

Facing future lighting trends: how can ILI collaborate with CIE?



From June 12 to 15, the International Commission on Illumination (CIE) held its Division 2 annual meeting at the campus of Eindhoven University of Technology. A NSVV (Nederlandse Stichting voor Verlichtingskunde) Workshop on Future Developments in LED Lighting and Measurements was also held connected with the CIE Division 2 meeting. The workshop was hosted by ILI's representative prof. Alex Rosemann, who presented his views on Smart and Connected Lighting during the workshop. Having the CIE at our campus obviously was the perfect occasion for a meeting with the Intelligent Lighting Institute. The President of the CIE, dr Yoshi Ohno, had an informal discussion with prof. dr Ingrid Heynderickx on how CIE and ILI can find each other in collaborations to face future trends in lighting.

The challenges of LED

Ohno stressed in the conversation that the introduction of LEDs in lighting, roughly one decade ago, has put the CIE with a number of new challenges in all its divisions. LED-based lighting changed some design rules for interior (CIE Division 3) and exterior (CIE Division 4) lighting and initiated the attention for the photo biological effects of light on humans (CIE Division 6). Among many different topics related to LEDs, metrics for colour rendering of light sources (CIE Division 1), the topic of Ohno's talk at the NSVV workshop, faced a big challenge as well. The introduction of LED-based light sources emphasized the problem of the Colour Rendering Index (CRI; see frame), i.e., its scores often do not correlate well with visual evaluation. It is generally agreed in CIE and in the lighting community that the CRI needs to be updated, but to achieve this is a big challenge. Ohno pointed to an important research activity of CIE, to define a metric on the description of overall colour quality, which includes colour fidelity and colour preference/perception. In the course of these activities

CIE recently published a new colour fidelity index. However, this new index could not replace the CRI because it is considered that fidelity only is not sufficient to judge overall colour quality of light sources. A new metric for colour preference/perception is needed, and CIE is encouraging more scientific research in this area (see CIE Research Strategy). ILI could contribute to this research domain with subjective studies evaluating the colour perception of illuminated objects in terms of naturalness and preference.

Smart network of light sources

Ohno and Heynderickx also discussed the trend of having connected light sources in a network. This network of light sources can sense collectively the environment and create the best lighting through learning algorithms. The Bright Environments program line within ILI researches this network behaviour in terms of communication protocols, fall-back scenario for communication or network errors and quality-of-service measures. The latter should define how well the

The Colour Rendering Index

For decades, the Color Rendering Index (CRI) has been the measure used to indicate how well an artificial light source renders colours of objects to be natural looking. The CRI value (general colour rendering index Ra) of a light source is based on the colour of eight specific test colour patches illuminated by that light source, compared with the colour of these patches illuminated by a reference illuminant (Planckian or daylight). The higher the CRI value, the better the light source reproduces colours in agreement with the reference illuminant.

networked lighting in an environment is functioning. Since CIE's focus is on defining recommendations and standards for quality of integrative lighting, ILI and CIE may clearly find each other on the latter topic: how does the quality of communication and light generation in the network affect the final quality of lighting in an indoor or outdoor environment, and how, for example, does this lead to improved performance, health or safety? CIE is also interested in scientific studies, proving improved vitality, cognitive performance, health prevention and safety feelings through appropriate (dynamic) lighting, and as such, has a natural link with the Sound Lighting program line of the ILI for scientific studies on claim validation.

Finding the best balance

Ohno also explained the complexity of the CIE mission in terms of standardization. Based on scientific research, the CIE writes recommendations for light characteristics or lighting design. CIE consists of National Committees, which together form the CIE General Assembly with representatives of 42 member countries. The CIE technical committees consist of members from the national committees interested, and CIE technical reports require unanimous approval at final committee draft stage. There are cases where methods based on the latest science would not fit the industry practice, and then agreement might be difficult to reach. In such cases, it is a difficult task to find a balance between the ideal methods based on the best scientific

knowledge and the practical methods acceptable for the industry. Such examples are the test method for LED lighting products and colour quality metrics. Ohno sees the importance of meeting the industry needs while providing best available science. Next year, Ohno's term as CIE President will end. He hopes by then to have substantially increased the number of CIE publications on various issues in LED lighting.

Future prospect of CIE

The revolution of lighting by LED is well on its way, and the world of lighting is changing in many aspects. One big direction is smart lighting (or connected lighting) as mentioned above, which is a big opportunity for further huge energy savings and new life style but ensuring quality of lighting and safety in transportation is an important aspect that CIE should keep addressing. Another big direction is healthful lighting (or called human centric lighting in the industry) where lighting can enhance health and well-being of users and may have a big impact, but this keeps requiring a lot more scientific research. Ohno hopes that CIE will take strong initiatives in promoting research in these areas and standardization in the future. These topics are among the ten topics of CIE Research Strategy published on CIE website. Ohno hopes CIE can address these important topics in coming years and will play critical roles in the revolution of lighting.



More about the CIE

Since 1913, the CIE has provided an international forum for the discussion of all matters relating to the science, technology and art in the field of light and lighting and for the interchange of information in these fields between countries. The CIE comprises of 42 member countries and its technical work is carried out within its six divisions, each of which focuses on different areas of light and lighting. The current Divisions are: Division 1: vision and colour, Division 2: physical measurement of light and radiation, Division 3: interior environment and lighting design, Division 4: transportation and exterior applications, Division 6: photobiology and photochemistry, and Division 8: image technology. Many activities, however, are cross-divisional; examples are the definition, measurement protocol and guidelines for colour rendering, flicker, and glare.

The CIE collaborates with ISO and IEC and is recognized by these two bodies as the international standardizing body in the field of light and lighting. Since 2013, CIE has been directly collaborating with ISO on the application standards, supported by agreements between the CIE and ISO/TC 274. Specifically CIE continues to work on fundamental standards (such as colorimetry, action spectra and measurement methods) and collaborates with ISO/TC 274 on the existing CIE and future joint CIE/ISO application standards.