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| *Title:* | **HLS: Extensions to Motion-constrained tile sets SEI message** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
| *Author(s) or Contact(s):* | Sally Hattori, Ohji Nakagami, Teruhiko Suzuki Sony City Osaki. 2-10-1 Osaki Shinagawa-ku , Tokyo, 141-8610 JAPAN | Tel: Email: | +81-50-3750-2746 [shinobu.hattori@jp.sony.com](mailto:shinobu.hattori@jp.sony.com) [ohji.nakagami@jp.sony.com](mailto:ohji.nakagami@jp.sony.com) [teruhikos@jp.sony.com](mailto:teruhikos@jp.sony.com) |
| *Source:* | Sony Electronics Inc.  Sony Corporation | | |

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# Abstract

This contribution proposes an extension to a motion-constrained tile sets SEI message to indicate the level for a decoder to decode each defined motion-constrained tile set. The proposal provides flexibility for HEVC tile structure to be applied for various applications such as in interactive UHDTV application, dynamic high-quality zoom-in application and interactive on-demand e-learning etc.

# Introduction

The HEVC standard [1] provides a structure of a rectangular region known as tiles to construct the picture. It is possible for tiles to have independent relationship relative to other tiles within the same picture or other pictures that are used as references for inter prediction. A motion-constrained tile sets SEI message is provided to identify such tile sets that are constrained in inter prediction process to reference only the regions within each corresponding set of tiles [2].

Such HEVC tile structure can be applied to an application of a tiled streaming. A tiled streaming is an application concept in which a high resolution video is split in independent videos that would compose a full panorama, and several videos can compose multiple layers of video at various resolutions of the panorama which are streamed to devices with various display resolutions. The videos to compose multi layers of video at various resolutions can be switched to display different regions of the high resolution full panorama video. The concept of tiled streaming can be applied to use cases such as an interactive UHDTV application, dynamic high-quality zoom-in application, interactive on-demand e-learning and etc. These use cases are also currently being studied in the core experiments of DASH [3]. See Figure 1 for an example of tiled streaming application image.

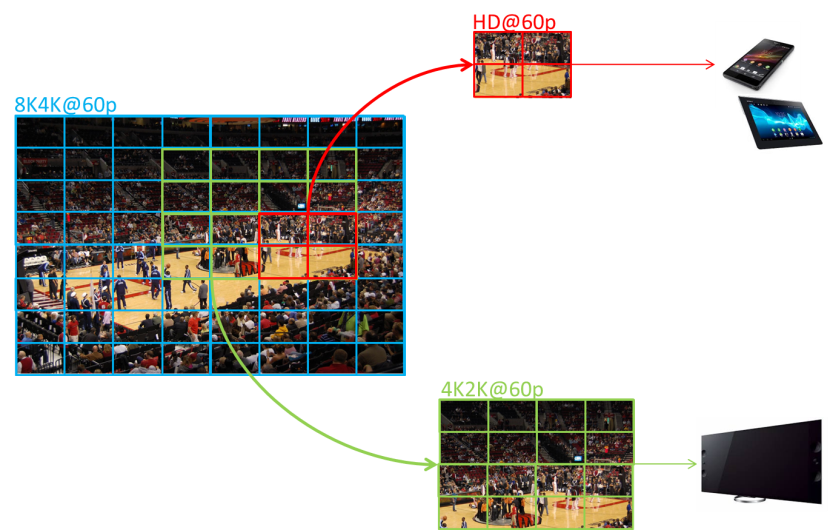


Figure Example of Tiled Streaming Application

The characteristics of the tiled streaming applications can be defined as follows:

* All tiles are independently decodable, i.e. motion-constrained tiles.
* All regions may be of interest for users, i.e. all regions are of interest.
* The resolution of the video to be decoded varys depending on the display devices

In case the HEVC tile structure is applied to tiled streaming application, since the the current HEVC standard [1] only defines level for each layer such that all devices for tiled streaming application will be required to have the capability of the highest resolution video. In case of an example in Figure 1, the smartphone, tablet and TV will all be required to have decoder with level 6.1 to support video in 8K4K@60p.

The proposal extends the syntax of a motion-constrained tile sets SEI message to provide improved signaling of motion constrained tile sets which provides and flexibility for HEVC tile structure to be applied for various applications.

# Proposals

The proposal extends the a motion-constrained tile sets SEI message to signal a level for motion-constrained tile set. This extension enables to signal required level to be supported by the decoder to decode indicated motion-constrained tile set independently.

The proposed syntax and semantics are as follows.

Motion-constrained tile sets SEI message syntax

|  |  |
| --- | --- |
| motion\_constrained\_tile\_sets( payloadSize ) { | Descriptor |
| **num\_sets\_in\_message\_minus1** | ue(v) |
| for( i = 0; i <= num\_sets\_in\_message\_minus1; i++) { |  |
| **mcts\_id**[ i ] | ue(v) |
| **num\_tile\_rects\_in\_set\_minus1**[ i ] | ue(v) |
| for( j = 0; j <= num\_tile\_rects\_in\_set\_minus1[ i ]; j++) { |  |
| **top\_left\_tile\_index[**i **][**j **]** | ue(v) |
| **bottom\_right\_tile\_index**[ i ]**[**j **]** | ue(v) |
| } |  |
| **exact\_sample\_value\_match\_flag**[ i ] | u(1) |
| **mcts\_level\_idc[**i **]** | ue(v) |
| } |  |
| } |  |

Motion-constrained tile sets SEI message semantics

*add the following paragraph after the semantics of exact\_sample\_value\_match\_flag[ i ]:*

The semantics of the syntax element **mcts\_level\_idc**[ i ] is the same as the syntax element general\_level\_idc but it is applied to the i-th identified motion-constrained tile set.

# Conclusion

The extension to a motion-constrained tile sets SEI message is propposed to signal a level for motion-constrained tile set. The proposal provides flexibility of HEVC tile structure to be applied for various applications, such as tiled streaming applications.

# Reference

1. B. Bross, W.-J. Han, J.-R. Ohm, G. J. Sullivan, Y.-K. Wang, and T. Wiegand (Eds.), “High efficiency video coding (HEVC) text specification draft 8”, JCTVC-L1003\_v34, 12th Meeting: Geneva, CH, 14–23 Jan. 2013.
2. D.Flynn, J.sole, T.Suzuki, “High Efficiency Video Coding (HEVC) Range Extensions text specification: Draft 3”, JCTVC-M1005, 13th Meeting: Incheon, KR, 18–26 Apr. 2013.
3. A.Giladi, T.Stockhammer, EE coordinators, “Descriptions of Core Experiments on DASH Amendement”, N13499, MPEG2013, Incheon, Korea, April 2013.

# Patent rights declaration(s)

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