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| *Title:* | **On MCTS extraction information set SEI message** | | |
| *Status:* | Input document | | |
| *Purpose:* | Proposal | | |
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| *Source:* | LG Electronics | | |

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# Abstract

With regard to motion-constrained tile set (MCTS) extraction information set SEI message described in JCTVC-AA1005, the correction of typo, additional description for MCTSs order in the output picture, and additional description for the procedure for slice segment header adjustment are proposed in this contribution.

In the revised version, the slice address reordering process of the decoder is updated based on the comment in the discussion.

# Problem Statement

Motion-constrained tile set (MCTS) extraction information set SEI message provides supplemental information that can be used in the MCTS sub-bitstream extraction to generate a conforming bitstream for an MCTS set [1].

One of the issues with regard to MCTS extraction information set SEI message is the arrangement of MCTSs in the output picture of the sub-bitstream extraction when the MCTSs are on the wrap-around position of the original picture. In the 27th JCT-VC meeting, the carriage of the replacement slice addresses through the MCTS extraction information set SEI message was proposed [2]. As an alternative solution, we propose to use the order of MCTSs in a MCTS set to identify the position of MCTSs in the output picture of the sub-bitstream.

For the slice header adjustment process, in the current text, it is not clear how the picture parameter set and the slice header are linked after the parameter sets replacement by the sub-bitstream extraction process. Since there is no strong constraint about the parameter set identifiers after the sub-bitstream extraction process, it is necessary to describe that the slice header and the corresponding parameter set should be aligned in the specification.

# Proposal

Based on the issues with regard to MCTS extraction information set SEI message, we propose to correct typos, add the description for MCTSs order in the output picture, and edit in additional description for the procedure of slice segment header adjustment.

1. Correct typos

* The output of the MCTS sub-bitstream extraction process is a sub-bitstream outBitstream derived as follows:

– The lists ausWithVps, ausWithSps, and ausWithPps are set to consist of all access units within outBitstream containing non-VCL NAL units with nal\_unit\_type equal to VPS\_NUT, SPS\_NUT, or PPS\_NUT.

2. Add constraints on the MCTS orders for slice segment header adjustment

**idx\_of\_mcts\_in\_set**[ i ][ j ][ k ] specifies the MCTS index of the k-th MCTS in the j-th MCTS set that is associated with the i-th extraction information set. The order index k represents the raster scan order of the k-th MCTSs in the j-th MCTS set where the width and the height of the output picture produced by the j-th MCTS set is provided by the associated activeSPS in the i-th extraction information set. The value of idx\_of\_mcts\_in\_set[ i ][ j ][ k ] shall be in the range of 0 to 511, inclusive.

Also, add the followings in the description of sub-bitstream extraction process

The output picture produced by the MCTS sub-bitstream extraction is constructed by the MCTSs in the MCTS set indicated by mctsSetIdxTarget. The arrangement of MCTSs in the output picture follows the order of idx\_of\_mcts\_in\_set[mctsSetIdxTarget][ mctsEisIdTarget][ k ] where the order index k represents the raster scan order of MCTSs in the output picture. The width and height of the output picture is given by pic\_width\_in\_luma\_samples and pic\_height\_in\_luma\_samples in the active SPS of outBitstream.

An example of the MCTS sub pictures reordering process by using the syntax orders in MCTS set is described in Figure 1.

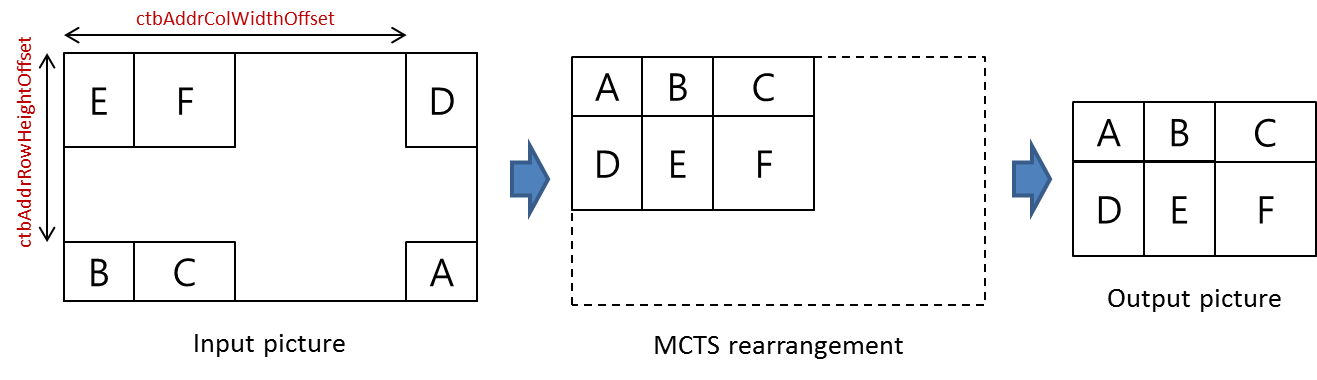


Figure 1. Reordering of MCTS with regard to the order of MCTS identifier. Alphabets in each MCTS (A-F) represent the order of MCTS identifier in the syntax element of MCTS EIS SEI message.

In addition, add the decoder process in the description of sub-bitstream extraction process

* The slice address replacement process is applied as follows:
* For MCTSs whose mcts\_id[ i ] equal to idx\_of\_mcts\_in\_set[ mctsEisIdTarget ][ mctsSetIdxTarget ][ 0 ], set colWidthOffsetInTiles and rowHeightOffsetInTiles equal to top\_left\_tile\_index[ i ][ 0 ] % ( num\_tile\_columns\_minus1 + 1 ) and top\_left\_tile\_index[ i ][ 0 ] / ( num\_tile\_columns\_minus1 + 1 ), respectively.
* Calculate ctbAddrColWidthOffset and ctbAddrRowHeightOffset which are the sum of colWidth[ j ] for j ranges from 0 to colWidthOffsetInTiles and rowHeight[ j ] for j ranges from 0 to rowHeightOffsetInTiles, respectively, with the functions colWidth[ j ] and rowHeight[ j ] are evoked from defined in 6.5.1 given the SPS and PPS of the input video stream.
* For each VCL NAL units in outBitstream, the following applies.
  + Set inCtbAddrColWidth and inCtbAddrRowHeight equal to slice\_segment\_address % PicWidthInCtbsY and slice\_segment\_address / PicWidthInCtbsY, respectively, given the SPS of the input video stream.
  + Set outCtbAddrColWidth and outCtbAddrRowHeight equal to ( inCtbAddrColWidth − ctbAddrColWidthOffset + PicWidthInCtbsY ) % PicWidthInCtbsY and ( inCtbAddrRowHeight − ctbAddrRowHeightOffset + PicHeightInCtbsY ) % PicHeightInCtbsY, respectively, given the SPS of the input video stream.
  + Set the value of slice\_segment\_address equal to outCtbAddrColWidth + outCtbAddrRowHeight \* PicWidthInCtbsY, given the replacement SPS of the output video stream.
* Reorder the VCL NAL units within each access unit for ascending values of slice\_segment\_address.
* For the first VCL NAL unit within each access unit, set the value of first\_slice\_segment\_in\_pic\_flag equal to 1.

3. Add the following procedure for slice segment header adjustment.

For each remaining VCL NAL units in outBitstream, adjust the slice segment header as follows:

Set the value of slice\_pic\_parameter\_set\_id equal to pps\_pic\_parameter\_set\_id in the replacement PPS.

1. **References**
2. JCTVC-AA1005, “HEVC Additional Supplemental Enhancement Information (Draft 2)”, J. Boyce, A. Ramasubramanian, R. Skupin, G. J. Sullivan, A. Tourapis, April 2017, Hobart.
3. JCTVC-AA0029, “MCTS extraction with slice reordering”, R. Skupin, Y. Sanchez, April 2017, Hobart.

# Patent rights declaration(s)

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