

Bin Classification using Temporal Gradient Estimation for Lossless Video Coding

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The accent of the proposed work is in predicting the deviation of intensity value of the current pixel from the same temporal location pixel of the previous frame. This variance in intensity is estimated by analysing the deviation of the causal group of pixels selected to carry out the algorithm. This group consists of 9 neighbouring pixels (Fig. 1,3) from the present and past frame. These are divided into four bins. This quartet is classified on the basis of distance from the present pixel 'X' where equal distant pixels are kept together in one group (Fig. 1). For any pixel in the current frame, causal nine pixels are subtracted from the pixels at the same temporal location in the previous frame. These four groups are multiplied with coefficients W_i obtained using least square based algorithm. Hence we get the predicted deviation of the pixel from the current location.

The proposed method works with some predefined coefficients. The coefficients are estimated by the simulation analysis and the prediction is done using them. Hence, this method needs few addition and subtraction as compared to the standard motion compensation. Because of less number of computations this scheme works very fast. An architecture diagram for its implementation is shown in Fig 2.

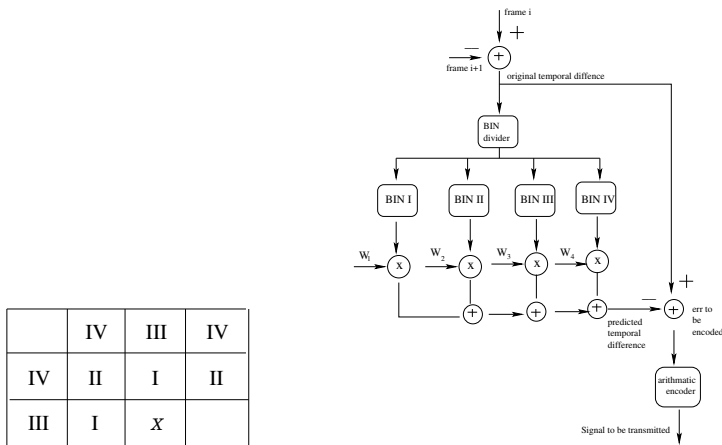


Figure 1: Grouping of pixels in different bins w.r.t. X

Figure 2: Architecture of Proposed Scheme

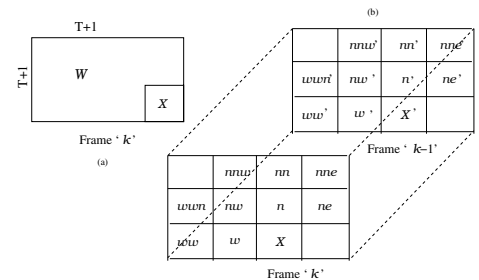


Figure 3: Orientation of pixels between two frames

Comparison with Standard Motion Compensation shows that both these schemes have nearly equal performance in terms of bitrate. After applying entropy coding method (arithmetic encoder) on an average bit rate of the proposed scheme is 2.72 bpp and that of standard motion is 2.66 bpp for QCIF while 3.23bpp for motion compensation comparison to that of 3.10 bpp for proposed scheme in case of CIF video sequence.

This paper put forward a unique way of predicting the value pixel gradient. Difference between the range of values which are obtained when two consecutive frames are subtracted in comparison to the range in the value of pixels being predicted in any of the existing algorithm is very small. So there is more probable chance of correct prediction for the values small in range. Exploiting this advantage, the paper presents a method which classifies the temporal difference into different bins and use accordingly. Simulations shows the greater performance level with much lower computational cost involvement. The proposed scheme works best for the video sequences having less motion.

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