CIE DIV. 1（色彩與視覺）近況與新演色性指標進展報告

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June 05, 2013

2013 Meetings

CIE Centenary Conference

Final Programme & Abstract Booklet

CNAM, Paris - 15-16th of April 2013

http://www.CIEcentenary.insight-outside.fr

CIE Division 1 Meeting –

- July 5th~6th, 2013
- @ University of Leeds, UK

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http://div1.cie.co.at/

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Term of Reference

- To study visual responses to light
- To establish standards of
  - response functions, models
- To establish procedures of specification relevant to
  - photometry,
  - colorimetry,
  - colour rendering,
  - visual performance
  - visual assessment of light and lighting.

Technical Committees

- **TC 1-92**: Skin Colour Database
- ✓ **TC 1-91**: ***New Methods for Evaluating the Colour Quality of White-Light Sources***
- ✓ **TC 1-90**: ***(~New CRI)***
- **TC 1-89**: Enhancement of Images for Colour Defective Observers
- **TC 1-86**: Models of Colour Emotion and Harmony
- ✓ **TC 1-85**: ***Update CIE Publication 15:2004 Colorimetry***
- ✓ **TC 1-82**: *The Calculation of Colour Matching Functions as a Function of Age and Field Size*
- ✓ **TC 1-81**: *Validity of Formulae for Predicting Small Colour Differences*
- ✓ **TC 1-80**: Research Methods for Psychophysical Studies of Brightness Judgments

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Technical Committees

- **TC 1-78**: Evaluation of Visual Performance in the Real Lit Environment
- **TC 1-77**: Improvement of the CIE Whiteness and Tint Equations
- **TC 1-76**: Unique Hue Data
- **TC 1-75**: A Comprehensive Model of Colour Appearance
- **TC 1-74**: Methods for Re-defining CIE D illuminants
- **TC 1-73**: Real Colour Gamut
- **TC 1-72**: Measurement of Appearance Network: MApNet
- **TC 1-71**: Tristimulus Integration
- **TC 1-70**: Metameric Samples for Indoor Daylight Evaluation
- **TC 1-69**: Colour Rendition by White Light Sources

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- **TC 1-68**: Effect of Stimulus Size on Colour Appearance
- **TC 1-67**: The Effects of Dynamic and Stereo Visual Images on Human Health
- **TC 1-64**: Terminology for Vision, Colour and Appearance
- **TC 1-63**: Validity of the Range of CIE DE2000
- **TC 1-61**: Categorical Colour Identification
- **TC 1-55**: Uniform Colour Space for Industrial Colour Difference Evaluation
- **TC 1-42**: Colour Appearance in Peripheral Vision
- **TC 1-36**: Fundamental Chromaticity Diagram with Physiologically Significant Axes

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Reporters

x 9 Reporters

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R1-40	Jack Holm	Scene Dynamic Range
R1-42	Changjun Li	Extensions of CIECAM02
R1-49	Malcolm Nicholson	Above Threshold Pulsed Light
R1-50	David Simmons	3D Aspects of Visual Appearance Measurement
R1-51	Michael Brill	Maxwell vs Maximum Saturation Colour Matches
R1-52	Hugh Fairman	Spectral Data Interpolation
R1-53	Frédéric Leloup	Gloss Perception and Measurement
R1-57	Thorstein Seim	Border Between Luminous and Blackish Colours
R1-58	Phil Green	Liaison with ISO TC130 Graphic Technology

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L1-3	ISO/TC6/WG3: Paper, boards & pulps: Optical Properties	Joanne Zwinkels
L1-4	ISO/TC 38/SC1: Textiles. Colour fastness & measurement	Ronnier Luo
L1-5	ISO/TC 42: Photography	Jack Holm
L1-6	ISO/TC 130: Graphic Technology	Danny Rich
L1-7	ISO/IEC/JTC 1/SC 28 Office Equipment	Klaus Richter
L1-8	IALA: International Association of Lighthouse Authorities	Malcolm Nicholson
L1-9	ISO TC 159 WG2 Design Issue for Elderly and Disabled People	Ken Sagawa

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OP06

SEMANTIC INTERPRETATION OF COLOUR RENDERING INDICES: A COMPARISON OF CRI AND CRI2012

Bodrogi, P., Krause, N., Brückner, S., Khanh, T.Q.

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bodrogi@lichttechnik.tu-darmstadt.de

CIE TC 1-69 (Colour Rendition by White Light Sources) recommended a method to improve the performance of the current CIE colour rendering index (CIE, 1995). This new method is the so-called CRI2012 colour rendering index. It has several advantages including:

- an improved set of test colour samples of both low and high constancy;
- a modern colour difference metric, CAM02-UCS (Luo et al., 2006) instead of the obsolete U*V*W* of the current CRI method (CIE, 1995); and
- a new scaling function from colour difference values to the CRI2012 scale which better reflects human perceptual responses.

very good (1-0)

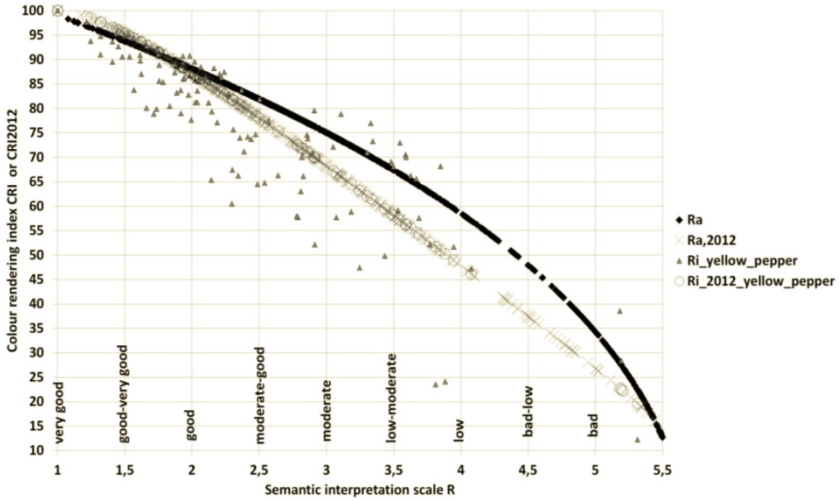
good (2.0)

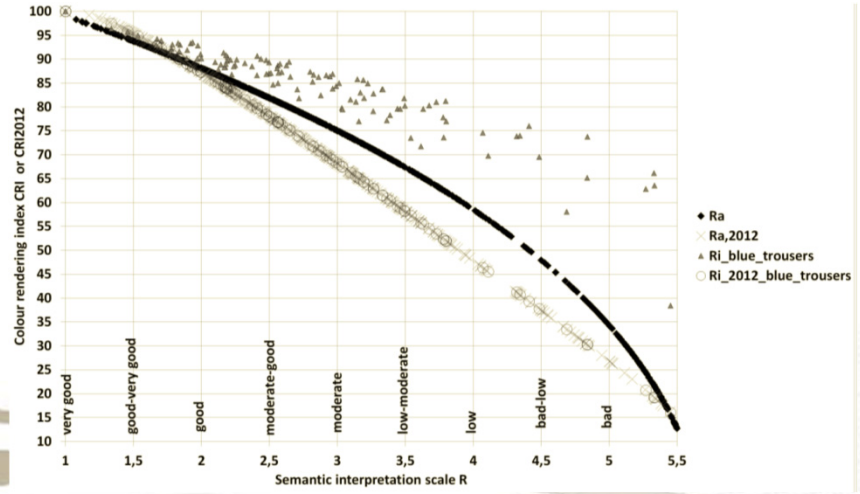
moderate (3.0)

low (4.0)

bad (5.0)

very bad (6.0)





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OP07

COLOUR RENDERING OF FACE COMPLEXION AND HAIR UNDER LED SOURCES

Jost, S.[1], Fontoynont, M.[2]

[1] Université de Lyon, Ecole Nationale des Travaux Publics de l'Etat, Laboratoire Génie Civil et Bâtiment, Vaulx-en-Velin, Lyon, FRANCE

[2] Department of Energy and Environment, Danish Building Research Institute, Aalborg University, A. C. Meyers Vænge 15, 2450 København, DENMARK

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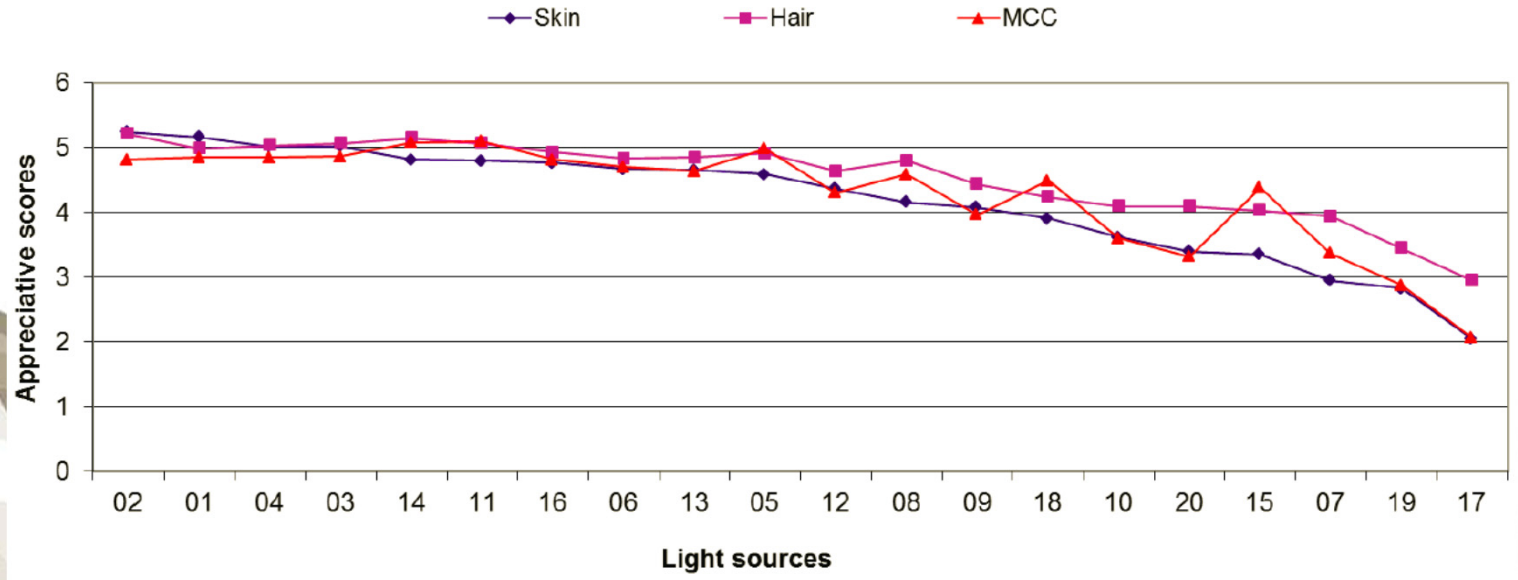
The experiment conducted looks at the perceived colour rendering on face complexion and hair under LEDs light sources and fluorescent sources. The aim is to identify which mixing of LEDs various observers assess as the most appropriate for their own complexion and hair. We have tested different types of skin and hair in order to establish whether people with different skin tones have different preferences regarding light spectra and to find out which lighting is the optimal for each type of skin. Further, we investigated which metrics best describe the subjective estimation. 63 subjects took part in the experiment and were asked to estimate 20 illuminations at 2700K.


Skin
Hair
MCC
Appreciative scores
0
1
2
3
4
5
6
02
01
04
03
14
11
16
06
13
05
12
08
09
18
10
20
15
07
19
17
Light sources

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OP08

A STUDY OF COLOR RENDERING PROPERTIES BASED ON COLOR PREFERENCE OF OBJECTS IN ADAPTATION TO LED LIGHTING

Imai, Y., Kotani, T., Fuchida, T.

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- **To further investigate the effect of distinctive feelings for chromatic objects illuminated by LED light sources.**

- **To provide detailed investigations of the relationship between preference and saturation of each of the familiar objects.**

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Conclusion

- To evaluate color rendering properties based on color preference, the selection of color samples is the most important .
  - For the familiar objects, the memory color method may be a candidate.
  - When including the other objects, the evaluation on naturalness, color harmony and general lighting impression may be necessary.

- It will be needed to make further investigation on the relationship between preference and samples.

OP09

OPTIMIZATION OF COLOUR QUALITY FOR LANDSCAPE LIGHTING BASED ON FEELING OF CONTRAST INDEX

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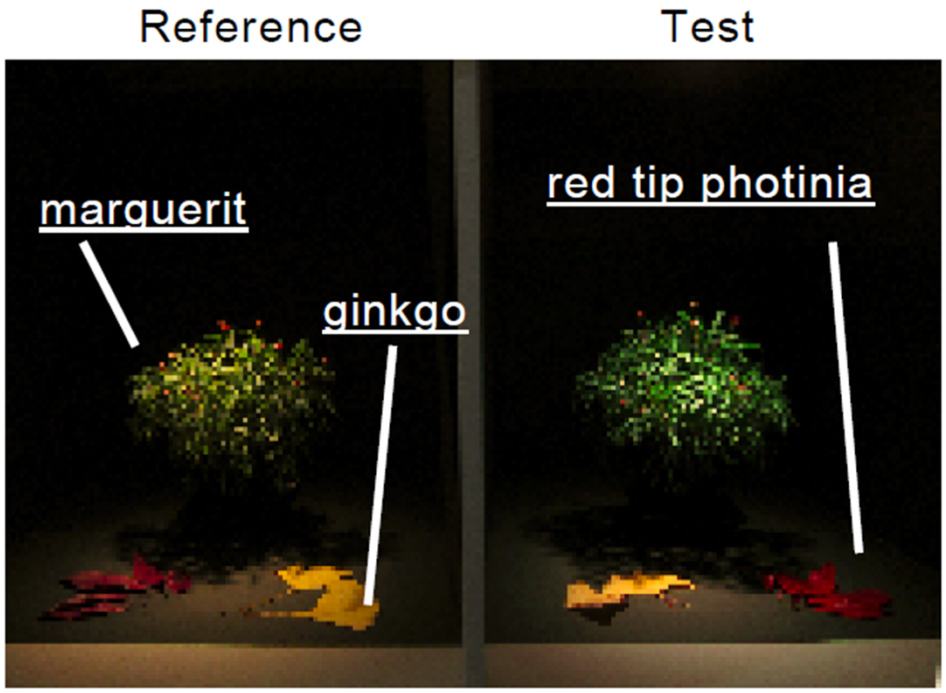
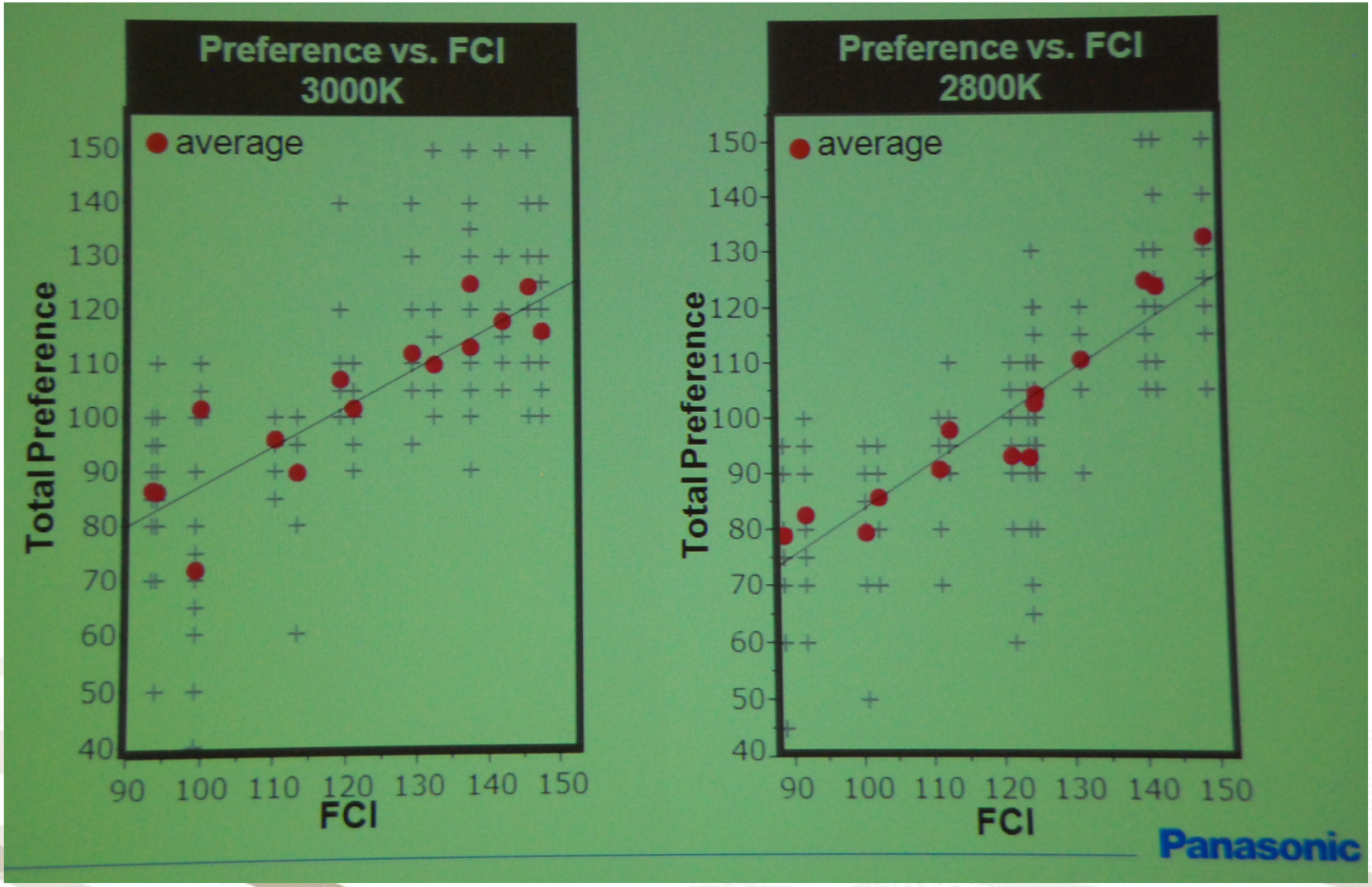
Tsukitani.ayako@jp.panasonic.com



$$FCI = \left[\frac{G(T)}{G(D65)}\right]^{1,5} \times 100$$


Preference vs. FCI
3000K
average
Total Preference
FCI
Preference vs. FCI
2800K
average
Total Preference
FCI
Panasonic

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OP10

THE EFFECT OF AMBIENT ILLUMINATION SPECTRUM ON VISUAL PERFORMANCE

Nagy, B.V.[1,2], Barboni, M.T.S.[1], Oliveira, J.G.[3], Ventura, D.F.[1]

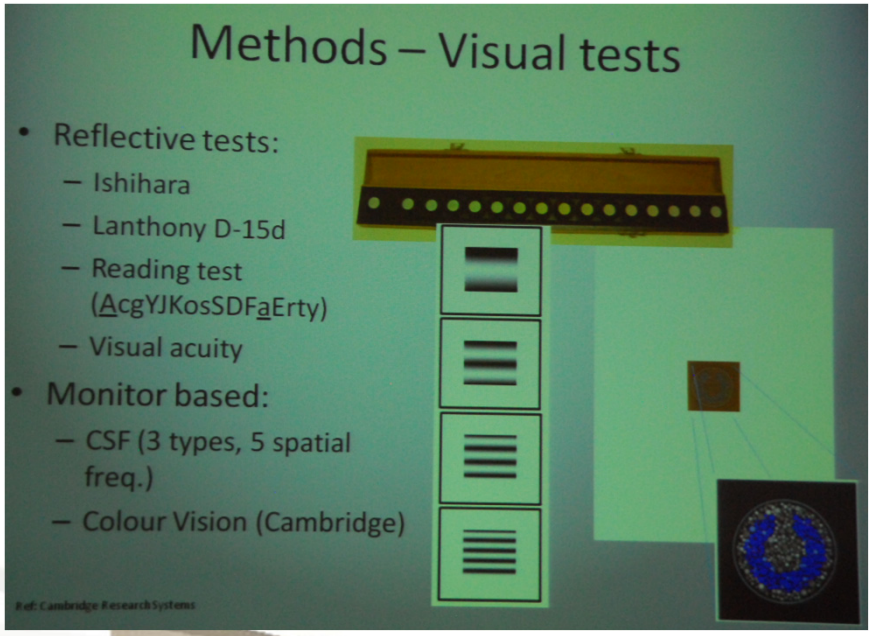
[1] Institute of Psychology, University of Sao Paulo, Sao Paulo, SP, BRAZIL

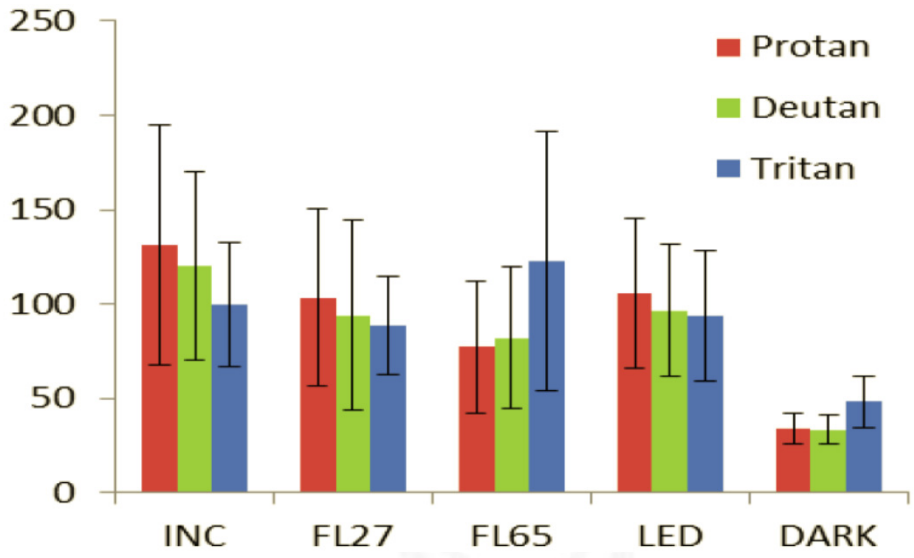
[2] Department of Mechatronics, Optics and Engineering Informatics, Budapest University of Technology and Economics, Budapest, HUNGARY

[3] Institute of Electrotechnics and Energy, University of Sao Paulo, Sao Paulo, SP, BRAZIL.

Contact email: nagybal@usp.br

To analyze visual performance through standard clinical and applied research visual tests in similar environments with different illumination spectra


Methods – Visual tests
• Reflective tests:
– Ishihara
– Lanthony D-15d
– Reading test (AcgYJKosSDFaErty)
– Visual acuity
• Monitor based:
– CSF (3 types, 5 spatial freq.)
– Colour Vision (Cambridge)


250
200
150
100
50
0
Protan
Deutan
Tritan
INC
FL27
FL65
LED
DARK

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OP11

SIMULATION OF THE RETINA RESPONSE TO MESOPIC VISUAL SCENES

Decuypere J.[1], Capron J.-L.[2], Dutoit T.[1], Renglet M.[1]

[1] University of Mons - UMONS, Mons, BELGIUM

[2] Université catholique de Louvain, Louvain-la-Neuve, BELGIUM

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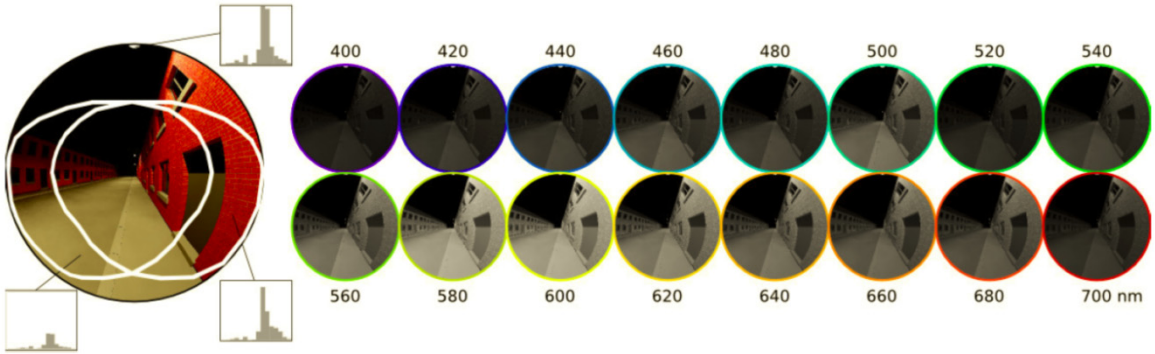
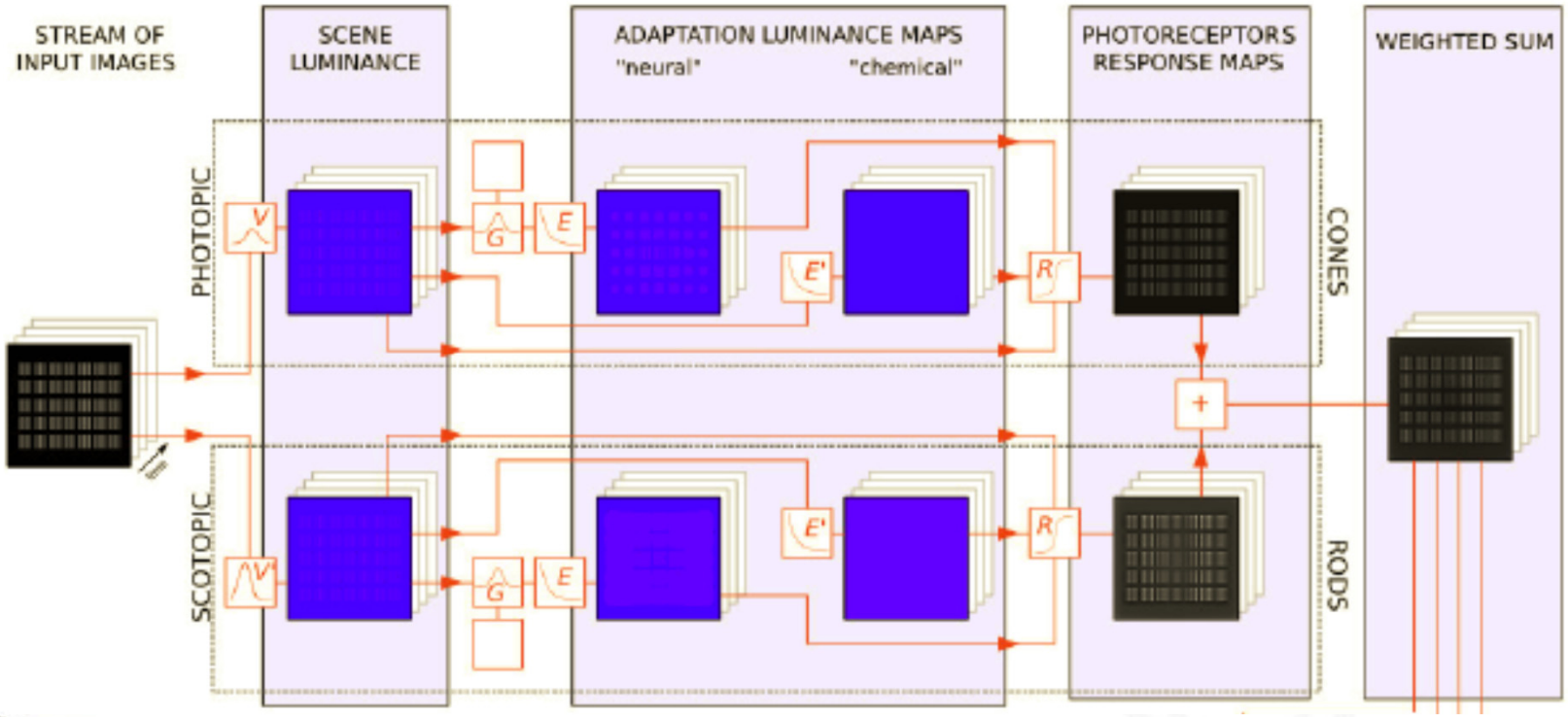
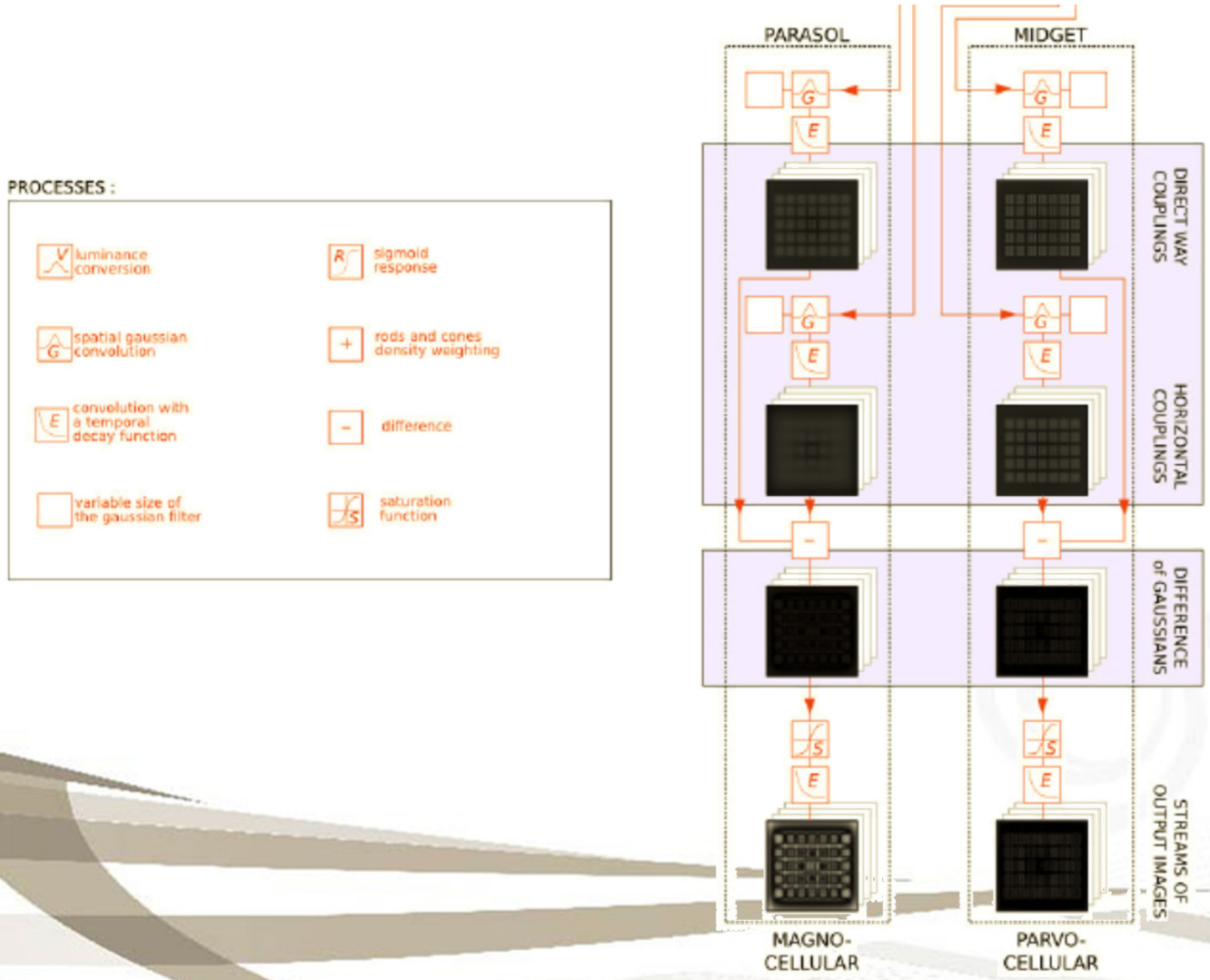
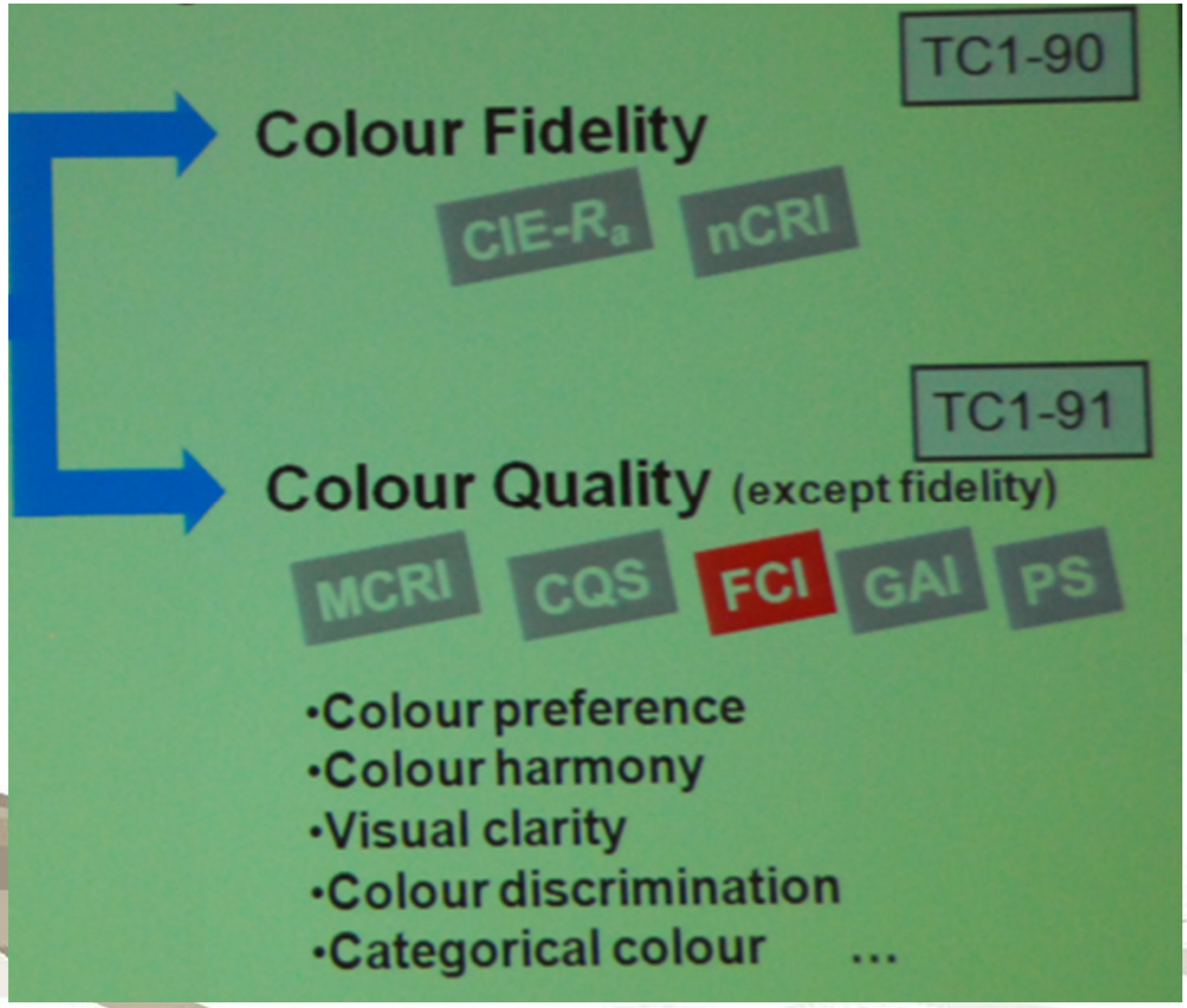



STREAM OF INPUT IMAGES
SCENE LUMINANCE
ADAPTATION LUMINANCE MAPS
"neural"
"chemical"
PHOTORECEPTORS RESPONSE MAPS
WEIGHTED SUM
PHOTOPIC
SCOTOPIC
CONES
RODS
V
G
E
E'
R
+


PROCESSES :
luminance conversion
sigmoid response
spatial gaussian convolution
rods and cones density weighting
convolution with a temporal decay function
difference
variable size of the gaussian filter
saturation function
PARASOL
MIDGET
DIRECT WAY COUPLINGS
HORIZONTAL COUPLINGS
DIFFERENCE of GAUSSIANS
STREAMS OF OUTPUT IMAGES
MAGNO-CELLULAR
PARVO-CELLULAR

Color Rendering



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Link with metrics

- **14 Metrics calculated:**
  - Ra8, Ra14, R13, nCRI,
  - CQS, Qf, Qp, Qg,
  - MCRI, MCRIskin,
  - GAI, FCI, FSCI, RCRI

- **Neither Ra (Ra8, Ra14) nor R13 are good predictors (R<0,3)**

- **Significant correlation (R> 0,7 ; p < 0,05)**
  - Skin : MCRI, Qp, CQS, MCRIskin, nCRI
  - Hair : MCRI, Qp , MCRIskin, CQS, Qg
  - MCC : Qg, Qp, GAI, MCRIskin, FCI

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The End