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Title: Analysis of further block splitting in feature-driven DSDE
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Abstract

This informative contribution presents the results of the experiments on the influence of block splitting on DSDE coding efficiency. Recursive block splitting was added, allowing better suiting to edges in depth maps. In total, 18 configurations were tested.

1 Recursive block splitting

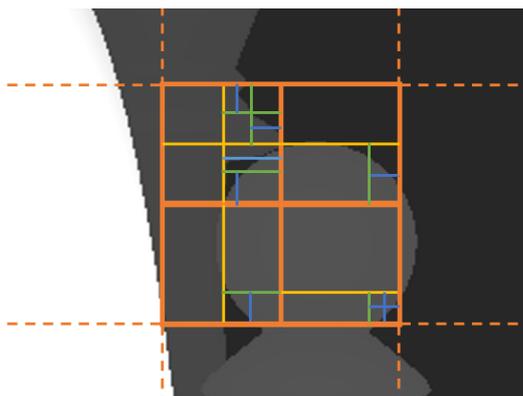


Fig. 1. Idea of the recursive block splitting. Orange: 1st split (128x128 => 64x64) as in [m56950]; additional recursive splits: 2nd (yellow), 3rd (green), and 4th (blue).

In the experiments, the influence of 3 parameters was evaluated: max block size, min block size, and rectangular splitting.

In total, 18 configurations were tested:

Block split types	Max/min block size		
	Square only	128/64	128/16
64/32		64/16	64/8
Square + symmetrical rectangle	128/64	128/16	128/8
	64/32	64/16	64/8
Square + symmetrical & asymmetrical rectangle	128/64	128/16	128/8
	64/32	64/16	64/8

2 Comparison of all configurations

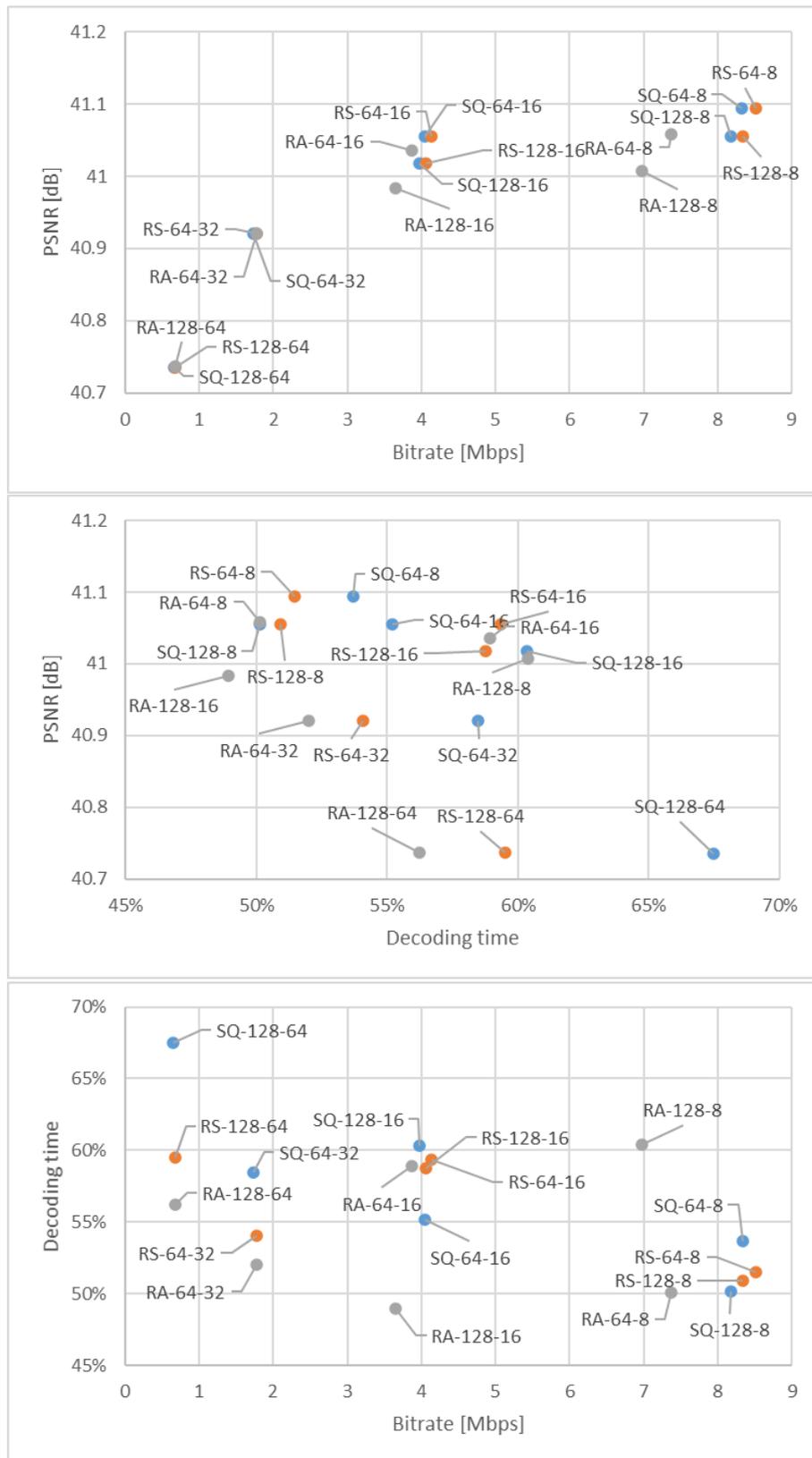
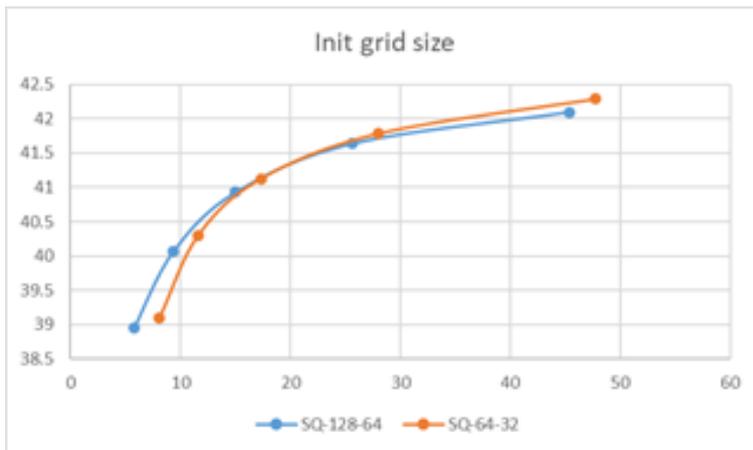


Fig. 2. WS-PSNR vs. bitrate vs. decoding time for different configurations, SQ – square only, RS – square + symmetrical rectangles, RA – square + all rectangles (50/50, 25/75, 75/25).

3 Influence of the initial grid size

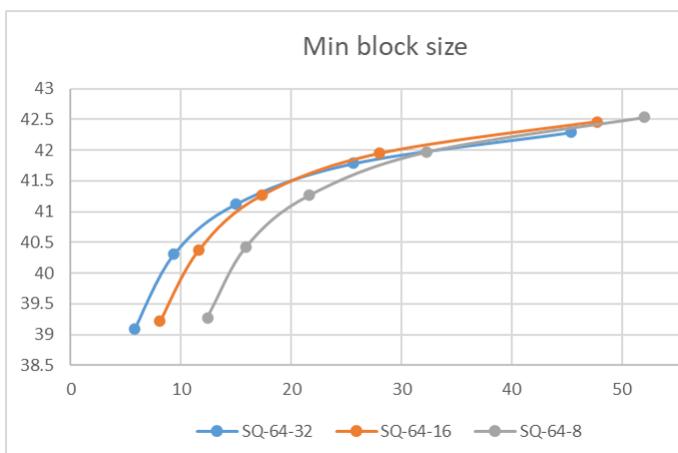


Decoding time:

init grid si	SQ-128-64	SQ-64-32
AVG	67%	58%
omni	75%	64%
persp	64%	55%
CG	63%	56%
NC	74%	62%

- the bitrate of the video is always the same,
- smaller grid size always increases metadata bitrate,
- for lower bitrates, the quality increase for smaller grid size is too small to compensate for the increase of the bitrate,
- for higher bitrates, smaller grid size allows achieving better results,
- the decoding time is always smaller for a smaller grid size.

4 Minimum block size

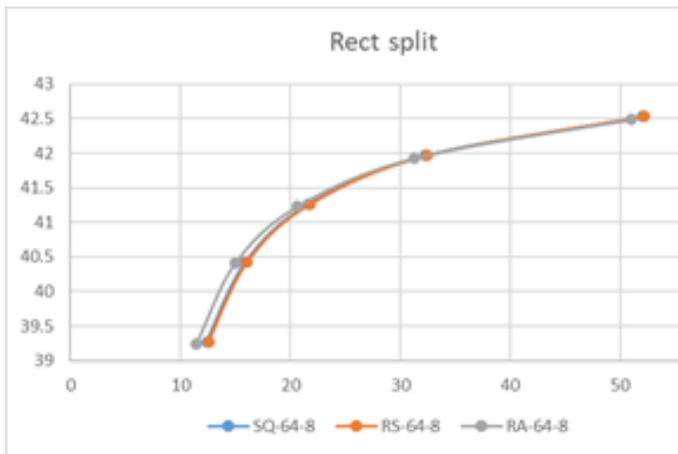


Decoding time:

min block	SQ-64-32	SQ-64-16	SQ-64-8
AVG	58%	55%	54%
omni	64%	64%	64%
persp	55%	51%	49%
CG	56%	54%	54%
NC	62%	56%	53%

- additional recursive splits increase the metadata bitrate (as expected),
- for lower bitrates, the best choice is to split only once,
- the additional splitting levels are profitable for higher bitrates: 2nd split for medium bitrates (20 – 45 Mbps), and 3rd split for highest bitrates (> 50 Mbps),
- the decoding time decreases when additional split levels are enabled (because of better adaptation to depth edges).

5 Allowance of rectangular splitting



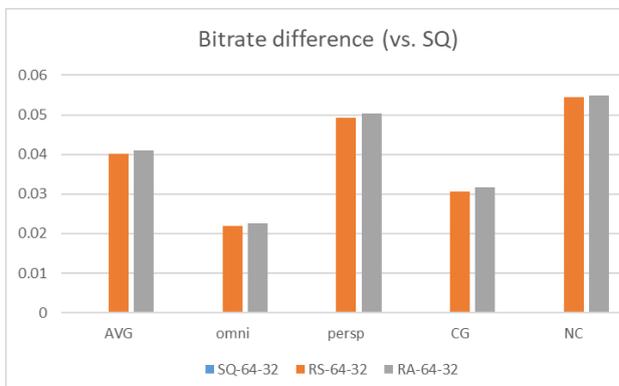
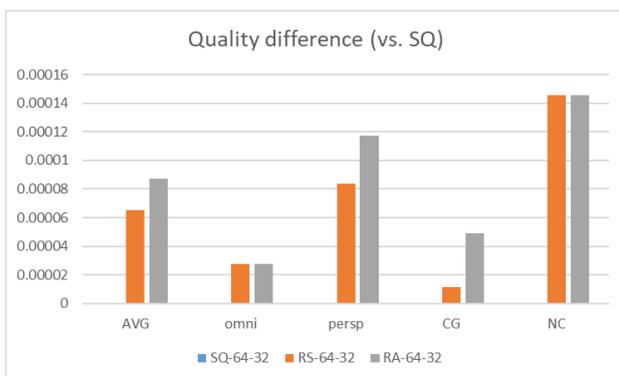
Decoding time:

rect split	SQ-64-8	RS-64-8	RA-64-8
AVG	54%	51%	50%
omni	64%	62%	60%
persp	49%	46%	45%
CG	54%	52%	52%
NC	53%	50%	47%

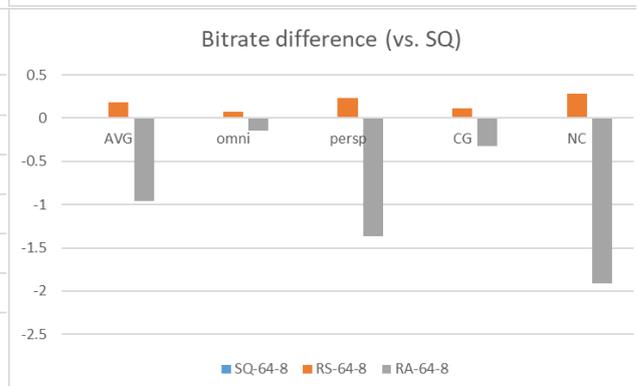
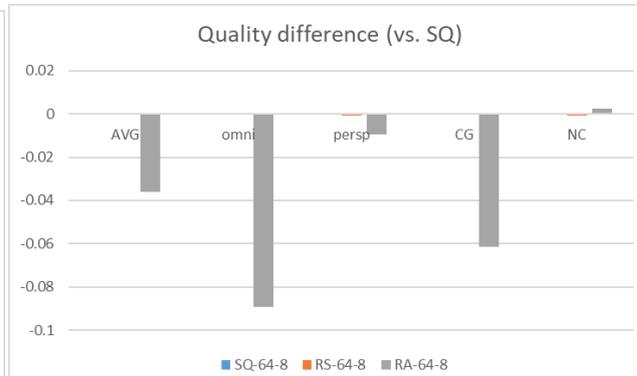
- the benefit of the symmetrical rectangular split is negligible in terms of quality or bitrate, but it decreases the decoding time,
- additional asymmetrical splitting allows to additionally decrease the computational time of the decoder while also increasing the encoding efficiency,
- further analysis of these results are provided in section 6

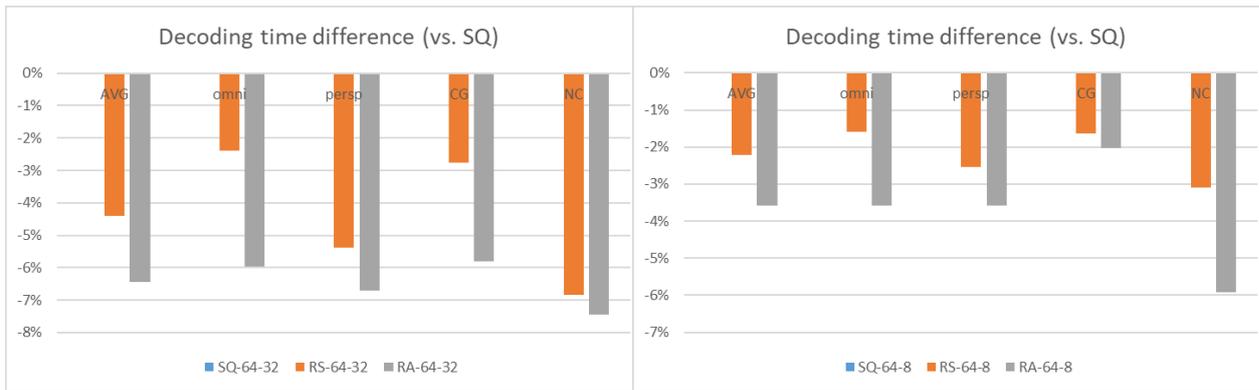
6 Square vs. rectangular splitting for recursive and non-recursive scenario

Non-recursive splitting (64 => 32)



Recursive splitting (64 => 8)





- the positive impact of the rectangular splitting is more noticeable in the recursive scenario,
- when only 1 split is allowed, both the quality and bitrate difference are negligible (up to 0.00014 dB and 50 kbps, on average),
- for recursive splitting, allowance of the asymmetrical rectangular split is very profitable in terms of bitrate (up to 2 Mbps reduction of the metadata bitrate for natural content),
 - the reason – asymmetrical rectangles can adapt to the depth edges much faster, than symmetrical rectangles and squares (therefore, fewer split levels are needed for many areas),
 - it also reduces the quality, but the result is negligible (up to 0.08 dB),
- rectangular splitting significantly reduces the decoding time, both for the recursive and non-recursive scenarios.

7 (No) recommendations

This is just an informative contribution, which shows the potential benefits of adding the recursive block splitting into the feature-driven DSDE.

Acknowledgement

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