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Source	**Poznań University of Technology,**
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Title	**FTV EE3: Compression of FTV video with circular camera arrangement**
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1 Introduction

This document presents a comparison of compression performance of a circular camera arrangement sequence "Poznan Blocks" with MV-HEVC [1], 3D-HEVC [2] and simulcast HEVC [3] coding.

2 Experimental setup

For the experiments, three different encoders have been used:

- HEVC[3] (Simulcast),
- MV-HEVC [1],
- 3D-HEVC [2].

As a software for all of the encoders, the latest HTM software has been used. For that HTM has been compiled with different modes and macro directives.

In the experiment 3 views of "Poznan Blocks" sequence have been used. Views number 4, 5 and 6 has been selected. Only the texture views (without depth) has been encoded.

A special case had to be taken in providing camera parameters for encoding with 3D-HEVC. The current 3D-HEVC is designed to support only linear camera arrangement. As the used "Poznan Blocks" sequence has arc camera arrangement, the camera position parameter (required by current 3D-HEVC encoder) has been set as an Euclidean distance between camera 5 and other cameras, as presented in Fig. 1. This way, a rough approximation of the distance between camera is available to the encoder.

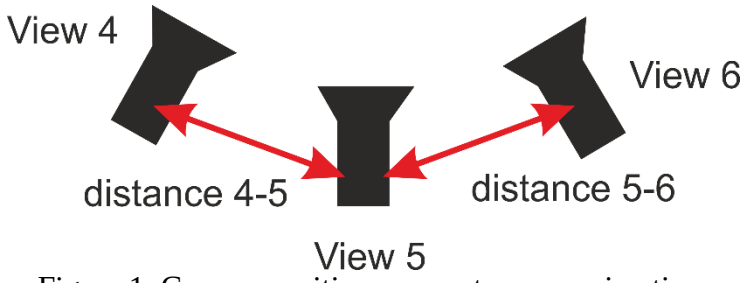

Figure 1. Camera position parameter approximation.

The encoding was performed according to JCT-3V Common Test Conditions (CTC) [4]. Four different QP values have been used: 25, 30, 35, 40. For each case, 50 frames of each view have been compressed.

3 Results

The raw results of the performed experiment are gathered in Table 1, showing total bitrates of all three coded views and averaged decoded views quality in terms of luminance PSNR.
In Fig. 2, corresponding rate-distortion curves are presented.

Table 1. Coding results of Poznan Blocks with use of three encoders.

HEVC		MV-HEVC		3D-HEVC	
Bitrate [kbps]	PSNR [dB]	Bitrate [kbps]	PSNR [dB]	Bitrate [kbps]	PSNR [dB]
3682	44,43	2695	43,41	2637	43,35
2121	41,96	1513	40,83	1468	40,75
1241	39,19	886	38,05	842	37,98
732	36,24	526	35,17	484	35,09

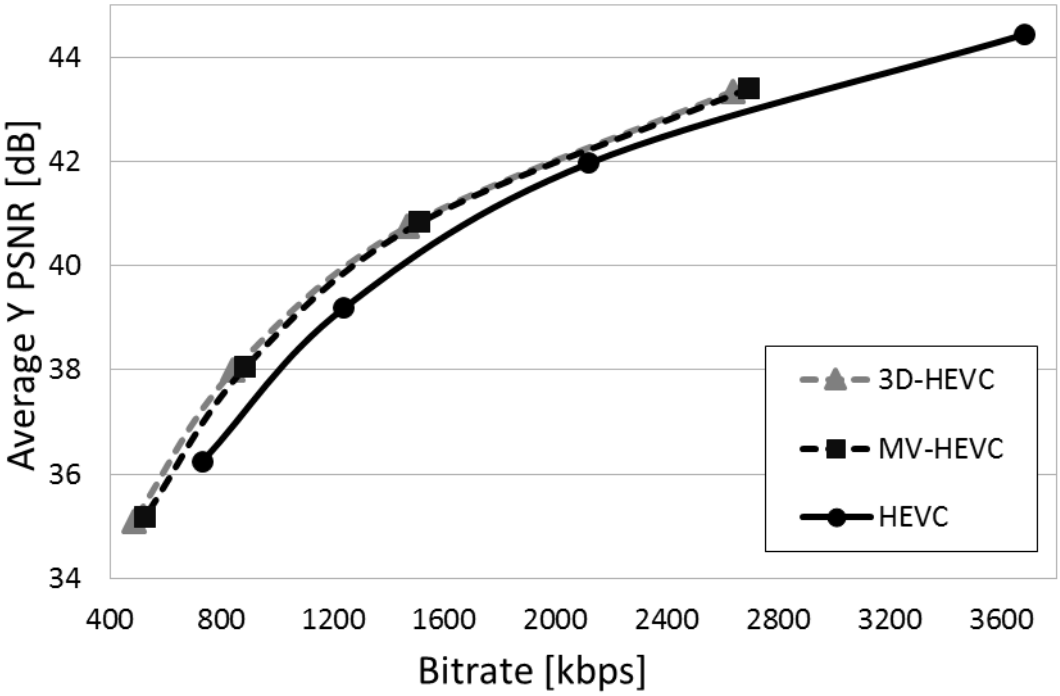

Figure 2. Experiment results.

Table 2. Comparison of different coding technologies with use of Bjøntegaard deltas.

MV-HEVC vs HEVC		3D-HEVC vs HEVC		MV-HEVC vs 3D-HEVC	
BD-Rate	**BD-Psnr**	**BD-Rate**	**BD-Psnr**	**BD-Rate**	**BD-Psnr**
-10,88%	0,59	-13,08%	0,69	-2,88%	0,14

In order to objectively asses the gains of each codec relatively to each other, Bjøntegaard deltas have been calculated. Those are presented in Table 2.
It can be seen that MV-HEVC provides gains of about 10% relatively to HEVC simulcast and that 3D-HEVC increases this gain by additional 3%.
This confirms intuitive assumptions that the gains of MV-HEVC and 3D-HEVC are lesser than in the case of linear camera arrangement. In the case of MV-HEVC, because the content overlap is much smaller in arc camera arrangement and in 3D-HEVC also because the coding tools in 3D-HEVC are adapted to such camera setup.

4 Conclusions

The results of the experiment show a clear improvement of the compression performance obtained when using multiview extension of HEVC over simulcast HEVC. On the other hand observed coding gains are lower compared to compression gains of multiview extension of HEVC reported in other documents obtained on sequences with linear camera arrangement. Further work is needed to increase coding performance of sequences with arc camera arrangement.

5 References

[1] G. Tech, K. Wegner, Y. Chen, M. Hannuksela, J. Boyce, „MV-HEVC Draft Text 3”, JCT3V Document, JCT3V-C1004, Geneva, Switzerland, Jan. 2013.

[2] G. Tech, K. Wegner, Y. Chen, S.Yea, “3D-HEVC Test Model 4”, JCT-3V of ITU-T SG 16 WP 3 and ISO/IEC JTC1/SC 29/WG 11, Doc. JCT3V-D1005, Incheon, South Korea, 2013.

[3] High Efficiency Video Coding technology described in ISO/IEC 23008-2:2013 (MPEG-H Part 2) and ITU Rec. H.265 international coding standards.

[4] Karsten Müller, Anthony Vetro, “Common Test Conditions of 3DV Core Experiments”, Joint Collaborative Team on 3D Video Coding Extension Development of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11 Document JCT3V-G1100, San José, US, 11–17 Jan. 2011.