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| *Title:* | **CE6.H related: Results on Fixes for Context Initialization and Unary Coding for SDC** | | |
| *Status:* | Input Document | | |
| *Purpose:* | Proposal | | |
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# Abstract

In this proposal two modifications to HTM and the 3D-HEVC specification text are proposed. First, it is proposed to align the unary coding of the SDC prediction mode in the software with the latest version of the specification text. Second, the context initialization in the software in HTM 6.1 is based on a *Short* data type, but needs to be *UChar*. This modification is also proposed in this contribution.

# Unary Coding of SDC Prediction Mode

In the current 3D-HEVC specification text the SDC prediction mode is coded with a unary code. The HTM 6.1 software also codes the SDC prediction mode a unary code, but the zeros and ones in that code are negated. Moreover, the number of CABAC contexts for the symbol sdc\_pred\_mode is reduced from 3 (as in HTM 6.1) to 2.

# Fixed Context Initialization

It is further proposed to fix the context initialization of the HTM 6.1 software for all SDC symbols from *Short* to *UChar*. This also includes improved initialization for the corresponding contexts. This modification is also described in contribution D0032.

## Modifications to Specification Text

1. Table G‑15 – Values of variable initValue for sdc\_flag ctxIdx

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Initialization variable** | **sdc\_flag** | | | | | | | | |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| **initValue** | ~~0~~ 154 | ~~0~~ 154 | ~~64~~ 154 | ~~0~~ 154 | ~~0~~ 154 | ~~0~~ 154 | ~~64~~ 154 | ~~0~~ 154 | ~~0~~ 154 |

1. Table G‑16 – Values of variable initValue for sdc\_residual\_flag ctxIdx

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Initialization variable** | **sdc\_residual\_flag** | | | | | |
| **0** | **1** | **2** | **~~3~~** | **~~4~~** | **~~5~~** |
| **initValue** | ~~251~~ 154 | ~~255~~ 154 | ~~0~~ 154 | ~~0~~ 154 | ~~56~~ 154 | ~~0~~ 154 |

1. Table G‑18 – Values of variable initValue for sdc\_residual\_abs\_minus1 ctxIdx

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **~~Initialization variable~~** | **~~sdc\_residual\_abs\_minus1~~** | | | | | | | | | |
| **~~0~~** | **~~1~~** | **~~2~~** | **~~3~~** | **~~4~~** | **~~5~~** | **~~6~~** | **~~7~~** | **~~8~~** | **~~9~~** |
| **~~initValue~~** | ~~255~~ | ~~255~~ | ~~64~~ | ~~0~~ | ~~2~~ | ~~0~~ | ~~64~~ | ~~0~~ | ~~6~~ | ~~0~~ |
|  | **~~10~~** | **~~11~~** | **~~12~~** | **~~13~~** | **~~14~~** | **~~15~~** | **~~16~~** | **~~17~~** | **~~18~~** | **~~19~~** |
| **~~initValue~~** | ~~67~~ | ~~0~~ | ~~8~~ | ~~0~~ | ~~61~~ | ~~0~~ | ~~7~~ | ~~0~~ | ~~47~~ | ~~0~~ |
|  | **~~20~~** | **~~21~~** | **~~22~~** | **~~23~~** | **~~24~~** | **~~25~~** | **~~26~~** | **~~27~~** | **~~28~~** | **~~29~~** |
| **~~initValue~~** | ~~243~~ | ~~255~~ | ~~12~~ | ~~0~~ | ~~14~~ | ~~0~~ | ~~33~~ | ~~0~~ | ~~243~~ | ~~255~~ |
|  | **~~30~~** | **~~31~~** | **~~32~~** | **~~33~~** | **~~34~~** | **~~35~~** | **~~36~~** | **~~37~~** | **~~38~~** | **~~39~~** |
| **~~initValue~~** | ~~2~~ | ~~0~~ | ~~66~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~63~~ | ~~0~~ | ~~1~~ | ~~0~~ |
|  | **~~40~~** | **~~41~~** | **~~42~~** | **~~43~~** | **~~44~~** | **~~45~~** | **~~46~~** | **~~47~~** | **~~48~~** | **~~49~~** |
| **~~initValue~~** | ~~12~~ | ~~0~~ | ~~50~~ | ~~0~~ | ~~14~~ | ~~0~~ | ~~27~~ | ~~0~~ | ~~0~~ | ~~0~~ |
|  | **~~50~~** | **~~51~~** | **~~52~~** | **~~53~~** | **~~54~~** | **~~55~~** | **~~56~~** | **~~57~~** | **~~58~~** | **~~59~~** |
| **~~initValue~~** | ~~239~~ | ~~255~~ | ~~14~~ | ~~9~~ | ~~27~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~239~~ | ~~255~~ |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Initialization variable** | **sdc\_residual\_abs\_minus1** | | | | | | | | |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **initValue** | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 |
|  | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** |
| **initValue** | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 |
|  | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** |
| **initValue** | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 |

Table G-19 – Values of variable initValue for sdc\_pred\_mode ctxIdx

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Initialization variable** | **sdc\_pred\_mode** | | | | | | | | |
| **0** | **1** | **2** | **3** | **4** | **5** | **~~6~~** | **~~7~~** | **~~8~~** |
| **initValue** | ~~9~~ 154 | ~~255~~ 154 | ~~70~~ 154 | ~~0~~ 154 | ~~9~~ 154 | ~~255~~ 154 | ~~70~~ | ~~0~~ | ~~9~~ |

# Simulation Results

The simulations were performed according the common test conditions [[1](#Hei11)]. For the All-Intra coding scenario, configuration files from Core Experiment 6 on Depth Map Intra Coding Tools were used.

The anchor for the simulations was HTM 6.1. Accidentally, the tested simulations did not only include the proposed modifications, but also some bug fixes to the HTM 6.1 software, which were enabled for the simulations. These include the following macro definitions in Typedef.h:

FIX\_CHROMA\_RESIDUAL\_C0129  
FCO\_DVP\_REFINE\_C0132\_C0170  
FCO\_FIX  
FCO\_FIX\_SPS\_CHANGE  
MTK\_DVPREFINE\_BVSP\_BUG\_FIX  
MERL\_VSP\_C0152\_BugFix\_ForNoDepthCase

The accidentally enabled bug fixes in HTM 6.1 without the proposed modifications does not lead to changes in the average coding performance compared to the unmodified HTM 6.1 anchor.

## Random Access Coding Configuration (CTC)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | video 0 | video 1 | video 2 | video PSNR / video bitrate | video PSNR / total bitrate | synth PSNR / total bitrate | enc time | dec time |
| Balloons | 0,0% | 0,0% | -0,1% | 0,0% | 0,0% | -0,1% | 99,7% | 98,3% |
| Kendo | 0,0% | 0,2% | -0,1% | 0,0% | -0,1% | -0,2% | 100,2% | 99,0% |
| Newspaper\_CC | 0,0% | -0,2% | 0,0% | 0,0% | -0,1% | -0,1% | 101,0% | 102,4% |
| GT\_Fly | 0,0% | -0,3% | -0,1% | 0,0% | 0,2% | 0,2% | 100,3% | 99,4% |
| Poznan\_Hall2 | 0,0% | 0,4% | 0,6% | 0,2% | 0,1% | 0,0% | 99,0% | 103,1% |
| Poznan\_Street | 0,0% | -0,2% | 0,1% | 0,0% | 0,0% | 0,0% | 99,6% | 99,9% |
| Undo\_Dancer | 0,0% | -0,1% | -0,2% | -0,1% | 0,0% | -0,5% | 101,9% | 98,2% |
| 1024x768 | 0,0% | 0,0% | -0,1% | 0,0% | -0,1% | -0,1% | 100,3% | 99,9% |
| 1920x1088 | 0,0% | -0,1% | 0,1% | 0,0% | 0,1% | -0,1% | 100,2% | 100,2% |
| **average** | **0,0%** | **0,0%** | **0,0%** | **0,0%** | **0,0%** | **-0,1%** | **100,2%** | **100,0%** |

## All-Intra Coding Configuration (AI)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | video 0 | video 1 | video 2 | video PSNR / video bitrate | video PSNR / total bitrate | synth PSNR / total bitrate | enc time | dec time |
| Balloons | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 100,1% | 101,8% |
| Kendo | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,1% | 100,8% | 103,2% |
| Newspaper\_CC | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 101,7% | 98,5% |
| GT\_Fly | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 103,0% | 98,5% |
| Poznan\_Hall2 | 0,0% | 0,0% | 0,0% | 0,0% | 0,2% | 0,2% | 98,2% | 100,0% |
| Poznan\_Street | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 99,6% | 102,2% |
| Undo\_Dancer | 0,0% | 0,0% | 0,0% | 0,0% | 0,1% | 0,1% | 98,6% | 99,3% |
| 1024x768 | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 100,9% | 101,2% |
| 1920x1088 | 0,0% | 0,0% | 0,0% | 0,0% | 0,1% | 0,1% | 99,9% | 100,0% |
| **average** | **0,0%** | **0,0%** | **0,0%** | **0,0%** | **0,0%** | **0,1%** | **100,3%** | **100,5%** |

# Cross Check

The cross check of the proposed modifications to the SDC tool was performed by Qualcomm. They investigated the source code modifications and ran the simulations for verification of the presented results.

In their investigation they did not find any problems with the source code. Their simulation results perfectly match with those presented in this document.

# Conclusion

In this contribution a software bug fixes in terms of context initialization and an alignment of specification text and software for unary coding of SDC prediction is proposed. The proposed modifications have an insignificant impact on the coding performance, but lead to a cleaner design of the HTM reference software.

# Patent rights declaration

**RWTH Aachen University may have current or pending patent rights relating to the technology described in this contribution and, conditioned on reciprocity, is prepared to grant licenses under reasonable and non-discriminatory terms as necessary for implementation of the resulting ITU-T Recommendation | ISO/IEC International Standard (per box 2 of the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form).**