near content will become brighter than deeper.

Figure 2 provide an illustration of the video plus depth representation & figure 3 provide an illustration of the MVD representation

Multi-view Video Coding (MVC) is an extended form of H.264 standards where depth map is generated for each view by the encoder [4] [5]. It includes some additional new features to decrease decoder complexity and improve encoder efficiency. It has the quality of inter-view prediction and temporal prediction for compensation in motion [6] [7] [8].

In figure 4, Stereo inputs (left and right view video sequence) are applied to the H.264/MVC encoder simultaneously for inter-view prediction encoding for stereo video data. Now the encoded bit streams (BS) generated by H.264/MVC encoder are transmitted via transport-stream (TS) using multiplexer. At the receiver side H.264/MVC decoder decode the encoded bit sequence simultaneously. Figure 5 provide illustration of inter-view prediction and temporal prediction for H.264/MVC technique

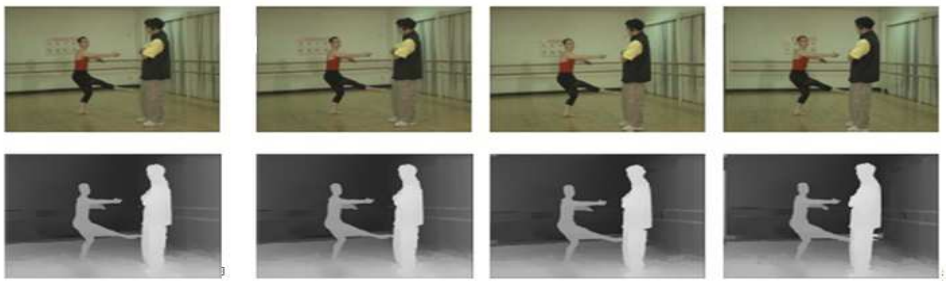


**Figure 2: Illustration of the Video Plus Depth Representation (Video + Depth) [13]**

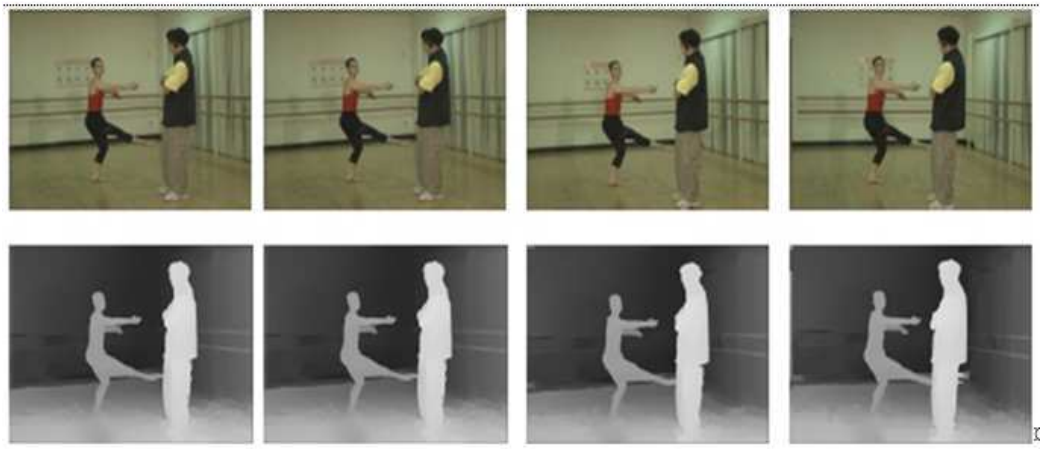


**Figure 3: Illustration of the Multi View Video + Depth Representation [13]**

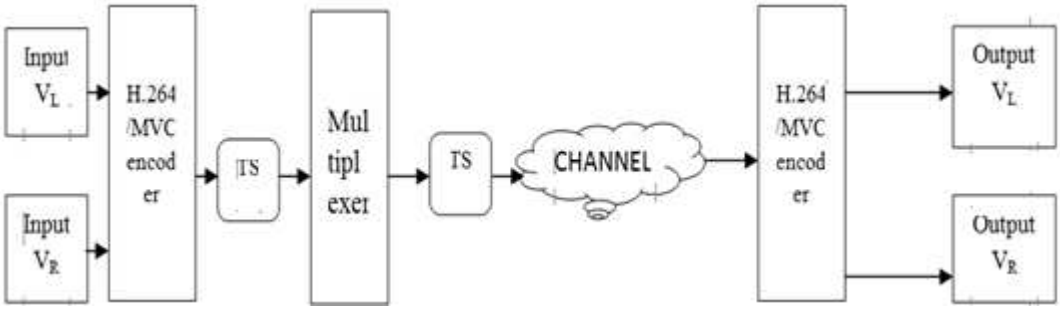



**Figure 4: Procedure of H.264/MVC Technique [1]**

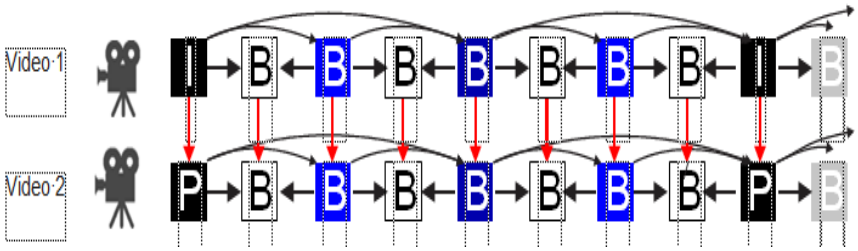



**Figure 5: Procedure of Inter-View Prediction and Temporal Prediction for H.264/MVC Technique [1]**

## 4. MIXED-RESOLUTION STEREO CODING (MRSC)

Mixed resolution stereoscopic coding (MRSC) is used to meet the requirement of bandwidth limitation by the transmission of a stereo image consists of one complete resolution video and other decimated video. Mixed resolution stereoscopic coding (MRSC) based on the binocular suppression principle to maintain the quality of video. According to the binocular suppression principle, if one view of the scene captured by one eye is blurry and the same view of the scene is captured by other eye is sharp, so the fused image creates the perception of three dimensional view with maintain the quality up to the mark. The mixed resolution scheme uses the advantage of human eye perception by decimating one view before transmission and up-scaling back to the original resolution at the decoder side to maintain the overall three dimensional perception quality, which results the reduction in the generation of bit stream. This is very effective methodology for the application in cell phone [9], [10], [11], [12], [13].

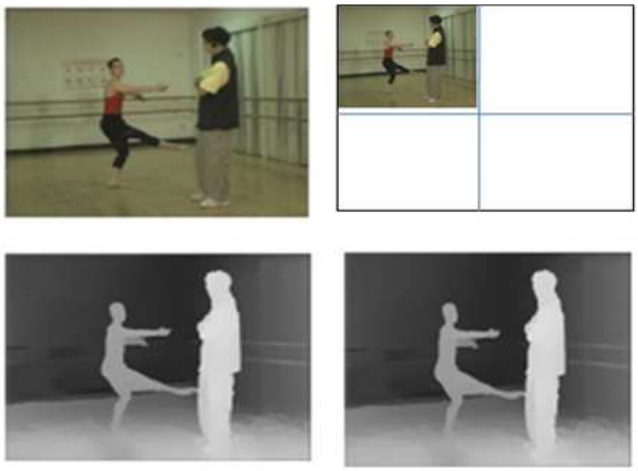
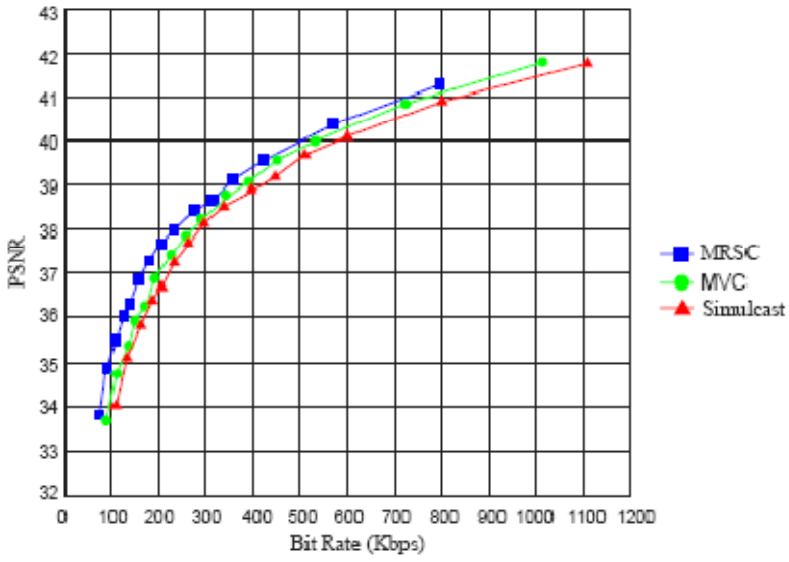


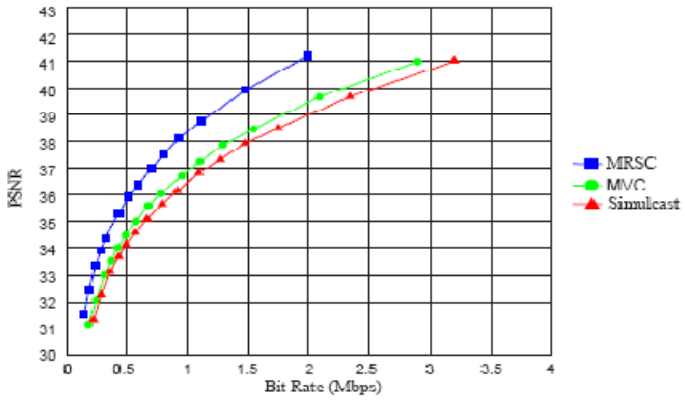
**Figure 6: Procedure of Video Plus Depth of One View and Decimated of Second View for H.264/MVC Technique [13]**

## 5. SUMMARY AND CONCLUSIONS

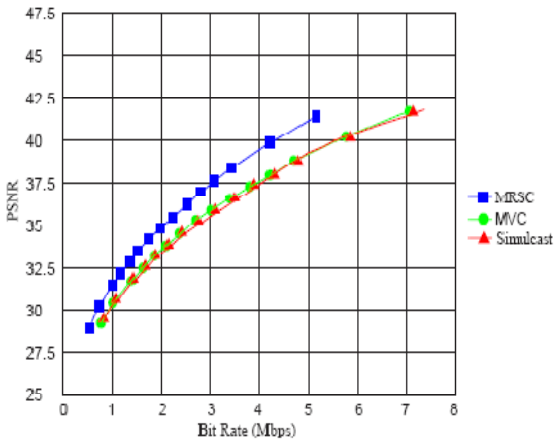
This comparison gives the comparative analysis amongst MRSC, H.264/AVC simulcast coding and H.264/MVC technique. H.264/AVC simulcast coding and H.264/MVC technique is comparatively lesser complex amongst the available three dimensional video coding. The Mixed resolution stereoscopic coding (MRSC) technique is most promising technique which has some more additional complexity with respect to other techniques. It compress one of the outgoing generated data with the help of down-sampling of one view (captured by left or right camera) of stereo data and the second view is full length data for transmission. Subjective test for peak signal to noise ratio has been conducted amongst H.264/AVC simulcast coding, H.264/MVC technique and MRSC using some standard videos having different-different bit rate like bullinger, car and hand motion. Results clearly show MRSC has comparatively higher peak signal to noise ratio (PSNR) for all the different type of standard video formats.




(a) Bullinger




(b) Car




(c) Hands

**Figure 7: Comparison amongst MRSC, H.264/MVC Technique and H.264/AVC Simulcast in (A), (B) and (C)**

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