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Development of comprehensive colour appearance model

The International Commission on Illumination (CIE) is responsible to provide standards and procedures for specifying colour and light. It should serve the three main functions of colour science: colour specification, colour difference evaluation and colour appearance prediction. The overall goal of this presentation is to develop a comprehensive colour appearance model (CCAM). For colour specification, CIE 1931 and 1964 systems specify XYZ values for 20 and 100 fields of view, respectively. CIE2006 system has recently been proposed to specify colours for different field sizes and different age of observers. For colour difference evaluation, the CIE proposed two uniform colour spaces, CIELAB and CIELUV in 1976. All colours can be presented to show their relative positions in a 3D space. CIEDE2000 formula was proposed to calculate colour-differences across different industries. In 2006 and 2017, the author proposed CAM02-UCS and Jzazbz UCSs. The latter provides high perceptual uniformity, accurate hue linearity and neutral point convergence, highly desired for HDR and WCG applications. It can be further extended to become a CAM. For predicting colour appearance of surface colours under different viewing conditions in terms of lightness, brightness, colourfulness, chroma, saturation and hue composition. Those attributes have recently been extended to include vividness, whiteness and blackness. New models were also developed to predict the appearance of stimulus in isolated field such as CAM15u for unrelated colours. This is particularly useful for light and lighting applications. A list of new colour appearance data will be provided to develop the CCAM. New research instrument based on spectrum tunable multi-channel LED system will be introduced to acquire some of these data.

Recent Publications

- 1. M Safdar, G Cui, Y J Kim and M R Luo (2017) Perceptually uniform color space for image signals including high dynamic range and wide gamut. Optics Express 25:15131–15151.
- 2. Y J Cho, L C Ou and M R Luo (2017) A cross-culture comparison of saturation, vividness, blackness and whiteness scales. Color Res and Appl. 42:203–215.
- 3. Withouck M, Smet K A G, Ryckaert W R and Hanselaer P (2015) Experimental driven modelling of the color appearance of unrelated self-luminous stimuli: CAM15u. Optics Express 23:12045–12064.
- 4. M R Luo, G Cui and C Li (2006) Uniform colour spaces based on CIECAM02 colour appearance model. Color Res. Appl. 31:320–330.
- 5. M R Luo, G Cui and B Rigg (2001) The development of the CIE 2000 colour-difference formula: CIEDE2000. Color Res. Appl. 26:340–350.

Biography

Ming Ronnier Luo is a Global Expertise Professor at the College of Optical Science and Technology, Zhejiang University (China), a Visiting Professor of Colour Science and Imaging, University of Leeds (UK) and a Chair Professor at the National Taiwan University of Science and Technology, Chinese Taipei. He is also the CIE Vice-President of Publication. He received his PhD in 1986 at the University of Bradford in the field of Colour Science. He has published 600 publications in the areas of colour science, imaging science and LED illumination. He is a Fellow of the Society for Imaging Science and Technology (IS&T), and the Society of Dyers and Colourists (SDC). He has received numerous awards for his research in Colour Science and Technology including the recent AIC 2017 Judd Award.

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