INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND AUDIO

ISO/IEC JTC1/SC29/WG11
MPEG2006/M13196
April 2006, Montreux, Switzerland

Title: Core Experiment on View-temporal Prediction Structures (CE1 D: TU Berlin)

Source: GIST
Authors: Kwan-Jung Oh, Jin Heo, Pil-Kyu Park, and Yo-Sung Ho
(Gwangju Institute of Science and Technology)

Status: CE Report

1. Introduction

At the 75th MPEG meeting in Bangkok, Thailand, the Description of Core Experiments in MVC was released [1]. According to the document [1], we conducted core experiments. This document describes the procedure and results of core experiments.

2. Core Experiments

The core experiment was conducted at GIST using eight test sequences and an MVC (multi-view video coding) software package (JSVM_3_5), released from Fraunhofer-HHI. Fraunhofer-HHI divided MVC into four steps: sorting, encoding, decoding, and resorting. The MVC software package consists of source codes, configuration files, and batch files for each step. According to the document [1], TU Berlin was supposed to experiment on the influence of the view chosen as I frame for a hierarchical decomposition structure and the influence of removing the inter-view prediction from higher temporal decomposition levels. However, they did not implement their algorithm properly because of the time limitation; instead, TU Berlin experimented the simplified inter-view prediction.

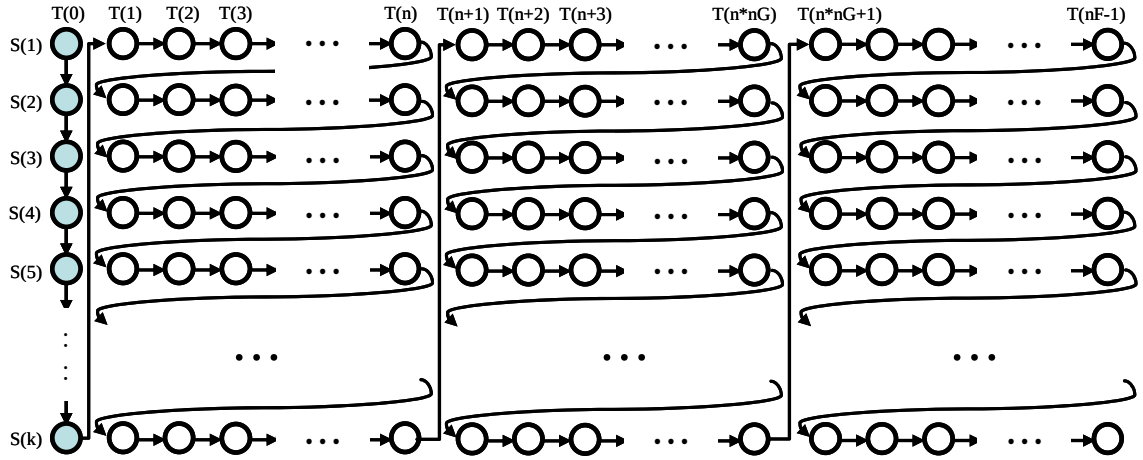

Fig. 1. General structure for frame reordering

2.1. Frame Reordering

TU Berlin followed the HHI's reordering scheme. It just combined several sequence into one sequence by the camera orders. Frame reordering is efficient for the implementation and the memory management. Figure 1 shows the general reordering method. *k*, *n*, *nG*, and *nF* represent the number of views, GOP length, number of GOP, and number of frame, respectively. Table 1 shows reordering parameters for each sequence.

Table 1. Reordering parameters for each sequence

Test Sequences	Number of Views (*k*)	GOP Length (*n*)	Number of GOP (*nG*)	Number of Frame (*nF*)
Ballroom	8	12	20	250
Exit	8	12	20	250
Uli	8	12	20	250
Race1	8	15	35	532
Flamence2	5	15	66	1000
Breakdancers	8	15	6	100
Rena	15	15	19	300
Akko&Kayo	16	15	19	300

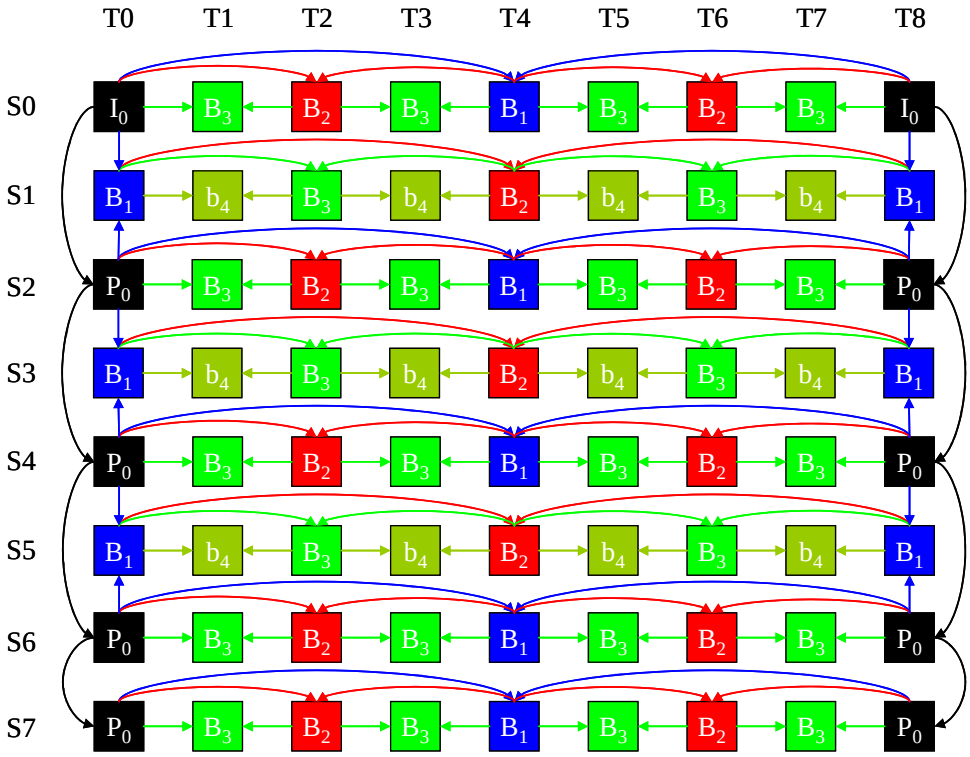

Fig. 2. Simplified prediction structure

2.2. Prediction Structure

Current MVC reference software is too slow to encode multi-view sequence. So, TU Berlin experimented about a simplified prediction structure of the MVC reference software. The simplified prediction structure means the inter-view prediction is only utilized at the first frame of each GOP. This reduces the encoding time drastically, while the drop in quality is only small. Furthermore, the encoding can be done better in parallel, because shared memory

is only required for the inter-view prediction. Figure 2 shows the simplified prediction structure whose GOP length is eight and the number of views is eight.

2. Results

We confirmed that all simulation results were similar to the results received from TU Berlin. We calculated the bitrate and PSNR for each test sequence by using Eq. (1) and Eq. (2), respectively.

$$Bitrate = \frac{Size\ of\ \ encoded\ \ bitstream \times 8 \times\ frame\ \ rate}{Num\_view \times Num\_\ frame} \tag{1}$$

where, *Num_view* and *Num_frame* mean number of views and frame, respectively.

$$PSNR = 10\log_{10}\left(\frac{255^2}{\sum_{i=0}^{Num\_frame-1} \sum_{x=0}^{width-1} \sum_{y=0}^{height-1} \frac{(O(x,y) - R(x,y))^2}{Num\_\ frame \times width \times height}} \right) \tag{2}$$

where, *width* and *height* mean image size. $O(x,y)$ and $R(x,y)$ are pixel value of original image and reconstructed image, respectively. The experimental results of CE1 D are as shown follows.

4. Conclusion

TU Berlin implemented the prediction structure of the MVC reference software instead of implementing the algorithms in the document [1]. We confirmed that TU Berlin implemented their algorithm without tricks or errors.

5. References

[1] ISO/IEC JTC1/SC29/WG11 w7798, “Description of Core Experiment in MVC,” January 2006.

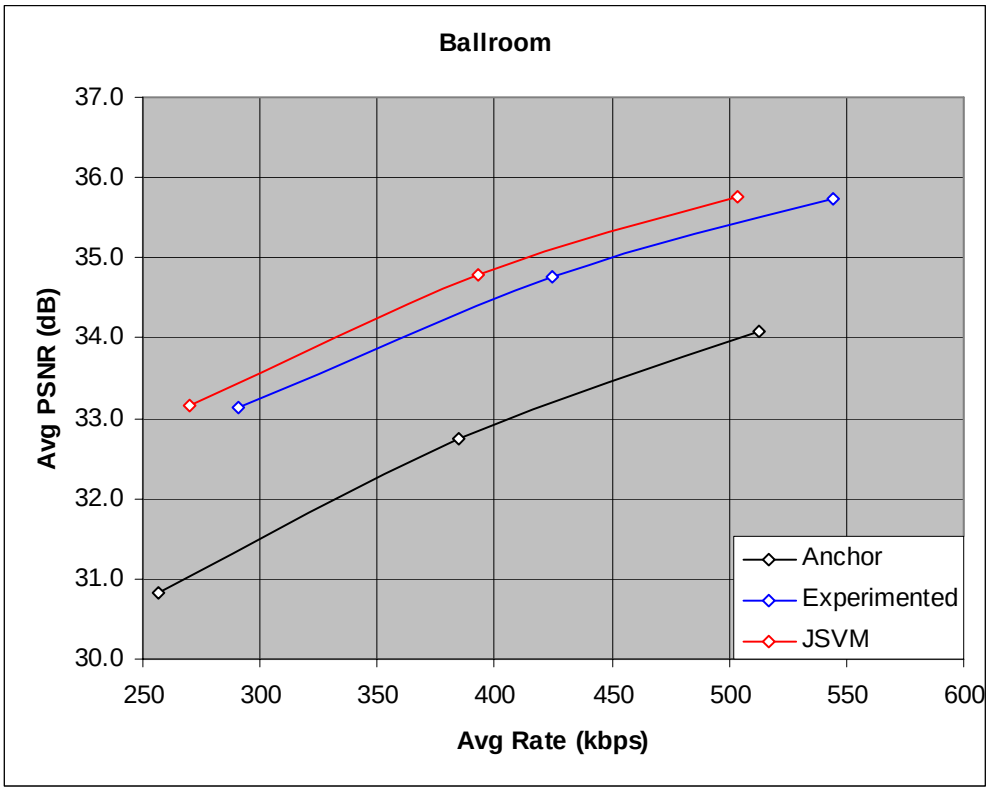

Fig. 3. Rate-distortion curves for “Ballroom”

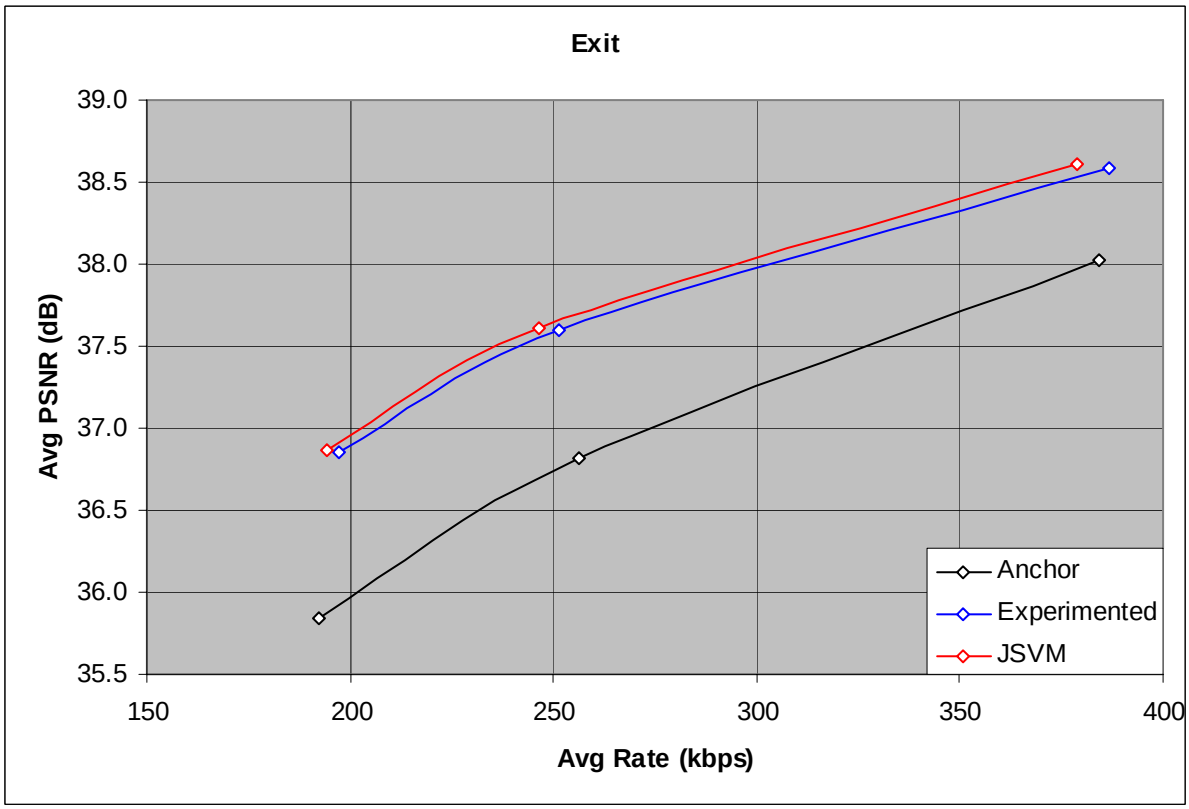

Fig. 4. Rate-distortion curves for “Exit”

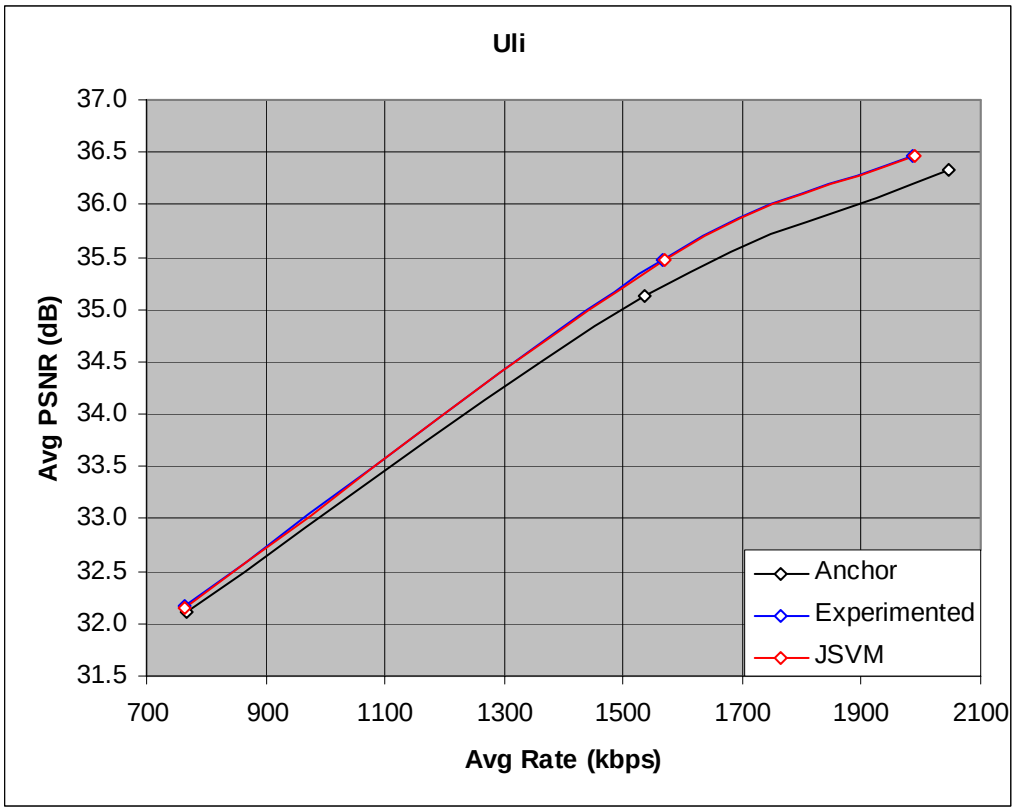

Fig. 5. Rate-distortion curves for “Uli”

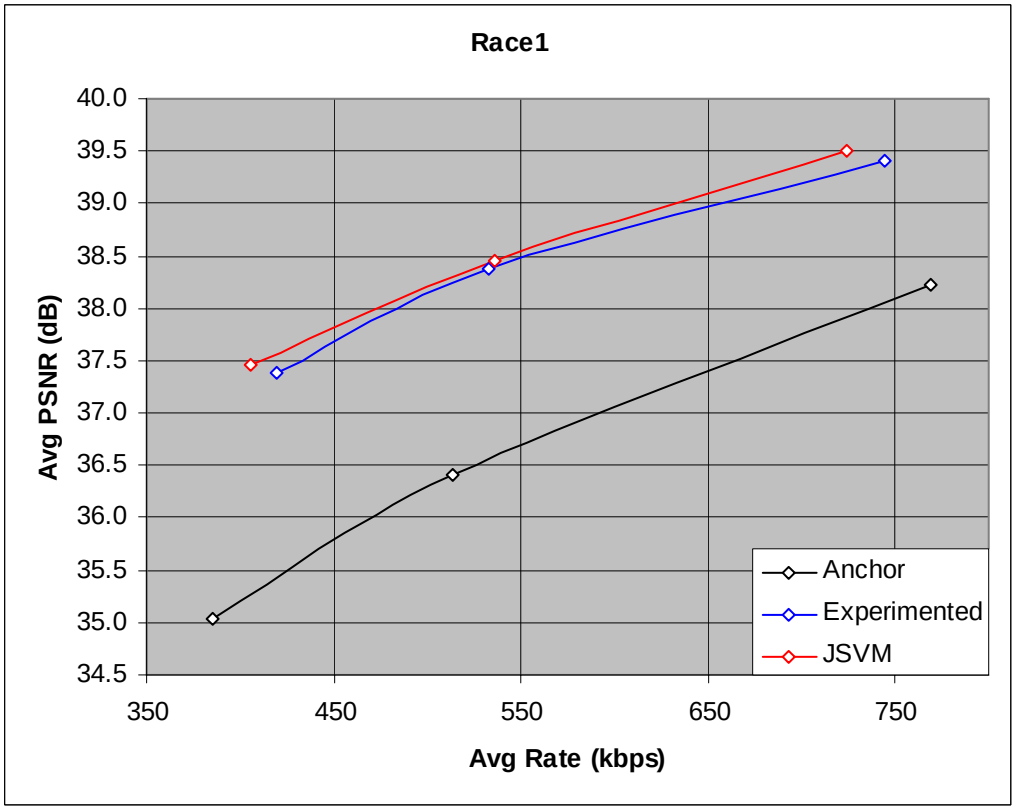

Fig. 6. Rate-distortion curves for “Race1”

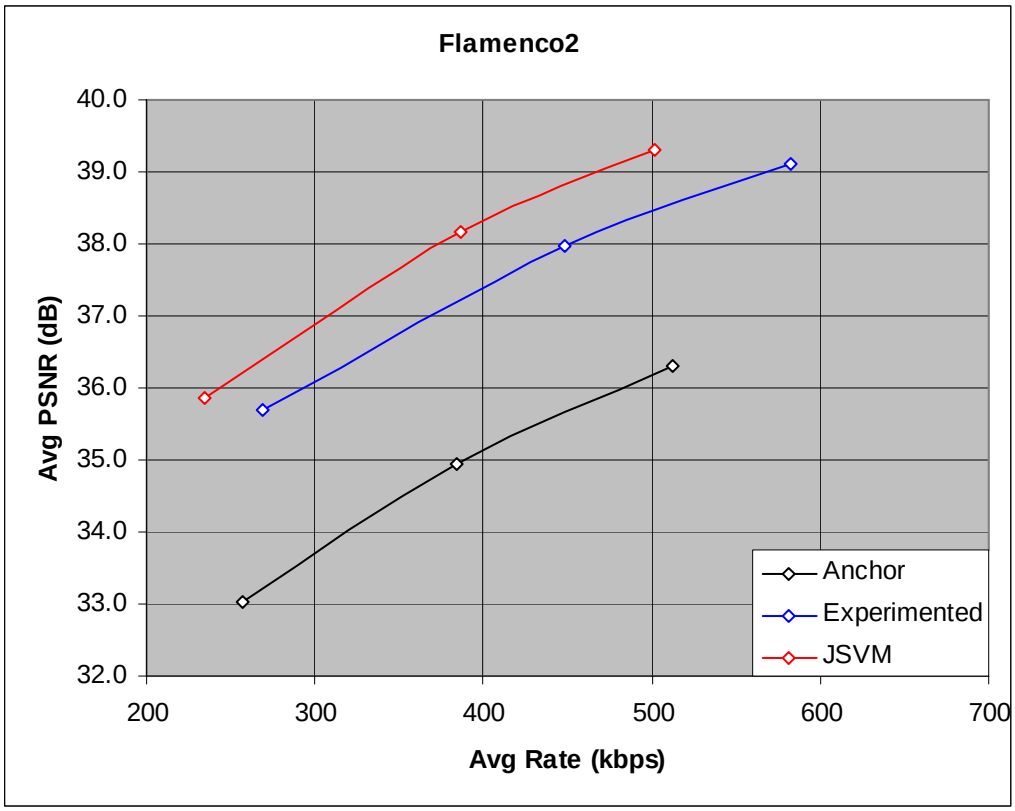

Fig. 7. Rate-distortion curves for “Flamenco2”

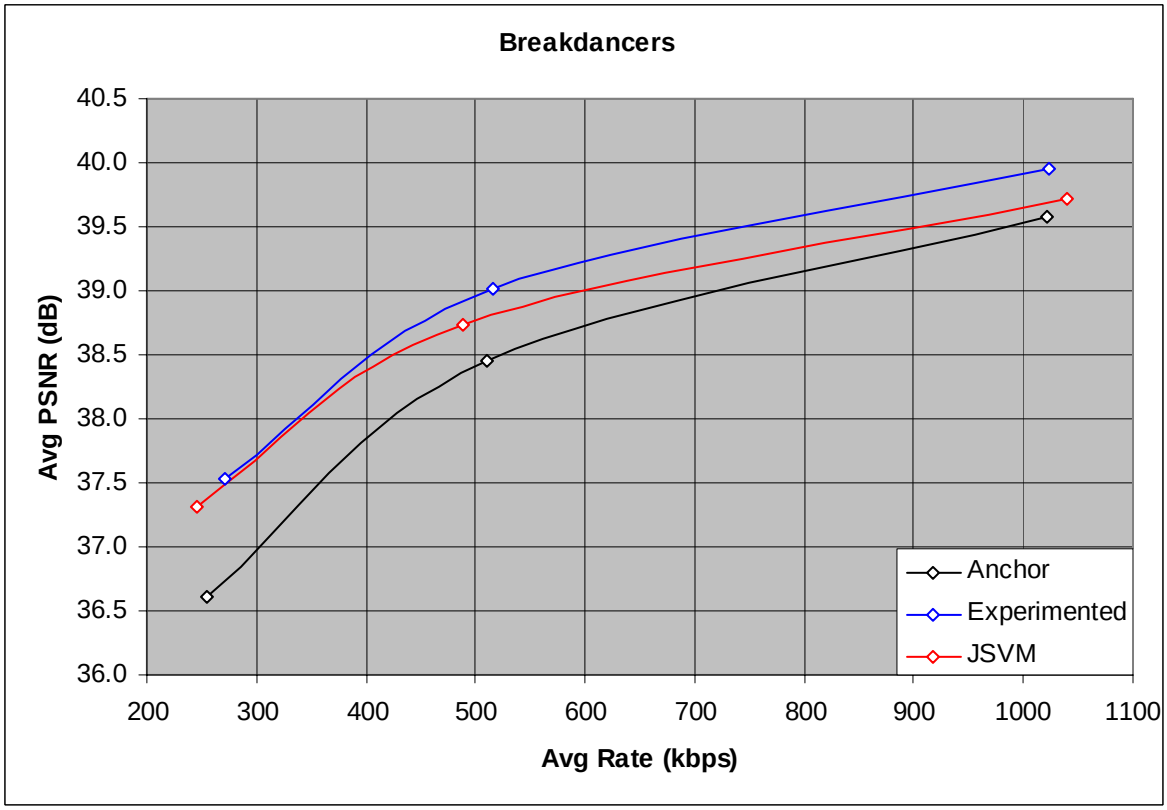

Fig. 8. Rate-distortion curves for “Breakdancers”

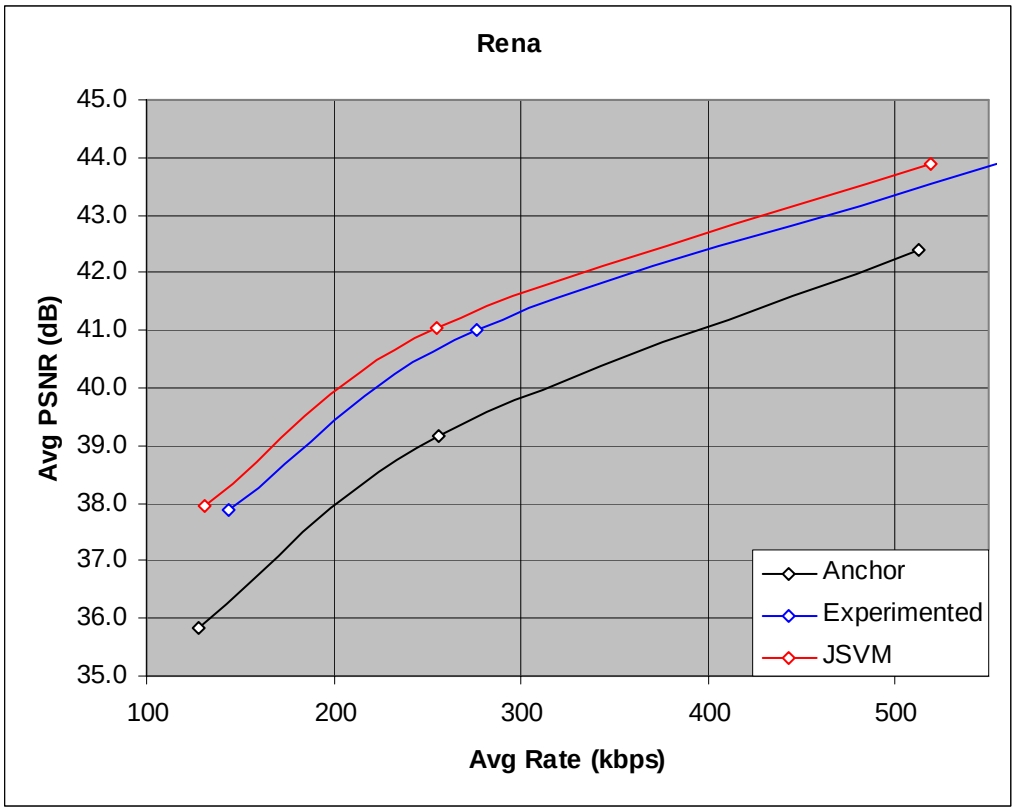

Fig. 9. Rate-distortion curves for “Rena”

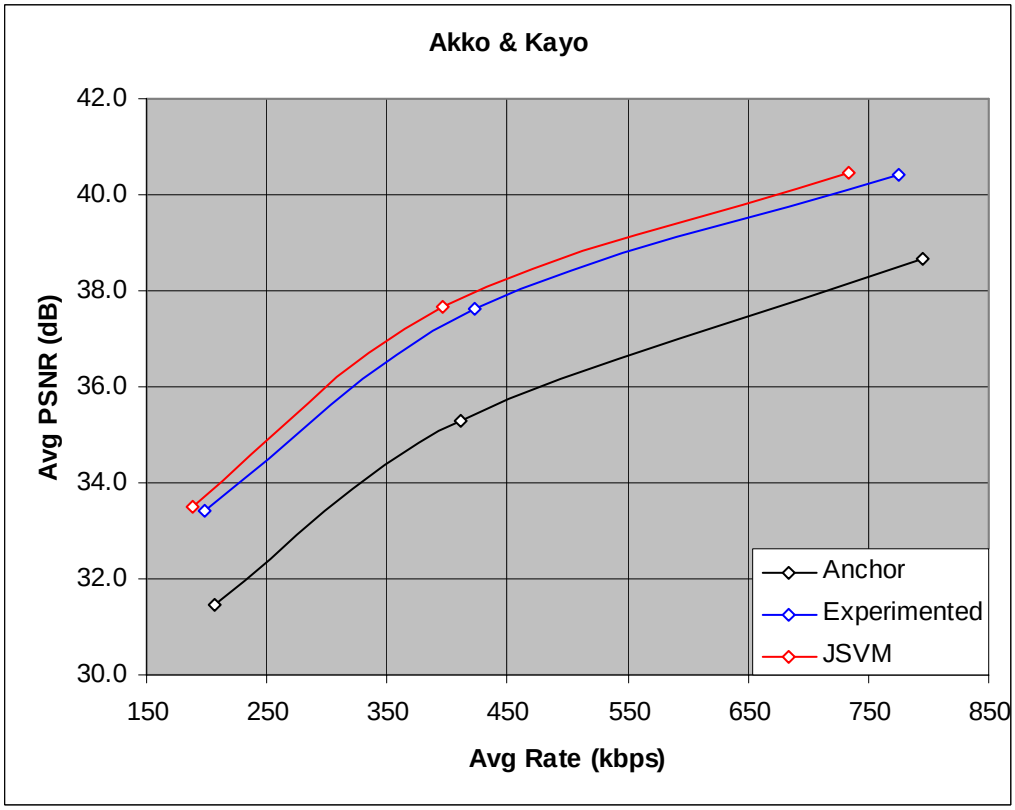

Fig. 10. Rate-distortion curves for “Akko&Kayo”