Annex B

Replace the existing Annex B, by the following:

Annex B
(informative)

Non-linear encoding for scRGB : scRGB-nl
and its YCC Transformation: scYCC-nl

B.1 General
This annex describes non-linear encoding for scRGB: scRGB-nl and its YCC transformation: scYCC-nl. Applications and hardware developers who want to support various colour compression schemes based on luma-chroma-chroma spaces can utilise this standard. This transformation is targeted for compression and storage, and is not targeted for displaying images.

B.2 Non-linear encoding in 12-bit

The relationship is defined as follows:

If \( R_{\text{scRGB}}, G_{\text{scRGB}}, B_{\text{scRGB}} \geq 0.003 \times 130 \ 8 \)

\[
R'_{\text{scRGB}} = 1.055 \times R_{\text{scRGB}}^{(1.0,2.4)} - 0.055 \\
G'_{\text{scRGB}} = 1.055 \times G_{\text{scRGB}}^{(1.0,2.4)} - 0.055 \\
B'_{\text{scRGB}} = 1.055 \times B_{\text{scRGB}}^{(1.0,2.4)} - 0.055
\] (B.1)

If \( 0.003 \times 130 \ 8 > R_{\text{scRGB}}, G_{\text{scRGB}}, B_{\text{scRGB}} > -0.003 \times 130 \ 8 \)

\[
R'_{\text{scRGB}} = 12.92 \times R_{\text{scRGB}} \\
G'_{\text{scRGB}} = 12.92 \times G_{\text{scRGB}} \\
B'_{\text{scRGB}} = 12.92 \times B_{\text{scRGB}}
\] (B.2)

If \( R_{\text{scRGB}}, G_{\text{scRGB}}, B_{\text{scRGB}} \leq -0.003 \times 130 \ 8 \)

\[
R'_{\text{scRGB}} = -1.055 \times (- R_{\text{scRGB}})^{(1.0,2.4)} + 0.055 \\
G'_{\text{scRGB}} = -1.055 \times (- G_{\text{scRGB}})^{(1.0,2.4)} + 0.055 \\
B'_{\text{scRGB}} = -1.055 \times (- B_{\text{scRGB}})^{(1.0,2.4)} + 0.055
\] (B.3)

12 bit non-linear version of scRGB-nl: \( R_{\text{scRGB-nl}}, G_{\text{scRGB-nl}}, B_{\text{scRGB-nl}} \) is defined as:

\[
R_{\text{scRGB-nl}} = \text{round}(l \ 280 \times R'_{\text{scRGB}} + 1 \ 024) \\
G_{\text{scRGB-nl}} = \text{round}(l \ 280 \times G'_{\text{scRGB}} + 1 \ 024) \\
B_{\text{scRGB-nl}} = \text{round}(l \ 280 \times B'_{\text{scRGB}} + 1 \ 024)
\] (B.4)
For compression, scRGB-nl is converted to luma-chroma-chroma encoding: scYCC-nl.

\[ \begin{bmatrix}
    Y'_{scYCC} \\
    Cb'_{scYCC} \\
    Cr'_{scYCC}
\end{bmatrix} = \begin{bmatrix}
    0.299 & 0 & 0.114 \\
    -0.168 & 7 & -0.331 \\
    0.500 & 0 & -0.081
\end{bmatrix} \begin{bmatrix}
    R'_{scRGB} \\
    G'_{scRGB} \\
    B'_{scRGB}
\end{bmatrix} \]  

(B.5)

And quantization for 12 bit non-linear scYCC-nl:

\[ \begin{align*}
    Y'_{scYCC-nl} &= \text{round}(1.280 \times Y'_{scYCC} + 1.024) \\
    Cb'_{scYCC-nl} &= \text{round}(1.280 \times Cb'_{scYCC} + 2.048) \\
    Cr'_{scYCC-nl} &= \text{round}(1.280 \times Cr'_{scYCC} + 2.048)
\end{align*} \]  

(B.6)

Note that this quantization leads to the following relationships, where a value of 65 535 in scRGB(16) is equivalent to 7,499 9 in scRGB and 4 080 in scRGB-nl. This is to ease computational implementations.

\textbf{Table B.1 – Quantization relationships using scRGB}

<table>
<thead>
<tr>
<th>scRGB(16)</th>
<th>scRGB</th>
<th>scR’G’B</th>
<th>scRGB-nl</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>-0.603 8</td>
<td>-0.800 0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>-0.5</td>
<td>-0.735 4</td>
<td>83</td>
</tr>
<tr>
<td>2 048</td>
<td>-0.25</td>
<td>-0.537 1</td>
<td>337</td>
</tr>
<tr>
<td>4 096</td>
<td>0</td>
<td>0.000 0</td>
<td>1 024</td>
</tr>
<tr>
<td>12 288</td>
<td>1</td>
<td>1.000 0</td>
<td>2 304</td>
</tr>
<tr>
<td>20 480</td>
<td>2</td>
<td>1.353 3</td>
<td>2 756</td>
</tr>
<tr>
<td>28 672</td>
<td>3</td>
<td>1.612 5</td>
<td>3 088</td>
</tr>
<tr>
<td>36 864</td>
<td>4</td>
<td>1.824 8</td>
<td>3 360</td>
</tr>
<tr>
<td>45 056</td>
<td>5</td>
<td>2.008 0</td>
<td>3 594</td>
</tr>
<tr>
<td>53 248</td>
<td>6</td>
<td>2.170 8</td>
<td>3 803</td>
</tr>
<tr>
<td>61 440</td>
<td>7</td>
<td>2.318 4</td>
<td>3 992</td>
</tr>
<tr>
<td>65 535</td>
<td>7.499 9</td>
<td>2.387 6</td>
<td>4 080</td>
</tr>
<tr>
<td>N/A</td>
<td>7.5</td>
<td>2.387 7</td>
<td>4 080</td>
</tr>
<tr>
<td>N/A</td>
<td>7.591 3</td>
<td>2.400 0</td>
<td>4 096</td>
</tr>
</tbody>
</table>

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\textbf{Figure C.1 – Example workflow using scRGB}

Replace, in the top line of Figure C.1, the words ‘Output-referred colour’, by the words ‘Output-referred colour space’.

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