

JVET-AM0126 AHG9: Temporal quality indication for EOI SEI message

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Introduction to EOI SEI message

- The EOI SEI message is used to indicate if the video has been optimized for human viewing or machine analysis
- Six different optimization types are supported in VSEI-v4 and one additional optimization type was added in TuC

bitMask	Interpretation
0x01	Object-based optimization ; the pictures for which this SEI message persists have been pre-processed or encoded so that detected objects in the pictures are optimized with respect to other parts of the pictures for the indicated optimization purposes
0x02	Temporal resampling optimization
0x04	Spatial resampling optimization
0x08	Temporal quality optimization in a manner that quality fluctuates temporally
0x10	Spatial quality optimization ; the pictures for which this SEI message persists have been pre-processed or encoded to reduce unnecessary information or improve the quality of necessary information.(e.g to reduce the amount of noise and remove speckles at the picture-level)
0x20	Privacy protection optimization ; the pictures for which this SEI message persists have been pre-processed or encoded to protect personal information. (e.g. removal or replacing of personal identifiable information, pseudonymization, anonymization)
0x40 (in TuC)	Luma range adaptation optimization ; the pictures for which this SEI message persists have been pre-processed or encoded to adapt the average luma computed on the whole picture by decreasing or increasing its level (e.g. to reduce the amount of energy consumption at the display)

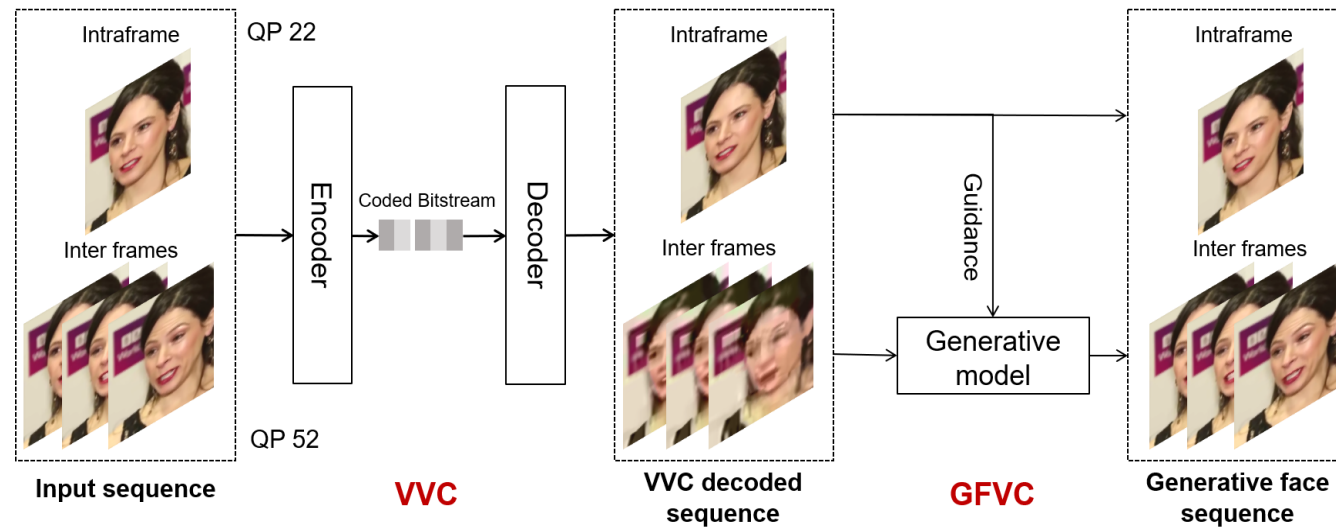
Problem statement

- The optimization type is indicated by **eoi_type** and the detailed information of different optimization types is signaled by **the following syntax elements**.
- However, when temporal quality optimization is indicated, **no further information** is signaled at all.
- Thus, the decoder
 - ✓ only knows the quality of the decoded pictures fluctuates temporally
 - ✓ but doesn't know which pictures are of higher quality and which pictures are of lower quality
➔ such information could be quite useful in the decoder side in some applications.

encoder_optimization_info(payloadSize) {	Descriptor
...	u(1)
eoi_type	u(16)
...	
if(EoiObjectBasedFlag) {	
eoi_object_based_idc	ue(v)
if(eoi_object_based_idc & 0x02) {	
eoi_quant_threshold_delta	ue(v)
if(eoi_quant_threshold_delta > 0)	
eoi_pic_quant_object_flag	u(1)
}	
}	
if(EoiTemporalResamplingFlag) {	
eoi_temporal_resampling_type_flag	u(1)
eoi_num_int_pics	ue(v)
}	
if(EoiSpatialResamplingFlag) {	
eoi_orig_pic_dimensions_flag	u(1)
if(eoi_orig_pic_dimensions_flag) {	
eoi_orig_pic_width	u(16)
eoi_orig_pic_height	u(16)
} else	
eoi_spatial_resampling_type_flag	u(1)
}	
if(EoiPrivacyProtectionFlag) {	
eoi_privacy_protection_method_idc	u(4)
eoi_privacy_info_type	u(8)
}	

An example

- JVET-AK0068 proposed a VVC-conformed generative face video compression (GFVC) scheme, namely VVC GFVC
 - Encode I frame with very small QP to get high quality
 - Encode following inter frames with very high QP to save the bits
 - A quality enhancement model is invoked at decoder side to improve the quality of the decoded inter pictures with the help of the high quality I picture



- It was commented in the JVET-AK meeting that “**Potentially the EOI SEI could be used to signal that something like that has been done, not recommending the direct decoder output for viewing.**”

Proposal

- It is proposed to add an indicator **eo_i_pic_quality_idc** for temporal quality optimization in EOI SEI message to indicate the quality of each picture.
- The proposed indicator can be the following four values
 - 3: high quality → suitable for human viewing, and can be used to improve quality of other pictures
 - 2: medium quality → suitable for human viewing, but shouldn't be used to improve quality of other pictures
 - 1: low quality → unsuitable for human viewing
 - 0: unknown

Proposed text changes

EoiTemporalQualityFlag = ((eoi_type & 0x08) > 0) ? 1 : 0

}	
if(EoiSpatialResamplingFlag) {	
eoi_orig_pic_dimensions_flag	u(1)
if(eoi_orig_pic_dimensions_flag) {	
eoi_orig_pic_width	u(16)
eoi_orig_pic_height	u(16)
} else	
eoi_spatial_resampling_type_flag	u(1)
}	
if(EoiTemporalQualityFlag)	
eoi_pic_quality_idc	u(2)
if(EoiPrivacyProtectionFlag) {	
eoi_privacy_protection_method_idc	u(4)
eoi_privacy_info_type	u(8)
}	

eoi_pic_quality_idc equal to 3 specifies that the picture associated with the SEI message is not only suitable for human viewing, but also can be used to improve the quality of other pictures in the CLVS.

eoi_pic_quality_idc equal to 2 specifies that the picture associated with the SEI message is suitable for human viewing, but should not be used to improve the quality of other pictures. **eoi_pic_quality_idc** equal to 1 specifies that the picture associated with the SEI message is unsuitable for human viewing. **eoi_pic_quality_idc** equal to 0 specifies that it is unknown if the picture associated with the SEI message is suitable for human viewing.

Proposed text changes

- Additional option (Option 2)

eoi_pic_quality_idc equal to 2 specifies that the quality of the picture associated with SEI message is optimized. **eoi_pic_quality_idc** equal to 1 specifies that the quality of the picture associated with the SEI message is not optimized. **eoi_pic_quality_idc** equal to 0 specifies that it is unknown if the quality of the picture associated with the SEI message is optimized. The value of **eoi_pic_quality_idc** shall be in the range of 0 to 2, inclusive.

- Option 1 (for comparison)

eoi_pic_quality_idc equal to 3 specifies that the picture associated with the SEI message is not only suitable for human viewing, but also can be used to improve the quality of other pictures in the CLVS. **eoi_pic_quality_idc** equal to 2 specifies that the picture associated with the SEI message is suitable for human viewing, but should not be used to improve the quality of other pictures. **eoi_pic_quality_idc** equal to 1 specifies that the picture associated with the SEI message is unsuitable for human viewing. **eoi_pic_quality_idc** equal to 0 specifies that it is unknown if the picture associated with the SEI message is suitable for human viewing.