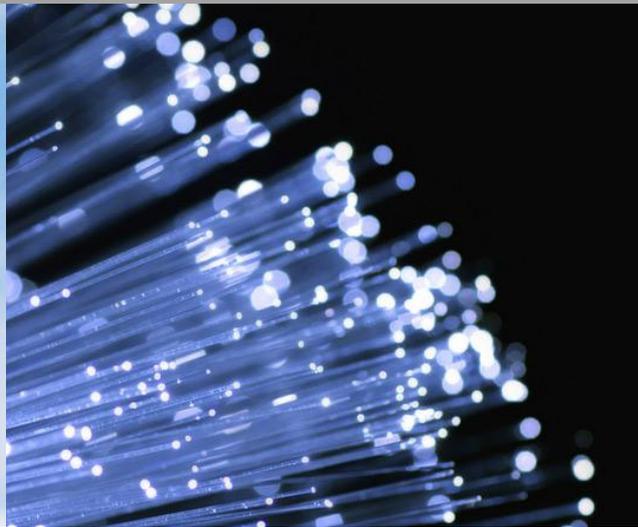


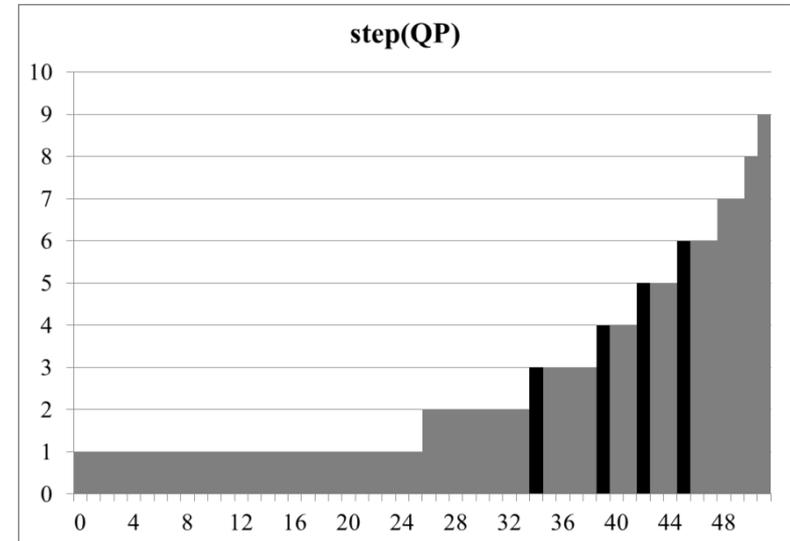
CE6.H related: Modified *deltaDC* for DMM Proposal (JCT3V-C0034)

Philipp Merkle, Karsten Müller, and Thomas Wiegand



Current *deltaDC* method:

- Residual adaptation in pixel domain by transmitting partition offset values for DMM modes.
- QP-dependent quantization of offset values.
- Encoder estimation of offset values by VSO-based minimum distortion search.

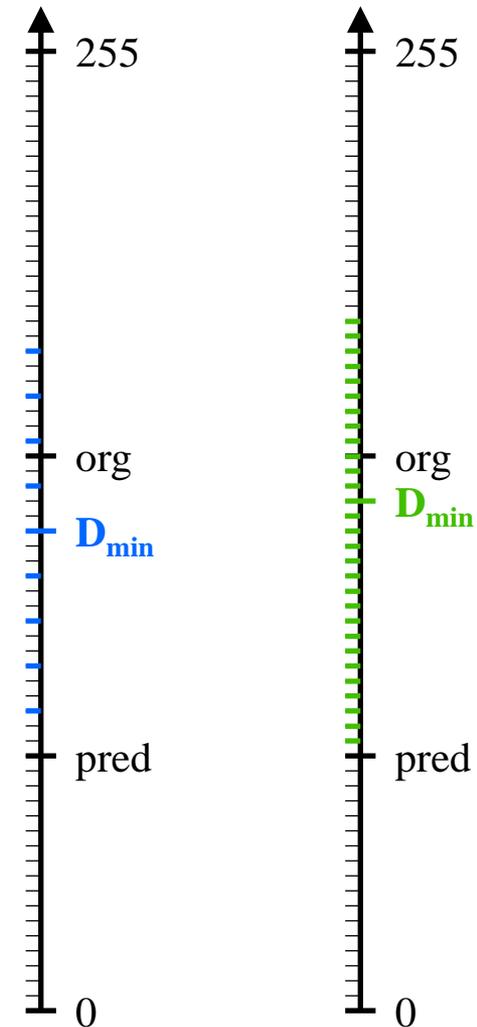


Motivation for proposal:

- Remove quantization and operate with full depth precision (cp. SDC in JCT3V-B0036), targeting better coding performance without increase in complexity.

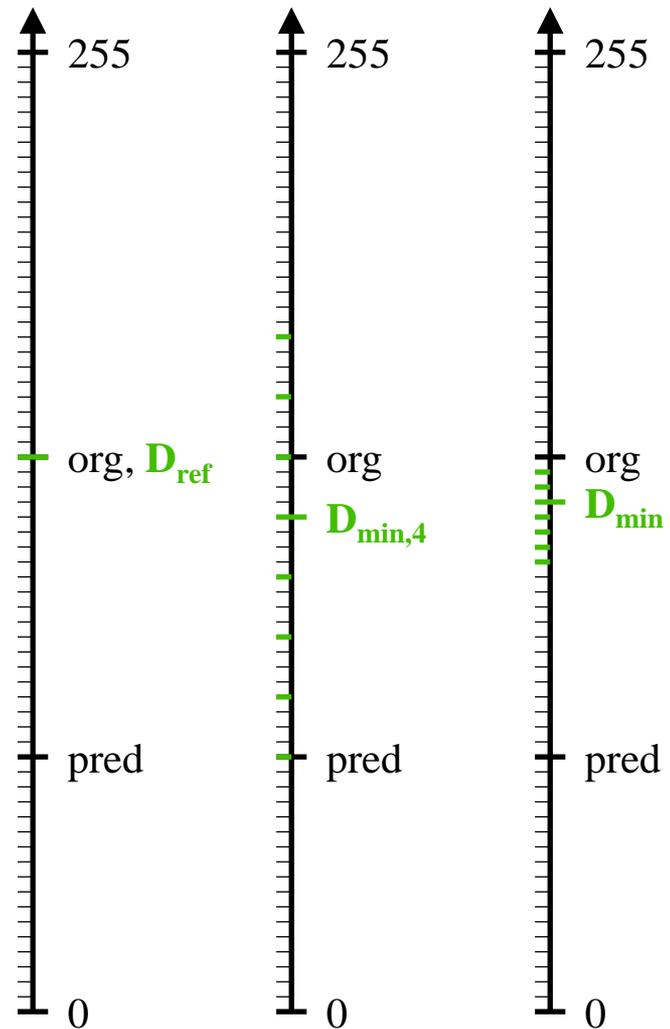
Un-quantized partition offset values:

- Higher precision of residual adaptation, allowing to omit transform coefficients more often.
- Increase in encoder complexity, due to more offset values to be tested.
- Larger absolute values that have to be signaled.
- Simplification of decoding process (specification and implementation).



Optimized search strategy:

- Goal: keep coding gain, reduce complexity overhead.
- Initialize search with distortion of original partition values.
- Perform coarse search with offset steps of 4, starting with 0.
- If one of the coarse offset combinations leads to lower distortion than original partition values, perform refinement step for $[-3,3]$ around best coarse offsets.



Fix for DMM context initialization:

- Data type for context initialization values has changed from `Short` to `UChar` since the DMM modes were first implemented.
- Correcting data type results in a very small coding gain.

- Random access:

	video only	synthesized only	coded & synthesized	enc time	dec time	ren time
Balloons	0.0%	-0.1%	0.0%	100.6%	91.6%	99.4%
Kendo	0.0%	-0.1%	0.0%	100.2%	95.0%	99.6%
Newspapercc	0.0%	-0.3%	-0.2%	100.5%	96.0%	100.5%
GhostTownFly	0.0%	-0.3%	-0.2%	100.8%	99.4%	96.8%
PoznanHall2	0.0%	-0.1%	-0.1%	99.9%	87.3%	96.2%
PoznanStreet	0.0%	-0.2%	-0.1%	100.3%	94.1%	99.1%
UndoDancer	0.0%	-0.1%	-0.1%	100.2%	95.0%	99.3%
1024x768	0.0%	-0.1%	-0.1%	100.4%	94.2%	99.8%
1920x1088	0.0%	-0.2%	-0.1%	100.3%	93.9%	97.8%
average	0.0%	-0.2%	-0.1%	100.3%	94.0%	98.7%

- All-intra:

	video only	synthesized only	coded & synthesized	enc time	dec time	ren time
Balloons	0.0%	-0.4%	-0.2%	107.0%	91.8%	99.1%
Kendo	0.0%	-0.4%	-0.2%	107.1%	99.6%	100.2%
Newspapercc	0.0%	-0.8%	-0.4%	107.0%	95.7%	99.9%
GhostTownFly	0.0%	-1.1%	-0.7%	108.1%	102.8%	98.1%
PoznanHall2	0.0%	-0.7%	-0.5%	104.1%	107.8%	100.3%
PoznanStreet	0.0%	-0.5%	-0.3%	106.1%	99.3%	99.8%
UndoDancer	0.0%	-0.9%	-0.6%	104.7%	98.6%	101.0%
1024x768	0.0%	-0.5%	-0.3%	107.1%	95.7%	99.7%
1920x1088	0.0%	-0.8%	-0.5%	105.7%	102.1%	99.8%
average	0.0%	-0.7%	-0.4%	106.3%	99.3%	99.8%

Section G.8.4.4.2.12 of JCT3V-B1005:

- Removing de-quantization from decoding process.

2. The variables `predDcVal` specifying the predicted constant partition values for partition X is derived as follows.

$$\text{predDcVal} = (\text{numNeigh} \neq 0) ? (\text{sumNeigh} / \text{numNeigh}) : (1 \ll (\text{BitDepth}_Y - 1))$$

~~3. The variable `deQuantDcOffset` specifying the de-quantized DC offset is derived as follows.~~

~~— If `dcOffsetAvailFlag` is equal to 1, the following applies.:~~

$$\begin{aligned} \text{deOffset} = \\ \text{quantDcOffsetPX} * \text{Clip3}(1, (1 \ll \text{BitDepth}_Y) - 1, \text{Round}(2^{-(\text{QP}_Y - 10) - 2})) \end{aligned}$$

~~— Otherwise (`dcOffsetAvailFlag` is equal to 0), `deQuantDcOffset` is set equal to 0.~~

4.3. The predicted sample values `predSamples` are derived as follows for $x = 0..nT-1$ and for $y = 0..nT-1$.

– When `partitionPattern[x][y]` is equal to X, the following applies.

– If `dcOffsetAvailFlag` is equal to 1, the following applies:

$$\text{predSamples}[x][y] = \text{predDcVal} + \text{deOffset} \text{quantDcOffsetPX}$$

– Otherwise (`dcOffsetAvailFlag` is equal to 0), the following applies:

$$\text{predSamples}[x][y] = \text{predDcVal}$$

- Proposed method achieves BD-rate gains of 0.2% (CTC) and 0.7% (all-intra).
 - Decoder complexity identical, little increase in encoder complexity.
 - Draft specification simplified (small change).
 - Fix for DMM context initialization.
 - Thanks to Qualcomm for kindly cross-checking proposal.
- Proposed modifications lead to **better coding performance** and **simplify decoding process** for DMM modes and should therefore be **considered for adoption to 3D-HTM**.