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| *Title:* | **On fisheye video information SEI message** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution proposes the following aspects on the fisheye video information SEI message:

1. It is prohibited to have a fisheye video information SEI message present for a picture when the value of general\_non\_packed\_constraint\_flag is equal to 1.
2. The persistency scope of the fisheye video information SEI message is specified by using a cancel flag and a persistency flag, similarly as for the equirectangular projection SEI message and the cubemap projection SEI message.
3. It is prohibited to have both a fisheye video information SEI message and a projection indication SEI message (i.e., an equirectangular projection SEI message or a cubemap projection SEI message) present for a picture.
4. It is prohibited to have both a fisheye video information SEI message and a frame packing indication SEI message (i.e., a frame packing arrangement SEI message or a segmented rectangular frame packing arrangement SEI message) present for a picture.
5. It is recommended to avoid combined uses of aspect\_ratio\_idc greater than 1 and fisheye video information SEI messages, similarly as for the equirectangular projection SEI message and the cubemap projection SEI message.

The proposed text changes are provided in this contribution. The proposed text changes contain some asserted purely editorial changes that are not mentioned in the above list.

# Proposed text changes

## Semantics of general\_non\_packed\_constraint\_flag

*The semantics of general\_non\_packed\_constraint\_flag is changed as follows, where the changed parts are highlighted in green:*

**general\_non\_packed\_constraint\_flag** equal to 1 specifies that there are no frame packing arrangement SEI messages, segmented rectangular frame packing arrangement SEI messages, equirectangular projection SEI messages, cubemap projection SEI messages, or fisheye video information SEI messages present in the CVS. general\_non\_packed\_constraint\_flag equal to 0 indicates that there may or may not be one or more frame packing arrangement SEI messages, segmented rectangular frame packing arrangement SEI messages, equirectangular projection SEI messages, cubemap projection SEI messages, or fisheye video information SEI messages present in the CVS.

NOTE 2 – Decoders may ignore the value of general\_non\_packed\_constraint\_flag, as there are no decoding process requirements associated with the presence or interpretation of frame packing arrangement SEI messages, segmented rectangular frame packing arrangement SEI messages, equirectangular projection SEI messages, cubemap projection SEI messages, or fisheye video information SEI messages.

## Syntax and semantics of the fisheye video information SEI message

*The syntax and semantics of the* *fisheye video information SEI message are changed as follows, where the changed parts are highlighted in green:*

|  |  |
| --- | --- |
| fisheye\_video\_info( payloadSize ) { | **Descriptor** |
| **fisheye\_cancel\_flag** | u(1) |
| if( !fisheye\_cancel\_flag ) { |  |
| **fisheye\_persistence\_flag** | u(1) |
| **fisheye\_view\_dimension\_idc** | u(3) |
| **fisheye\_reserved\_zero\_3bits** | u(3) |
| **fisheye\_num\_active\_areas\_minus1** | u(8) |
| for( i = 0; i  <=  fisheye\_num\_active\_areas\_minus1; i++ ) { |  |
| **fisheye\_circular\_region\_centre\_x**[ i ] | u(32) |
| **fisheye\_circular\_region\_centre\_y**[ i ] | u(32) |
| **fisheye\_rect\_region\_top**[ i ] | u(32) |
| **fisheye\_rect\_region\_left**[ i ] | u(32) |
| **fisheye\_rect\_region\_width**[ i ] | u(32) |
| **fisheye\_rect\_region\_height**[ i ] | u(32) |
| **fisheye\_circular\_region\_radius**[ i ] | u(32) |
| **fisheye\_scene\_radius**[ i ] | u(32) |
| **fisheye\_camera\_centre\_azimuth**[ i ] | i(32) |
| **fisheye\_camera\_centre\_elevation**[ i ] | i(32) |
| **fisheye\_camera\_centre\_tilt**[ i ] | i(32) |
| **fisheye\_camera\_centre\_offset\_x**[ i ] | u(32) |
| **fisheye\_camera\_centre\_offset\_y**[ i ] | u(32) |
| **fisheye\_camera\_centre\_offset\_z**[ i ] | u(32) |
| **fisheye\_field\_of\_view**[ i ] | u(32) |
| **fisheye\_num\_polynomial\_coeffs**[ i ] | u(16) |
| for( j = 0; j < fisheye\_num\_polynomial\_coeffs[ i ]; j++ ) |  |
| **fisheye\_polynomial\_coeff**[ i ][ j ] | i(32) |
| } |  |
| } |  |
| } |  |

The presence of the fisheye video information SEI message for any picture of a CLVS indicates that the picture is a fisheye video information video picture containing a number of active areas captured by fisheye camera lens. The information carried in the fisheye video information SEI message enables remapping of the colour samples of the pictures onto a sphere coordinate space in sphere coordinates (ϕ, θ), for use in omnidirectional video applications for which the viewing perspective is from the origin looking outward toward the inside of the sphere. The sphere coordinates are defined so that ϕ is the azimuth (longitude, increasing eastward) and θ is the elevation (latitude, increasing northward).

When a fisheye video information SEI message is present for any picture of a CLVS of a particular layer, a fisheye video information SEI message shall be present for the first picture of the CLVS and no equirectangular projection SEI message or cubemap projection SEI message shall be present for any picture of the CLVS.

When general\_non\_packed\_constraint\_flag is equal to 1 in the active SPS for the current layer, there shall be no fisheye video information SEI messages applicable for any picture of the CLVS of the current layer.

When aspect\_ratio\_idc is present and greater than 1 in the active SPS for the current layer, there should be no fisheye video information SEI messages applicable for any picture of the CLVS of the current layer.

When a frame packing arrangement SEI message with frame\_packing\_arrangement\_cancel\_flag equal to 0 or a segmented rectangular frame packing arrangement SEI message with segmented\_rect\_frame\_packing\_arrangement\_cancel\_flag equal to 0 that applies to the picture is present, a fisheye video information SEI message with fisheye\_cancel\_flag equal to 0 that applies to the picture shall not be present. Decoders shall ignore fisheye video information SEI messages when a frame packing arrangement SEI message with frame\_packing\_arrangement\_cancel\_flag equal to 0 or a segmented rectangular frame packing arrangement SEI message with segmented\_rect\_frame\_packing\_arrangement\_cancel\_flag equal to 0 that applies to the picture is present.

**fisheye\_cancel\_flag** equal to 1 indicates that the SEI message cancels the persistence of any previous fisheye video information SEI message in output order. fisheye\_cancel\_flag equal to 0 indicates that fisheye video information follows.

**fisheye\_persistence\_flag** specifies the persistence of the fisheye video information SEI message for the current layer.

fisheye\_persistence\_flag equal to 0 specifies that the fisheye video information SEI message applies to the current decoded picture only.

Let picA be the current picture. fisheye\_persistence\_flag equal to 1 specifies that the fisheye video information SEI message persists for the current layer in output order until one or more of the following conditions are true:

– A new CLVS of the current layer begins.

– The bitstream ends.

– A picture picB in the current layer in an access unit containing a fisheye video information SEI message that is applicable to the current layer is output for which PicOrderCnt( picB ) is greater than PicOrderCnt( picA ), where PicOrderCnt( picB ) and PicOrderCnt( picA ) are the PicOrderCntVal values of picB and picA, respectively, immediately after the invocation of the decoding process for picture order count for picB.

**fisheye\_view\_dimension\_idc** indicates the alignment and viewing direction of a fisheye lens, as follows:

– fisheye\_view\_dimension\_idc equal to 0 indicates that fisheye\_num\_active\_areas is equal to 2, and the values of fisheye\_camera\_centre\_azimuth, fisheye\_camera\_centre\_elevation, fisheye\_camera\_centre\_tilt, fisheye\_camera\_centre\_offset\_x, fisheye\_camera\_centre\_offset\_y, and fisheye\_camera\_centre\_offset\_z are such that the active areas have aligned optical axes and face opposite directions, and the sum of fisheye\_field\_of\_view values is greater than or equal to 360 \* 216.

– fisheye\_view\_dimension\_idc equal to 1 indicates that fisheye\_num\_active\_areas is equal to 2, and the values of fisheye\_camera\_centre\_azimuth, fisheye\_camera\_centre\_elevation, fisheye\_camera\_centre\_tilt, fisheye\_camera\_centre\_offset\_x, fisheye\_camera\_centre\_offset\_y, and fisheye\_camera\_centre\_offset\_z are such that the active areas have parallel optical axes that are orthogonal to the line intersecting the camera centre points, and the camera corresponding to i equal to 0 is the left view.

– fisheye\_view\_dimension\_idc equal to 2 indicates that fisheye\_num\_active\_areas is equal to 2, and the values of fisheye\_camera\_centre\_azimuth, fisheye\_camera\_centre\_elevation, fisheye\_camera\_centre\_tilt, fisheye\_camera\_centre\_offset\_x, fisheye\_camera\_centre\_offset\_y, and fisheye\_camera\_centre\_offset\_z are such that the active areas have parallel optical axes that are orthogonal to the line intersecting the camera centre points, and the camera corresponding to i equal to 0 is the right view.

– fisheye\_view\_dimension\_idc equal to 7 indicates that no additional constraints are implied for the syntax element values within the fisheye video information SEI message.

– Values of fisheye\_view\_dimension\_idc in the range of 3 to 6, inclusive, are reserved for future use by ITU-T | ISO/IEC. Decoders encountering a value of fisheye\_view\_dimension\_idc in the range of 3 to 6, inclusive, shall ignore it.

**fisheye**\_**reserved\_zero\_3bits** shall be equal to 0 in bitstreams conforming to this version of this Specification. Other values for fisheye\_reserved\_zero\_3bits are reserved for future use by ITU-T | ISO/IEC. Decoders shall ignore the value of fisheye\_reserved\_zero\_3bits.

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# Patent rights declaration(s)

**Huawei Technologies Co., Ltd. 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).**