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| *Title:* | **Preferred rendering operation for a recommended viewport** | | |
| *Status:* | Input document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution proposes to signal a preferred rendering operation for a recommended viewport in the omnidirectional viewport SEI message. The signalling indicates the rendering operation that is considered as preferred by the content creator to keep the aspect ratio of the viewport region and minimize the rendered parts that are not covered by the viewport after a possible spatial resolution scaling operation.

The MPEG input document m41462 proposes the same signalling to the recommended viewport signalling in the Omnidirectional MediA Format (OMAF) that is being developed by the MPEG Systems subgroup.

It is suggested that this aspect should be aligned between the omnidirectional viewport SEI message and the recommended viewport signalling in OMAF.

# Introduction

Given a signalled viewport, e.g., per the director's cut, for the best user experience from the content generator's point of view, e.g., for a good storytelling, sometimes it is preferred that the entire viewport is rendered to the user without cropping away any part. However, depending on the properties of the display, sometimes some adjustments may be needed in rendering of the viewport to fit the display. For example, the aspect ratio (i.e., the ratio between the width and height) of the viewport region may need to be adjusted because the display has a different aspect ratio, or some parts of the omnidirectional video adjacent to the viewport may also need to be rendered to fit the size and the aspect ratio of the display, or sometimes it might be better to crop away some part of the viewport region. For another example, the signalled viewport may have a changing resolution across time, and in this case zooming in or out needs to be performed during rendering, and in this case the same adjustments as mentioned above may be needed.

The artist intent may have different preferences on what adjustments should be made in different scenarios. Sometimes it may be preferred that the aspect ratio of the signalled region is kept unchanged, thus keeping aspect ratio should have a higher priority than minimizing the rendered parts that are not covered by the signalled viewport, or vice versa.

In many cases, it is preferred that the aspect ratio of the signalled viewport is maintained to avoid deformations of the objects in the viewport by the renderer to fit the aspect ratio of the display. This can be achieved by cropping the viewport region to fit the display, resulting in some loss of content, or by rendering parts that are adjacent to the viewport region, resulting in additional content being displayed, or by adding banners around the viewport region.

Therefore, signalling of the preferred rendering operation for a recommended viewport is proposed.

# Proposal

The syntax and semantics of the omnidirectional viewport SEI message are changed as below, where changes are marked.

|  |  |
| --- | --- |
| omni\_viewport( payloadSize ) { | **Descriptor** |
| **omni\_viewport\_id** | u(10) |
| **omni\_viewport\_cancel\_flag** | u(1) |
| if( !omni\_viewport\_cancel\_flag ) { |  |
| **omni\_viewport\_persistence\_flag** | u(1) |
| **omni\_viewport\_cnt\_minus1** | u(4) |
| for( i = 0; i  <=  omni\_viewport\_cnt\_minus1; i++ ) { |  |
| **omni\_viewport\_azimuth\_centre**[ i ] | i(32) |
| **omni\_viewport\_elevation\_centre**[ i ] | i(32) |
| **omni\_viewport\_tilt\_centre**[ i ] | i(32) |
| **omni\_viewport\_azimuth\_range**[ i ] | u(32) |
| **omni\_viewport\_elevation\_range**[ i ] | u(32) |
| **omni\_viewport\_preferred\_rendering\_operation**[ i ] | u(8) |
| } |  |
| } |  |
| } |  |

**...**

**omni\_viewport\_azimuth\_range**[ i ] indicates the azimuth range of the i-th recommended viewport region, in units of 2−16 degrees. The value of omni\_viewport\_azimuth\_range[ i ] shall be in the range of 1 to 360 \* 216 (i.e., 23592960), inclusive.

**omni\_viewport\_elevation\_range**[ i ] indicates the elevation range of the i-th recommended viewport region, in units of 2−16 degrees. The value of omni\_viewport\_elevation\_range[ i ] shall be in the range of 1 to 180 \* 216 (i.e., 11796480), inclusive.

**omni\_viewport\_preferred\_rendering\_operation**[ i ] indicates the preferred rendering operation for the i-th recommended viewport region as listed in the Table D.X, to keep the aspect ratio of the viewport region and minimize the rendered parts that are not covered by the viewport after a possible spatial resolution scaling operation:

Table D.X – omni\_viewport\_preferred\_rendering\_operation[ i ] values

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | Preference unspecified |
| 1 | Rendering adjacent regions |
| 2 | Adding banners around the viewport region |
| 3 | Cropping the viewport region |
| 4-255 | Reserved |

# Patent rights declaration(s)

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