CCITT SGXV
Working Party XV/I
Experts Group for ATM Video Coding

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SOURCE : NEC
TITLE : A study on subsampling of chrominance signals
PURPOSE : Information

1 Introduction

In converting source signal format from 4:2:2 to 4:2:0, chrominance signals should be subsampled. This paper reports effects of chrominance signal subsampling.

2 Simulation

Computer simulations are achieved using four subsampling and reconstruction methods shown below. Test sequences used for simulations are also shown below.

2.1 Simulated methods

- Line Subsampling + Line Repeat (LR)
  Horizontal lines of each chrominance signal field are subsampled into 1/2. A previous line is repeated for reconstruction of the omitted line.
- Line Subsampling + Line Filtered Interpolation (LF)
  Horizontal lines of each chrominance signal field are subsampled into 1/2 (same as LR). An interpolation filter is used for reconstruction of the omitted line.
- Field Drop + Field Repeat (FR)
  The second field of each chrominance signal is dropped. The first field is repeated for the dropped second field.
- Field Drop + Field Filtered Interpolation (FF)
  The second field of each chrominance signal is dropped (same as FR). An interpolation filter is used for reconstruction of the dropped second field.

2.2 Tested sequences

"Mobile and Calendar"	60 frames
"Football"	60 frames
"Popple"	last 60 frames

3 Results

Figure 1 shows SNR of chrominance signals between 4:2:2 and reconstructed from 4:2:0. LF is always the best in terms of SNR. Subjective impression is described below.

- "Mobile and Calendar"
  LR looks worst because of color aliasing effects on reconstructed pictures. Other three methods look almost the same although a little loss of color resolution can be found.

- "Football" and "Popple"
  FR looks worst because chrominance signals cannot follow motion at relatively high speed motion area. For example, the red back print of the uniform in "Football" and the red cage wires in "Popple" delay so much from luminance signal. FF looks better than FR, but delay of chrominance signals is not yet negligible. LR looks also bad because of aliasing effects. LF seems to have a little loss of color resolution, which is almost negligible when the sequence is viewed in normal speed.

4 Conclusion

It is confirmed that FR and FF are not convenient because of color shifting on relatively high motion sequences. It is also confirmed that LR is not convenient because of color aliasing effects. Same picture quality as LF, at least, is necessary for source signals.

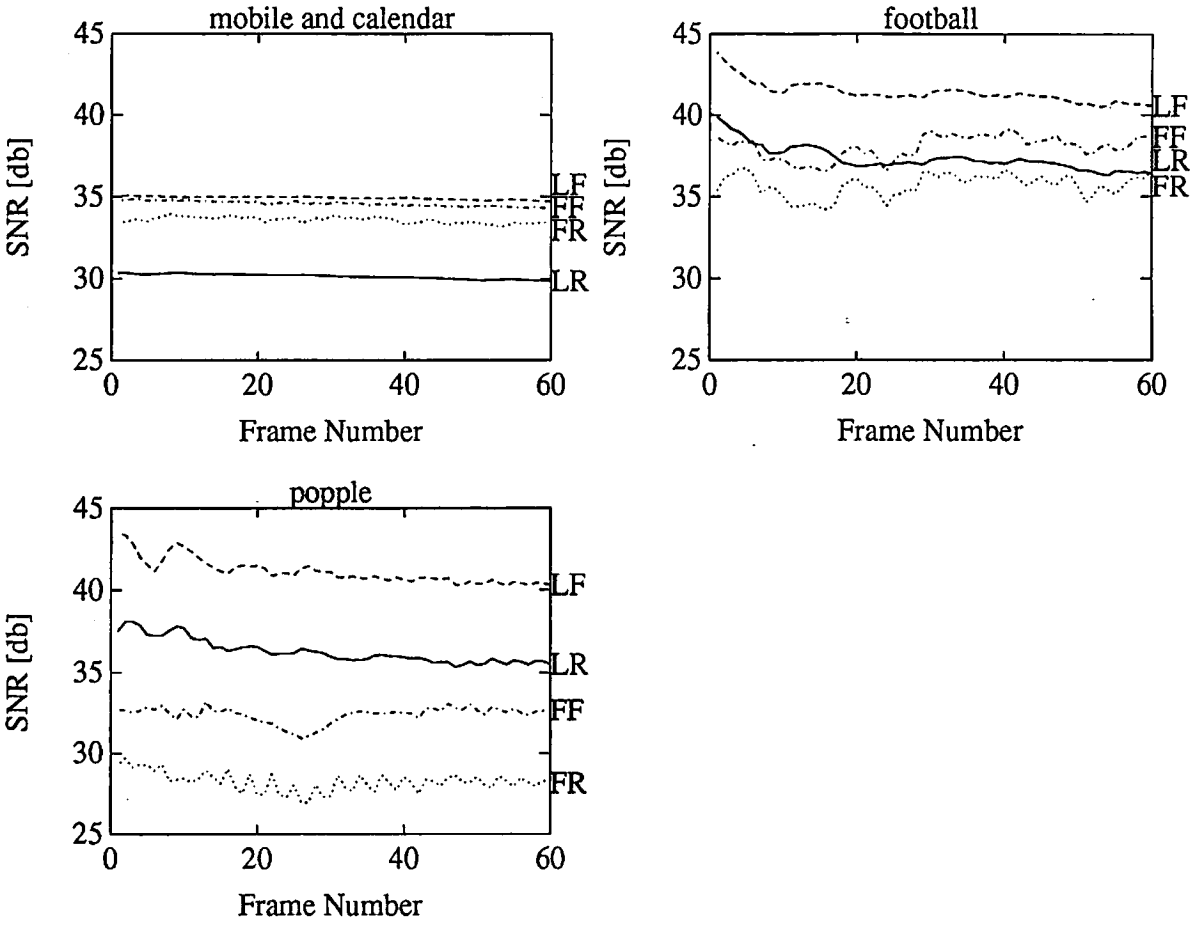

Figure 1: SNR of color signals