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Author Dawid Mieloch, Adrian Dziembowski, Marek Domański

1 Introduction

This document presents a technical description of the PUT experiment on texture-based pruning (Immersive Video CE2.7). In the proposed solution, pruning is performed using depth and color information.

2 Proposed technique

In TMIV5, pruning is based on depth information. In the proposed approach, two types of information are taken into account: depth and texture.

Depth information is analyzed in the same way as in TMIV5. Color information is analyzed as a pixel-to-block comparison (Fig. 1). In this example, a pixel from view v0 is reprojected to v1. Depth similarity is being checked only for the colocated pixel (dark blue). Color of pixel marked in orange is compared to the color of all pixels in the 3×3 neighborhood of the colocated one.

If the minimum error within a block is lower than a threshold (and $\text{abs}(\text{depthError}) < m_\text{maxDepthError}$ like in TMIV5), the pixel of view v1 is being pruned. Otherwise, it is preserved. The threshold was set to 40 for all sequences.

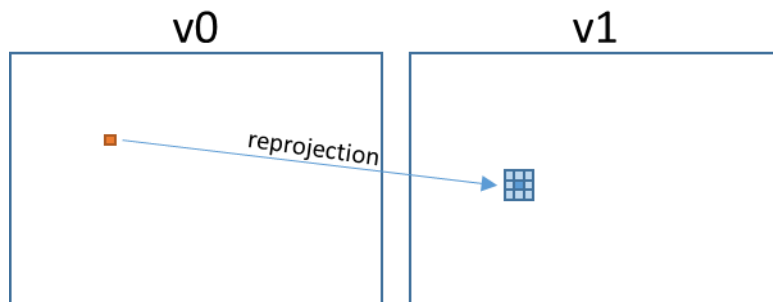


Fig. 1. The idea of color-aware block-based pruning.

Example of atlases with and without proposed color-aware block-based pruning are presented in Figs. 2 and 3. As shown, proposed solution allows preserving regions with different texture/lighting conditions (Fig. 2). On the other hand, because of block-based characteristics, it is less sensitive to noise (Fig. 3) and only slightly increases non-pruned area for such type of content.



Fig. 2. SN atlas: anchor (left) vs. proposal (right).



Fig. 3. SA atlas: anchor (left) vs. proposal (right).

3 Experimental results

Table 1. Proposed approach vs. A97 anchor, objective results.

Mandatory content - Proposal vs. Low/High-bitrate Anchors

Sequence		High-BR BD rate Y-PSNR	Low-BR BD rate Y-PSNR	Max delta Y-PSNR	High-BR BD rate VMAF	Low-BR BD rate VMAF	High-BR BD rate IV-PSNR	Low-BR BD rate IV-PSNR	Pixel rate ratio
ClassroomVideo	SA	6.8%	15.4%	3.20	19.6%	20.7%	9.7%	15.3%	0.63
TechnicolorMuseum	SB	0.7%	1.5%	13.93	-0.6%	0.9%	0.2%	1.2%	0.63
InterdigitalHijack	SC	-19.8%	-10.2%	8.16	4.2%	5.2%	-24.9%	-15.9%	0.63
OrangeKitchen	SJ	-33.1%	-9.0%	12.60	7.9%	21.5%	-35.1%	-14.0%	0.62
TechnicolorPainter	SD	1.3%	2.0%	6.94	1.2%	2.0%	1.7%	2.0%	0.63
IntelFrog	SE	-32.3%	11.5%	10.89	9.7%	35.5%	-23.1%	14.7%	0.62
PoznanFencing	SL	0.0%	0.0%	12.63	0.0%	-51.5%	0.0%	-39.4%	0.52
MIV		-10.9%	1.6%	9.77	6.0%	4.9%	-10.2%	-5.2%	

Optional content - Proposal vs. Low/High-bitrate Anchors

NokiaChess	SN	-64.0%	-46.9%	11.40	-2.6%	17.0%	-61.8%	-47.8%	0.63
PoznanCarpark	SP	-19.8%	-8.6%	12.24	-12.3%	-2.9%	-17.2%	-6.7%	0.52
PoznanHall	ST	-51.1%	-33.5%	10.90	-16.4%	-6.9%	-40.8%	-29.4%	0.52
PoznanStreet	SU	-10.9%	-2.5%	12.59	-11.2%	-0.1%	0.5%	4.3%	0.52
MIV		-36.5%	-22.9%	11.78	-10.7%	1.8%	-29.8%	-19.9%	

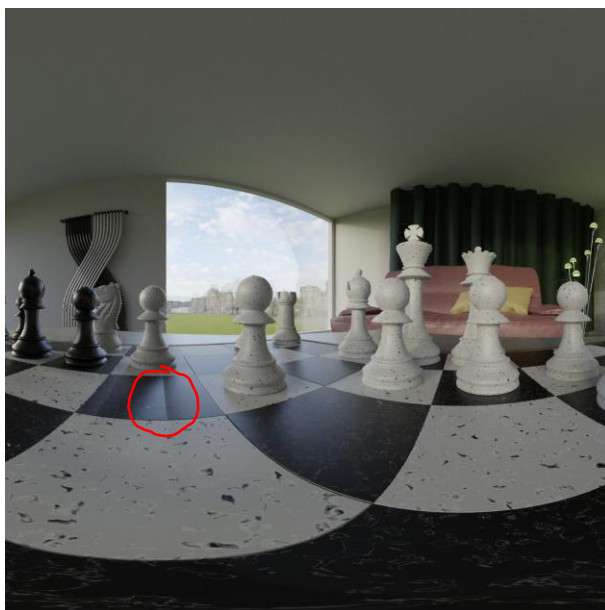
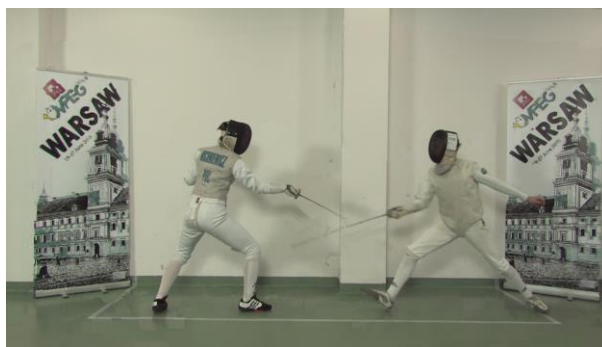
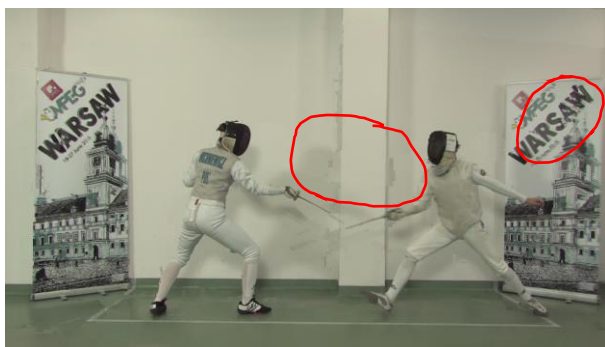


Fig. 4. Anchor vs. proposal at similar bitrate, synthesized input views.

4 Acknowledgement

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5 Recommendations

We recommend to include the proposed technique into TMIV6.

6 References

- [N19216] “Description of Immersive Video Core Experiments 2: Pruning and Synthesis”
ISO/IEC JTC1/SC29/WG11 MPEG/N19216, May 2020, Alpbach, Austria.