Houser Leads Study on Perceptions of LED Lighting

A research team led by Kevin Houser, professor of architectural engineering, has determined that color and whiteness rendition has a profound effect on LED light source preference. The team's findings were published in Lighting Research & Technology in an article titled "Perceptual responses to LED illumination with colour rendering indices of 85 and 97" .

In addition to Houser, the research team included architectural engineering graduate student Minchen Wei, and Aurelien David and Mike Krames from Soraa, the California-based lighting manufacturer that participated in the study.

The researchers recruited 48 participants to compare colorful and white objects under two different light-emitting diode (LED) sources: a blue-pumped LED with a two-phosphor mix and color rendering index (CRI) of 85 and a violet-pumped LED with three phosphors and a CRI of 97 (Soraa's VP3 Technology). CRI is a measure of a light source's ability to show object colors realistically or naturally compared to a familiar reference source, either incandescent light or daylight. CRI has a maximum value of 100, with a lower value indicating that some colors may appear unnatural when illuminated by the lamp. For instance, incandescent lamps have a CRI above 99 while most fluorescent lamps have CRI values in the low to mid 80s. Additionally important for red color rendering, including human skin tones, is the index R9. Like CRI, R9 has a maximum value of 100. Incandescent lamps have R9 above 99 while fluorescent lamps vary widely (e.g., R9 of less than 0 to greater than 90). The experimental set up achieved an R9 of 89 for the 97 CRI lamp and 24 for the 85 CRI lamp.

The team found that the participants strongly preferred colors under the light with the high CRI and R9. While this was anticipated, even more pronounced was the perception of common white objects. The strong preference for whites was made possible by the full visible spectrum of the high CRI sources, which is unlike standard LEDs that lack the short wavelengths, specifically violet.

Houser explained that the results have implications that consumers can see on a day-to-day basis. "We evaluate color continuously, sometimes consciously and sometimes not. I was recently in the produce section of a remodeled grocery store and most types of fruits looked unappealing. Then, I looked up to see that the store had converted the produce lighting to LEDs with apparently a low CRI. The color distortion that I was seeing was caused by the light sources."

He said the same concept applies to buying paint for a room in your house or a tie to match a shirt. "Lighting, more specifically the way objects appear under a light, makes a difference in how we perceive and evaluate the colors in our world."

Houser added that partnering with industry to conduct these types of studies is a win-win for both entities. "Soraa partnered with Penn State in cutting-edge research and in return we have provided data that Soraa can use to enhance their products."

"Kevin's depth of expertise and attention to detail have helped us breakdown the critical elements of lighting perception and develop fundamentally better products based on scientific facts, rather than on gimmicks or marketing tricks," said Mike Krames, Soraa of CTO. "We look forward to even more opportunities in understanding and improving the way our customers view the world."

Ramaji Receives Student Award

Issa Ramaji, a doctoral candidate in architectural engineering, is the recipient of a Central Pennsylvania Section of the American Society of Civil Engineers (ASCE) 2014 Student Award.

He was one of four students from 19 eligible Pennsylvania counties who received the $2,000 award.

Applicants were selected based on the following criteria: grade-point average and class rank, honors and activities, adviser recommendations and personal essays.

Ramaji is advised by Ali Memari, Bernard and Henrietta Hankin Chair of Residential Construction and director of the Pennsylvania Housing Research Center and the Building Envelopes Research Laboratory.

Founded in 1852, the ASCE represents more than 145,000 members of the civil engineering profession worldwide and is America's oldest national engineering society. The society's vision is to position engineers as global leaders, building a better quality of life.

The Central Pennsylvania Section of the ASCE has nearly 1,100 members and represents the engineering and construction industry for communities throughout central Pennsylvania.

Memari Awarded Patent for Transparent Sustainable Wall System

Ali Memari, professor and Hankin Chair in Residential Building Construction, and Joseph Standley, an associate at Wiss, Janney, Elstner Associates, Inc. in Boston, Massachusetts, have been issued a patent: "Transparent Sustainable Wall System", US 8,833,012 B2 dated September 16, 2014.

According to Memari, the story-high wall system developed is transparent for maximum daylighting and is load-bearing. The structural system to carry gravity loads replaces conventional wood framing with structural steel tubing, while transparent polycarbonate sheathing that resists in-plane shear forces replaces conventional plywood or oriented strand board. Instead of conventional siding, the exterior face of the wall consists of energy efficient glazing systems that can include photovoltaic crystalline cells or thin film technology. The wall is designed to be panelized and can be partially or completely prefabricated. The panels can be erected at the job site using bolts as fasteners. For this reason, the panels can be reused if the building is properly disassembled. The wall system can be used for new permanent design, retrofit designs or temporary housing. The panels can be completely reused in other sites with minimum waste of material.

Penn State Alumni Association honors Dougherty as Volunteer of the Year

Architectural engineering graduate Jonathan Dougherty has been named the 2014 recipient of the Penn State Alumni Association's (PSAA) Kay and Ernie Salvino Volunteer of the Year Award. The award recognizes an individual who has provided exemplary service to the PSAA.

Dougherty has been a member of the Penn State Engineering Alumni Society (PSEAS) since 2012. In this capacity, he has: facilitated an annual Affiliate Program Group leaders forum, reviewed student resumes, helped organize the annual PSEAS alumni tailgate and volunteered at regional receptions for students accepted to the College of Engineering.

He is a founding member of the Department of Architectural Engineering's alumni society (ASAE) and has served as its president since 2010. Under his leadership, the group established an early career impact award; a student-alumni mentoring program through which he has mentored four students; and a president's council, which brings architectural engineering student organization leaders and ASAE members together to discuss department, campus and student challenges. Dougherty has been a member of the Department of Architectural Engineering's Industrial and Professional Advisory Council since 2013 and has served as a senior thesis juror since 2007. He was named an Architectural Engineering Centennial Fellow in 2010.

Dr. Dougherty was presented with his award in an October 24th ceremony. Congratulations Jonathan!