Source : ETRI
Title : Simulation Results on DTV/HDTV Compatibility
Purpose : Information

INTRODUCTION

This document describes the simulation results to inform that compatibility extensions provided by the MPEG-2 syntax can support a compatible coding of TV and HDTV. Digital coding of TV and HDTV signals is one of the key issues of future all-digital satellite transmission system. The higher layer is HDTV resolution (Y: 1920 x 1024, U/V: 960x512) while the lower layer is digital TV (DTV)(Y: 960x512, U/V: 480x256) .

COMPATIBILITY

Compatible coding can be achieved through use of layered coding schemes. Figure 1 shows an encoder for HDTV with embedded DTV. The DTV codec processes images that have been down-sampled (H:1/2, V: 1/2) from HDTV images. The residual encoder processes the residual signal of HDTV images obtained as differences of the original HDTV images and the locally decoded and up-sampled DTV images.   The corresponding decoder is shown in figure 2.

DOWN AND UP CONVERSION

Conversion between HDTV and DTV requires horizontal and vertical sample rate changing. For horizontal and vertical sample rate conversion, a horizontal filter and a vertical filter such as those described in [1] is used in this experiment.

SIMULATION

The DTV sequences were down-converted from HDTV sequences. These DTV pictures were then coded at 15 Mbits/s using Test Model 2[2] with adaptive field/frame prediction. The resulting coded pictures were up-sampled back to HDTV resolution and used as a prediction for the corresponding original HDTV pictures.   The residual signal of HDTV sequences is encoded at 20 Mbits/s using Test Model 2 with adaptive field/frame prediction(total bitrate: 35Mbits/s for HDTV). These two-layered coded HDTV pictures were also compared with single-layered coded(coded incompatibly) HDTV pictures.   The PSNRs for each case are shown in Figures 3 ~ 6.

CONCLUSION

Simulation results of compatible coding of DTV and HDTV are presented for the purpose of information. It has been shown that the Test Model 2 can be utilized as building blocks for a compatible coding of DTV and HDTV.

REFERENCES

[1] CMTT/TG2-SRG1,"Production of a original decimated TV picture".
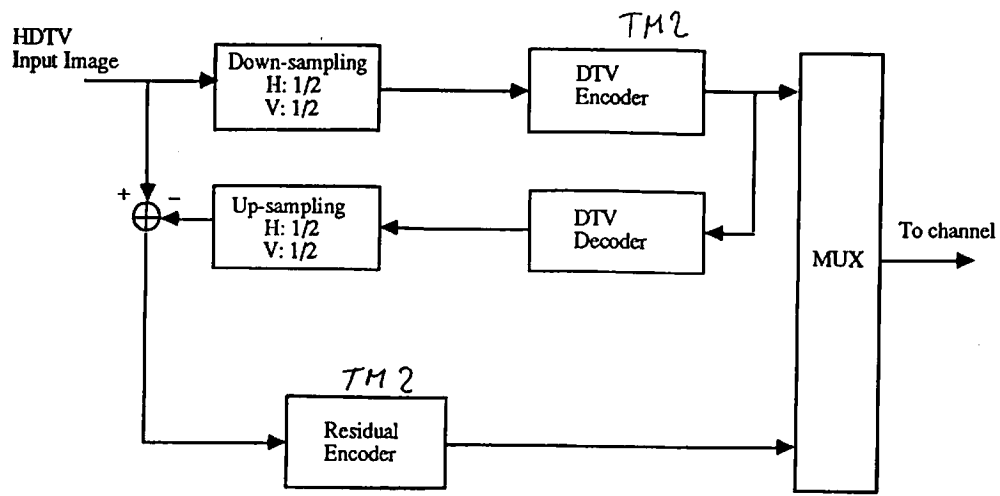[2] ISO-IEC/JTC1/SC29/WG11 MPEG 92/245, MPEG Test Model 2

Figure 1. DTV/HDTV compatible encoder
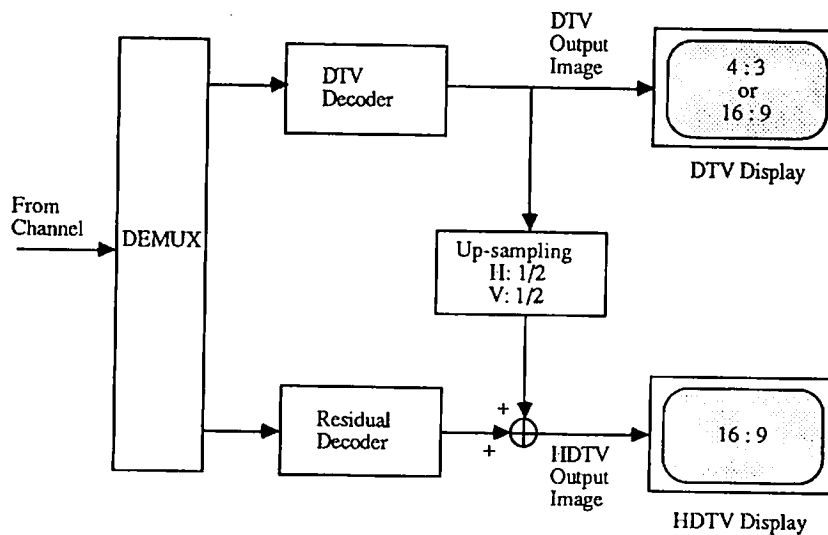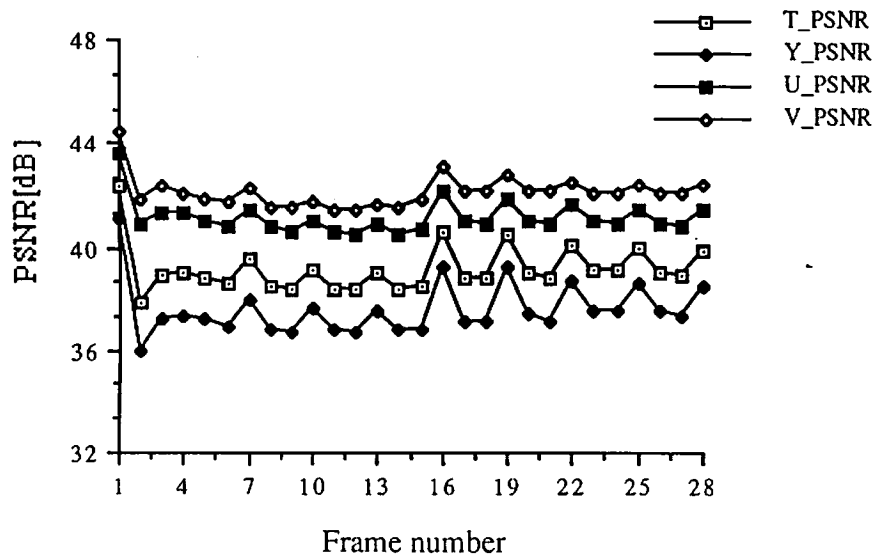
Figure 2. DTV/HDTV compatible decoder

Figure 3. Simulation results
      DTV size of Fashion show image, Bitrate= 15Mbps, M=3, 4:2:2 format
      T_PSNR : Total PSNR of Y, U, V components
      Y_PSNR : PSNR of Y component
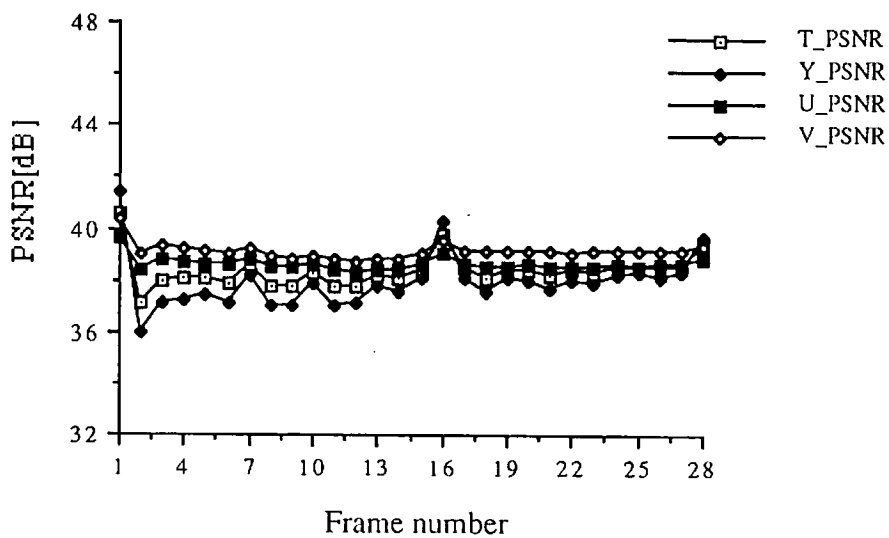   U_PSNR : PSNR of U component
      V_PSNR : PSNR of V component

Figure 4. Simulation results
      DTV size of Fashion show image, Bitrate= 15Mbps, M=3, 4:2:0 format
      T_PSNR : Total PSNR of Y, U, V components
      Y_PSNR : PSNR of Y component
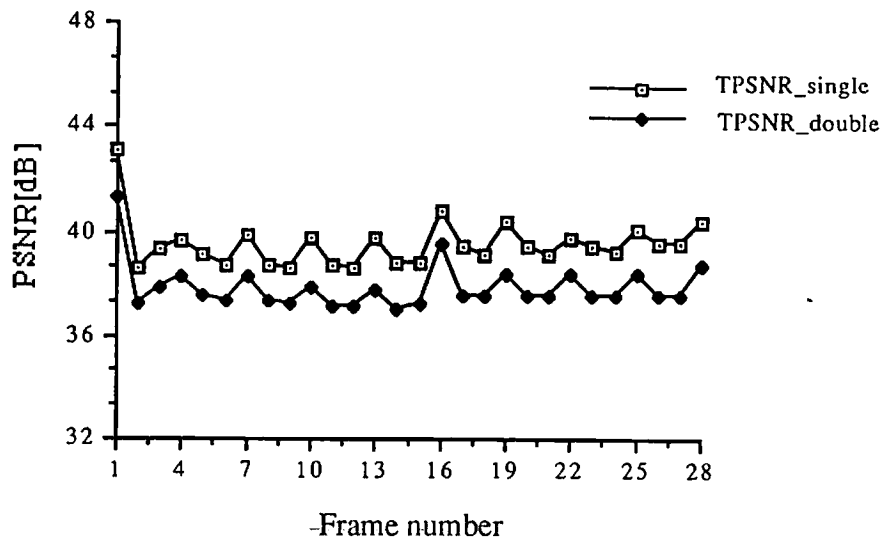   U_PSNR : PSNR of U component
      V_PSNR : PSNR of V component

Figure 5. Comparison of Performance
Fashion show image, Bitrate= 35Mbps, M=3, 4:2:2 format
TPSNR_single : Total PSNR on single layered coding
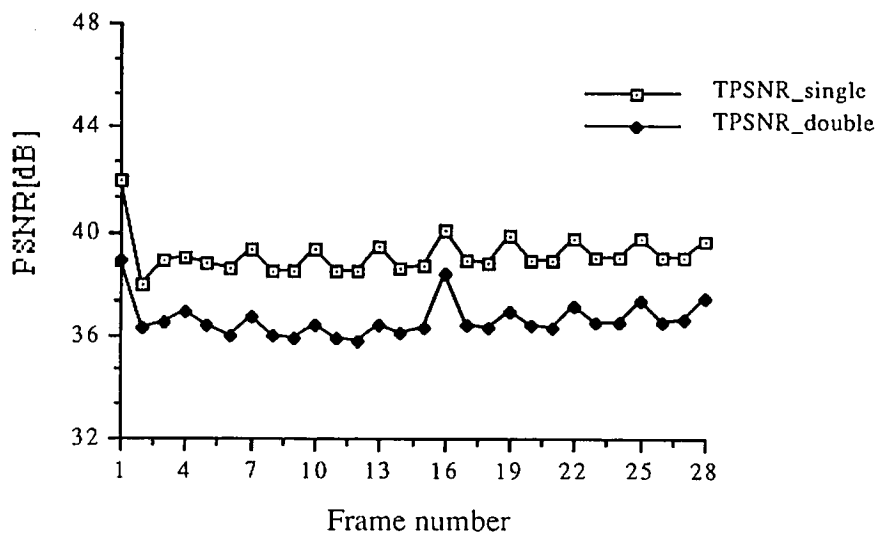TPSNR_double : Total PSNR on compatible coding

Figure 6. Comparison of Performance
Fashion show image, Bitrate= 35Mbps, M=3, 4:2:0 format
TPSNR_single : Total PSNR on single layered coding
TPSNR_double : Total PSNR on compatible coding