SMPTE Standard

Amendment 2:2011 to SMPTE ST 421M:2006

VC-1 Compressed Video Bitstream Format and Decoding Process — Amendment 2

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Foreword

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SMPTE Amendment 2:2011 to SMPTE ST 421M:2006 was prepared by Technology Committee 10E.

1 Scope

This purpose of this amendment is to correct typographical errors and provide clarifying text to support correct interpretation of the standard.

2 Amendments

2.1 SMPTE ST 421M Section 6.1.7

Append in Section 6.1.7

For each picture dependent on Frame Coding Mode (FCM) (Variable size) in its picture header, the coded picture width and height in MB shall be calculated as follows,

PicWidthInMBs = (CodedWidth + 15) / 16, always.

If Frame Coding Mode (FCM) (Variable size) is present, and FCM is field interlace,

PicHeightInMBs = (CodedHeight +31) / 32

For all other cases,

PicHeightInMBs = (CodedHeight + 15) / 16

Please refer to Figure 12 for the definitions of CodedWidth and CodedHeight.

2.2 SMPTE ST 421M Section 7.1.1.2

Replace

FRMCNT is a 2-bit syntax element that shall be present in all picture headers for simple and main profiles. The value of this field should be used as a frame count and shall be incremented by one for each consecutive frame (in coded order) in the bitstream. FRMCNT has no effect on the decoding or display process.

with the following:

FRMCNT,a 2-bit syntax element, shall be present in all picture headers for simple and main profiles, except for a skipped frame with the length of data less than or equal to 8 bits. The value of this field should be used as a frame count and shall be incremented by one for each consecutive frame (in coded order) in the bitstream. FRMCNT has no effect on the decoding or display process. On a skipped frame in simple and main profile, though FRMCNT syntax element doesn't exist, it should be incremented by 1 and modulo 4 to count the skipped frame.

2.3 SMPTE ST 421M Section 8.3.2

Replace

In the advanced profile, "frame edge", "frame corner" and "outside the boundary" shall refer to the true frame dimensions, not the dimensions right or bottom justified to the edge of the macroblock. In other words, the right and bottom pixels that are repeated to infinity for a 300 x 200 image shall begin at column 304 and row 208 for the simple and main profiles. However, for the advanced profile, these shall begin respectively at column 300 and row 200.

with the following:

In the advanced profile, “frame edge”, “frame corner” and “outside the boundary” shall refer to the true frame dimensions in the unit of pixels specified in Sections 6.16, 6.17 and Sections 6.2.13.1, 6.2.13.2 — not the dimensions right or bottom justified to the edge of the macroblock, which are the coded picture dimensions macroblock aligned.

For example, in the advanced profile, the right and bottom pixels that are repeated to infinity for a 300 x 200 image begin at column 300 and row 200.

However, in simple and main profiles, “frame edge”, “frame corner” and “outside the boundary” shall refer to the coded picture dimension macroblock aligned.

For example, in the simple and main profiles, the right and bottom pixels that are repeated to infinity for a 300 x 200 image begin at column 304 and row 208.

2.4 SMPTE ST 421M Section J.1.8

Replace

Note: When encoding, the upper limit is 31, so 7 bits minimum are needed.

with the following:

Note: When encoding, the upper limit is 31, so 5 bits minimum are used.

2.5 SMPTE ST 421M Section 5.6

Add the following Section:

5.6 Frame Buffer Management (Informative)

There are four operations which affect frame buffer allocation and management in VC-1, range adjustment (Section 8.3.4.11, Sections 6.2.15 and 6.2.16), intensity compensation (Section 10.3.8), post-filtering (Annex H) and coded resolution (Section 6.2.13 and Annex J.1.10).

If range adjustment is applied on a frame picture in main profile enabled by the flag of RANGEREDFRM, or on all pictures within an entry point segment enabled by the flags of RANGE_MAPY_FLAG and RANGE_MAPUV_FLAG in advanced profile, the range adjusted pictures are used for display and output. In main profile, it could have range adjustment occur at any frame for display and output. For advanced profile, range adjustment can only start to occur at GOP boundaries. Therefore there is never a need to remap a reconstructed frame for use as a reference frame in advanced profile. The original reconstructed pictures without range adjustment are used for reference in advanced profile.

However, in main profile the original reconstructed frame picture might need range adjustment for the reference of the subsequent frame picture in decoding order when there is a mismatch in the range flag RANGEREDFRM between current frame picture and its reference as specified in Section 8.3.4.11. Moreover, in main profile the range adjusted reconstructed frame pictures are used for reference of any subsequent frame pictures in decoding order, if range adjustment is applied on a reference picture, not the original reconstructed reference picture.

If range adjustment is enabled in main profile or advanced profile, decoding one frame of picture requires the use of two frame buffers. One frame buffer is for display and output with range adjustment and the second frame buffer is for reference of subsequent pictures in decoding order. In

advanced profile, the second frame buffer holds the original frame picture as in Sections 6.2.15 and 6.2.16. In main profile, the second frame buffer holds either the original or range adjusted frame picture as in Section 8.3.4.11.

If intensity compensation is applied on a P picture in main and advanced profiles, the original reconstructed reference picture of the P picture is used for display and output and the intensity remapped reconstructed reference picture for the P picture is used for reference of the P picture and any subsequent pictures in the decoding order. If the reconstructed reference picture already has a separate buffer for output and display besides the buffer holding the original reconstructed reference picture, intensity remapping could be performed in the same buffer which holds the original reconstructed reference picture. Otherwise, the P picture may need one more buffer to hold its intensity remapped reference picture. This applies for main and advanced profiles, not for simple profile since intensity compensation doesn't apply in simple profile.

If post-filtering is applied for a picture, the original reconstructed picture is used for reference and the post-filtered picture is used for display and output. If the reconstructed picture already has a separate buffer for output and display besides the buffer holding the original reconstructed picture, post-filtering could be performed in the same buffer for output and display.

If multi-resolution coding is applied, decoding process might not need to perform resizing of the reconstructed picture. Generally, resizing of the reconstructed picture could be done by display process after the picture is output. Decoding of multi-resolution doesn't need to have an additional buffer allocated.

Since intensity compensation and range adjustment could co-exist, the decoding process of one frame picture may need three frame buffers in the worst case, one buffer to hold current reconstructed picture, one buffer to hold current range adjusted picture for output and display and one buffer to hold the intensity remapped reference picture if the original reference picture doesn't allocate a separate buffer for its output and display. However, on average, the decoding process of one frame picture requires the use of two frame buffers: one buffer to hold current reconstructed picture, possibly with intensity remapping, and the other buffer to hold range adjusted and/or post-processed picture for display and output.

2.6 SMPTE ST 421M Figure 12

Replace

```
If (CODED_SIZE_FLAG) {
CodedWidth = CODED_WIDTH;
CodedHeight = CODED_HEIGHT;
}
else {
CodedWidth = MAX_CODED_WIDTH;
CodedHeight = MAX_CODED_HEIGHT;
}
```

with the following:

```
If (CODED_SIZE_FLAG) {
CodedWidth = 2*CODED_WIDTH+2;
CodedHeight = 2*CODED_HEIGHT+2;
}
else {
CodedWidth = 2*MAX_CODED_WIDTH+2;
CodedHeight = 2*MAX_CODED_HEIGHT+2;
}
```