

Title: Simplifying decoder mismatch checking
Status: Input document
Purpose: Proposal
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Abstract

The current HM software provides no integrated means of identifying a mismatch between the encoder and decoder. Experiments must manually confirm the equality of the [locally] decoded pictures from the encoder and decoder. A method is proposed for an encoder to embed an SEI message containing a fingerprint of each locally decoded picture; this may be used by a decoder to verify each decoded output frame. Such a system would allow the HM decoder to immediately flag the frame number of any decoding mismatch. Further more, debugger breakpoints may be used to allow inspection of state as soon as a mismatch is discovered.

1 Possible Syntax

Table 1: Modified syntax for sei payload handling

sei_payload(payloadType, payloadSize) {	C	Descriptor
...		
else if(payloadType == 513)		
decoded_picture_hash(payloadSize)		
...		
}		

Table 2: Syntax for Decoded picture hash

decoded_picture_hash(payloadSize) {	C	Descriptor
for(i = 0; i < 16; i++)		
picture_md5[i]	5	b(8)
}		

picture_md5 is a 16 byte array containing an MD5sum in little-endian byte order. The MD5 sum applies to the primary coded picture of the current access-unit.

2 Calculation of the MD5sum

The MD5 sum is calculated as per [1]. Calculation is performed over decoded picture data in plane sequential raster order. Samples forming the decoded picture data are zero-extended to the next byte boundary and are evaluated in little-endian order. i.e.,

- Evaluate the whole Y' plane first, Cb second, Cr third.
- Evaluate each plane in raster order without any additional padding.
- For 8 bit data, no further action is required in processing

- For $16 > n > 8$ bit data, zero extend each sample to 16 bits. Insert the data into the MD5 function in little-endian order.

3 Unresolved questions

- SEI messages that apply to the current access-unit must occur before the start of the primary coded picture. The natural ordering for this message is after the primary coded picture.
- The current SEI message does not handle any redundant or auxiliary coded picture; although, neither does the HM software.
- Should this be a non-specified message, for the sole purpose of standard development, or is it also useful for implementation debugging?
- Should this be done using a user data unregistered SEI message?
- It would be possible to use finer grained fingerprints that validate each coding tree.
- MD5 sum is not cryptographically secure

4 Parent rights declaration

The submitter is not aware of having any granted, pending, or planned patents associated with the technical content of the Recommendation | Standard or Contribution.

References

- [1] R. Rivest, “The MD5 Message-Digest Algorithm.” RFC 1321 (Informational), Apr. 1992. Updated by RFC 6151.