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Source: I. Parke, M.E.Nilsson, BT Labs
Title: Spatio-temporal weighting experiments
Purpose: Information and proposal

This document describes investigations into the performance of spatio-temporal weighting.

Experiments

Three methods of coding were used for the experiment:

1) Simple switching was used: this allows weights of (1,0), (0,1) and (1,1);

2) Simple switching and averaging was used: this allows weights of (1,0), (0,1), (1,1) and (0.5,0.5);

3) Optimum weights were used.

The differences between methods 1 and 2 indicate the practical advantage of weighting over simply switching the prediction modes. Method 3 uses optimum weights which were calculated to and used with 4 bit accuracy, that is, allowing values from 0 to 1 in steps of 1/16, independently for each field for each macroblock. This would require downloading prediction weights for each macroblock. The overhead of doing this is ignored. The aim of this method was to try to estimate the maximum possible benefit of spatio-temporal weighting.

The sequences calendar, susie and cheerleader were used. For calendar and cheerleader, the lower layer was coded with MPEG-1 at 1.5Mbit/s, and the upper layer with an additional 2.5Mbit/s. For susie, the lower layer was coded with H.261 at 0.5Mbit/s, and the upper layer with an additional 1.5Mbit/s.

Results

The statistical results are summarised in table 1. There was no noticeable difference in subjective picture quality between the three methods.

	Calendar	Susie	Cheerleader	Average gain over Method 1
Method 1	28.45	39.91	29.12	0.00
Method 2	28.50	40.04	29.22	0.09
Method 3	28.59	40.21	29.47	0.25

Table 1. Luminance SNR figures.

The gain of optimum spatio-temporal weights, ignoring their transmission overhead cost, compared to simple switching is 0.25dB. This is not subjectively noticeable. The gain of allowing averaging in addition to switching is 0.09dB. It is unlikely that a significant part of the additional 0.16dB can be obtained when true overhead costs are counted.

Conclusion

The advantage of downloadable spatio-temporal weights does not seem to be worth the cost in complexity and complication to the syntax. It is proposed to eliminate the possibility to download prediction weights from the syntax.

The averaging mode does achieve a little gain, while only increasing the complexity of the syntax a little. Although, there are memory/bandwidth penalties with this mode, it is proposed to retain it.

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