

Two Methods for Colour Comparison

User needs of professionals and others:

Absolute (professionals) und relative colorimetric reproduction

Absolute CIELAB data

h_{ab} hue
 C^*_{ab} chroma
 L^* lightness

Visual comparison
softcopy – hardcopy
Test of agreement
with test files

Advantages and disadvantages:

Advantage:

Colorimetric reproduction
of hue, chroma, lightness

Disadvantage:

Colour spaces of TV and
Print show differences,
often important colour
areas are clipped

Advantage:

Colorimetric reproduction
of hue, *relative* chroma
and *relative* lightness
Colour spaces of TV and
Print show differences,
No colour areas
are clipped

Disadvantage:
Tolerable small changes of
chroma and lightness

Relative CIELAB data

h_{ab} hue
 c^* relative chroma
 n^* relative blackness

Test of visual
equal relative spacing
of either softcopy
or hardcopy
Test of equal spacing
with test files

Colorimetric measurement problem for fluorescent (foto) paper

Measurement problem only for *absolute* and not for *relative* colour reproduction

Example of measurement

Two measurement devices A and B
measure two CIELAB b^* data for
two yellow colours no. 1 and 2:
Device A *without* measurement
of fluorescence (example *xy*-device)
 $b^*_{A1} = 100$ and $b^*_{A2} = 90$.
Device B *with* measurement
of fluorescence (professional device)
 $b^*_{B1} = 90$ and $b^*_{B2} = 81$.

Remarks: compare CIE 163:2004,
The effects of fluorescence in the
characterization of imaging media.

For the achromatic colour no. 1 the devices A and B may measure:
 $b^*_{A1} = 0$ and $b^*_{B1} = -10$

This is again an measurement shift $\Delta b^*_{A1,B1} = -10$
which is based on the fluorescent paper in the application.

Absolute colour reproduction

For equal measurement data of A and B
the visual colour difference is $\Delta b^*_{A2,B2} = 9$
This is three times *above* the colour
tolerance $\Delta E^*_{ab} = 3$ of ISO/IEC 15775.

Result:

Measurement device A is **not** appropriate.

Relative colour reproduction

Measurement differences of A and B:
 $\Delta b^*_{A1,A2} = 10$ and $\Delta b^*_{B1,B2} = 9$
This is a measurement failure of $\Delta b^* = 1$
The failure is three times *below* the colour
tolerance $\Delta E^*_{ab} = 3$ of ISO/IEC 15775.

Result:

Measurement device A is appropriate.

User input and output needs:

Interpretation of
input data rgb
as *undefined* colour data
 $rgb (-> rgb)$
*no special
device colours*

Interpretation of
input data rgb
as *device* colour data
 $rgb (-> olv^*)$
Device lookup table
 $olv^* - rgb'$, $8LCH^*$ data

Interpretation of
input data rgb
as *elementary* colour data
 $rgb (-> rgb^*)$
Device lookup table
 $rgb^* - rgb''$, $8LCH^*$ data

Remark:
For output linearisation
see ISO/IEC TR 19797

application
program creates
colour data file;
Output / download
of colour file to
colour printer
or monitor

Test: Equally spaced device and elementary hue output?

Purpose:

Output linearisation
If the output is regular then
measure lookup table
 $rgb - LCH^*$ and
calculate lookup tables
 $olv^* - rgb'$, $rgb^* - rgb''$

Test with test file:

Is the device output
equally spaced
for any of the six
device hues *OYLCVM*
and for the grey scale?

Test with test file:

Is the device output
equally spaced
for any of the four
elementary hues *RJGB*
and for the grey scale?

Colour data in file, user choice and output needs:

Colour data file with
input data rgb as
undefined colour data
 $rgb (-> rgb)$
*no special
device colours*

User interpretation
of colour data for output:
1. Default output device
as *device* data
2. Output interpretation
as *device* data
3. Output interpretation
as *elementary* data

Remark:
For output linearisation
see ISO/IEC TR 19797

Test: Equally spaced device and elementary hue output?

Device uses default value:

Device uses lookup table
 $olv^* - rgb'$ for output.
1
Is the device output
equally spaced
for any of the six
device hues *OYLCVM*?

Device uses lookup table

$olv^* - rgb'$ for output.
2
Is the device output
equally spaced
for any of the six
device hues *OYLCVM*?

Device uses lookup table

$rgb^* - rgb''$ for output.
3
Is the device output
equally spaced
for any of the four
elementary hues *RJGB*?