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see similar files: http://farbe.li.tu-berlin.de/EE00/EE00.HTM technical information: http://farbe.li.tu-berlin.de or http://130.149.60.45/~farbmetrik

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nd image technology Problem: For example the standard organisations ISO, CEN, DIN, and CIE us anticopy software. This software is incompatible with the EPS vector graphic of the software Adobe Illustrator. However, this image software is used

nce 20 years in standard documents. How to revise these ISO documents ome existing problems for visibility, readability, resolution, and colour are sted. A solution shall maintain the former high quality of ISO standards. If the nticopy software is necessary then it shall be compatible with EPS vector grap

Many problems show the PDF document N1581 of ISO TC159/SC4/WG2 Visual Display Requirements. Many colours of three 16 step colour scales bet white and RGB disappear on page 36. The Word document with EPS graphic thous all colours as intradad.

hows all colours as intended

Solution 1: The vector graphic files are transfered to pixel graphic files and are included in the Word file.

Ind are invoked and intervention of the second seco

solution 2: ISO 9241-306:2018 is published in pixel graphic (low quality). SO-test charts in vector graphic are for download from the ISO Standard Main ance Portal. Therefore the test quality of ISO 9241-306:2009 remains, see

References and access to archive-web sites with navigation Basic References [1] CIE Toolkit for Technical Work, see 2] ISO What delegates and experts need to know 3] ISO How to write standards

[4] K. Richter, 2016, How to find public Web Pages with broken links e/WBM_find_PFs_16.pd

WBM access to public CIE documents until 2017 Navigate for Reports of CIE D1: Meeting (MR), Activity (AR)

tp://web.archive.org/web/20170624033105/http://div1.cie.co.at/?i_ca_id=544 avigate for Reports of Meeting (MR), Activity (AR), Reportership (RR) web.archive.org/web/20160406200138/http://div1.cie.co.at/?i_ca_id=544 ist of more than 300 CIE documents:

//web.archive.org/web/*/http://files.cie.co.at/ WBM and direct access to public BAM documents until 2010 e/index.htm Aost content of this BAM web site has been transfered in 2018 to:

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ccess of ISO-TC42 members to working documents of CIE Division 1 CIE D1 Vision and Colour produces 3 more document types compared to ISO: CIE D1 Reports: Anual (AR), Meeting (MR), and Reportership (RR). There were requests of ISO committes to the CIE for a colorimetric support. n some cases a CIE TC was created to solve this ISO problem with a documen xchanche until the final publication. An example is CIE 184 (indoor daylight). n other cases the CIE nominates a Reportership Reporter to write a (public) RR Many Reporters liked this job because the copyright remained by Fable 1: Access of TC42 members to CIE Liaison documents right remained by the author copy- public access to rigth CIE documents CIE document 2017 2018 CIE D1 Anual Meet CIE eport D1MR CIE D1 Anual Activ CIE Report D1AR IE D1 Reportership Auth port DIRR CIE D1 WD/CD/ED/A CIE ntil 2015, lim CIE D1 TR or IS TR, DHS 1 see >300 de

ccess of ISO-TC42 members to working documents of CIE Division 1

CIE D1 Vision and Colour produces 3 more document types compared to ISO CIE D1 Reports: Anual (AR), Meeting (MR), and Reportership (RR). here were requests of ISO committees to the CIE for a colorimetric support. a some cases a CIE TC was created to solve this ISO problem with a document kchanche until the final publication. An example is CIE 184 (indoor daylight). n other cases the CIE nominates a Reportership Reporter to write a (public) RR Any Reporters like this job because the copyright remained by Fable 1: Access of TC42 members to CIE Liaison documents? nained by the author IE document public access to CIE documents copy-rigth 2018 CIE D1 Anual Meetir

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Report D1AR	CIE Website			WBM archive [1]	
CIE D1 Reportership	public	internal	Author	until 2017, see	
Report D1RR	CIE Website	D1 members		WBM archive [1]	
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[1] provinces for MR_AB: http://www.archive.org/www.20120624022105.http://div.l.ois.co.at/%i.or.id=544					

The Weber-Fe The Stevens la	chner law de w describes t	escribes the ligh the lightness L*	tness L*r as logo TIELAB as potent	trithmic fun	ction of L_r . of $L_r = Y/5$.		
IEC 61966-2-1	uses a simil	lar potential fun	ction $L^{*}_{IEC} = m$	$L_{r}^{1/2,4}$.			
The Weber-Fechner law is equivalent to the equation: $\Delta L_r = c L_r$ [1]							
Integration leads to the logarithmic equation: $L^*_r = k \log(L_r)$. [2]							
Derivation leads for $\Delta L_{r}^{*}=1$ to the linear equation: $L_{r}/\Delta L_{r}=k=57$. [3]							
For Adjacent colours in offices the standard contrast range is 25:1=90:3,6.							
Table 1: CIE tristimulus value Y, luminance L, and lightnesses L*							
Colour	Tritimulus	office	relative	CIE	relative		

(matte)	value	luminance	luminance	lightness	lightness
(contrast) (25:1=90:3,6)	Y	L [cd/m ²]	Lr =L/Lz	L [*] CIELAB ~m L _r ^{1/2,4}	L_r^* = $k \log(L_r)$
White W	90	142	5	94	40
(paper)	=18*5	=28,2*5		=50+44	$=k \log(5)$
(paper)	18	28,2	1	50	$=k\log(1)$
Black N	3,6	5,6	0,2	18	-40
(paper)	=18/5	28,2/5		50-32	$=k \log(0,2)$
For the lightness range between $L^*=-40$ and 40 the constant is: $k=40/\log(5)=57$					

Weber-Fechner law in CIE 230:2019 for threshold col surface colours The Weber-Fechner law describes the lightness L_r^* as logarithmic function of L_r . For local adaptation to Adjacent colours there is a visible contrast 100:1 The Stevens law describes the lightness L^{*}_{CELAB} as **potential** function of $L_r=Y/5$ IEC 61966-2-1 uses a similar potential function $L^{*}_{\text{IEC}} = m L_r^{-1/2,4}$. For separate colours on a grey surround there is a visible contrast 25:1=90:3,6. The Weber-Fechner law is equivalent to the equation: $\Delta L_r = c L_r$ [1] [2] ration leads to the logarithmic equation: $L^*_r = k \log(L_r)$. Table 1: CIE tristimulus value Y, luminance L, and lightn Tritimu sloffice CIE relative Colom relative lightnes natte ahne (contrast) (25:1=90:3,6 *CIELAB L_r =k log(L, [cd/m²] White W . 18*5 =28,2*5 50+44 $=k \log(5)$ (paper) 28.2 Grev Z =klog(1) (paper =18/5 28,2/5 50-32 =klog(0,2 (paper) =-40 and 40 the constant is: $k=40/\log(5)=57$ For the lightness range between L*,

Colorimetric scan, display, and print for archiving based on the ergonomic International Standard ISO 9241-306:2018 for work places

Klaus Richter, Berlin University of Technology (TUB), Germany

Abstract

FE001-7N

ISO 9241-306:2018 shows colorimetric methods for output optimization of displays and projectors at work places. The optimization for equal spacing of colour series, visibility and readability is intended

There are input linearization methods for scanners and photography and output linearization methods for displays, printers, and offset print. By a start output of a digital ISO-test chart with 729 colours (9x9x9 rgb* values) for example the loop "ISO standard file -> ISO print -> ISO scan -> ISO file" is closed and the reb* colour data of the original ISO file are approximately reproduced at the end of the loop. For any hue there is a linear relation in both directions between the reb* and the CIELAB LCh* data. The closed loop and the linear relations are important properties for archiving.

Colorimetric workflow: digital input -> printer -> analog output based on the ergonomic Standard ISO 9241-306:2018 for work place Colorimetric workflow: digital input -> printer -> analog output based on the ergonomic Standard ISO 9241-306:2018 for work place In this default case the printer driver has the relative gamma $\gamma = 1,000$. In this special case the printer driver has the relative gamma $\gamma = 2.105$ analog output ISO output contrast output relative digital printer relative elative gamma input gamma ımma 2,105 2,105 2,10 1,818 1,818 1,818 darker 1,6101,600 1,428 1,290 1,600 -1,600 pleasent output 1.428 -1.428 -1,290 _____ 1,176 _____ 1,081 _____ 1,290 -1,176 1,176 no change 1.081 → 1,000 1.000 > f gamma 1.000 1.000 >288:1 YES 0.924 0.924 0.924 0,849 0,775 0,700 0.849 0.849 0.775 0.775 0,700 lighter output 0,700 -0,625 0.625 0,550 0,550 0,550 0,475 0,475 ►

eber-Fechner law in CIE 230:2019 for irface colours

The Weber-Fechner law describes the lightness L^*_r as logarithmic function of L_r For local adaptation to Adjacent colours there is a visible contrast 100:1. The Stevens law describes the lightness L^*_{CIELAB} as potential function of $L_r = Y/5$. The observation describes the figures L_{CIELAB} as potential function of $L_r = 1$. EC 61966-2-1 uses a similar potential function $L_{\text{BCC}}^* = m_r^{1/2.4}$. For *separate* colours on a grey surround there is a *visible contrast* 25:1=90:3,6. ee K. Richter, 2006, Relation of Weber and Stevens law at achromatic threshold. http://farbe.tu-berlin.de/A/BAMAT.PDF

Colour	Tritimulus	office	relative	CIE	relative
(matte)	value	luminance	luminance	lightness	lightness
(contrast)	Y	L	Lr	L^*_{CIELAB}	L_r^*
(25:1=90:3,6)		[cd/m ²]	=L/Lz	~ $m L_r^{1/2,4}$	= $k \log(L_r)$
White W	90	142	5	94	40
(paper)	=18*5	=28,2*5		=50+44	=klog(5)
Grey Z (paper)	18	28,2	1	50	$0 = k \log(1)$
Black N (paper)	3,6 =18/5	5,6 28,2/5	0,2	18 50-32	$-40 = k \log(0, 2)$

Weber-Fechner law in CIE 230:2019 for surface colours The Weber-Fechner law describes the lightness L*r as logarithmic function of L

or local adaptation to Adjacent colours there is a visible contrast 100:1. The Stevens law describes the lightness L^*_{CIELAB} as **potential** function of $L_r = Y/5$. IEC 61966-2-1 uses a similar potential function $L^*_{\text{IEC}} = m L_r^{-1/2,4}$. or separate colours on a grey surround there is a visible contrast 25:1=90:3,6 Surface colours cover the visible contrast 100:1. Negative film covers the ontrast 100000:1 (density 5:1). Film stores images from under to over expo Table 1: CIE tristimulus value Y, luminance L, and lightnesses L* Tritimulus office CIE olour natte value lumin . htm ightne (contrast) (25:1=90:3,6 ^{*}CIELAB m L 1/2,4 $L_r = k \log(L_r)$ [cd/m²] =L/La White W 142 =28,2*5 18*5 . 50+44 $=k\log(5)$ paper) 28.2 Grev Z klog(1) (paper) lack N 5,6 28,2/5 =18/5 50-32 $=k\log(0,2)$ (paper) or the lightness range between L*,= -40 and 40 the constant is: k=40/log(5)=5

Motivation and Problem

digital

input

0.47

The ideal reproduction for archiving occurs, if the loop: 1. ISO-standard file ->ISO print ->ISO scan ->ISO file is closed, and the **rgb*** values in the start and final file are equal. 2. ISO-standard print ->ISO scan ->ISO file ->ISO print is closed, and the LCh* values in the start and final print are equal. Both goals are approximately possible, if the output linearization method OLM_16 is applied, see

Richter, 2016, Output linearization method OLM16 for displays, printers and offset: tp://farbe.li.tu-berlin.de/OUTLIN16_01.PDF (similar to CIE R8-09:2015)

relative

1,818

1,176

- 1.081

0 924

0.849

0.775

- 0,700

- 0.625

- 0,550

1.000

analog output

darker

pleasen output

lighter output

output ISO contrast output

>288:1 YES

printer

hange by

umma γ~ l

TXT /.PS

TUB

registration:

application

tor

measurement of display output 20190501-EE00/EE00L0NA.

TUB-test chart EE00; Basics for the development of ISO and CIE standard documents Access to data; links and basic references; Visual threshold and Weber Fechner law