Preference and perception

Iain Carlile singles out three of the latest LR&T papers which look at how colour temperature and lighting method affect our view of space and objects

The effect of different factors on colour preference (Huang et al)

A paper by Stokkermans et al investigates how the method of lighting can affect a person's impression of a space. Considering brightness and perceived uniformity, an experiment was conducted in which a number of observers viewed high-quality visualisations under controlled conditions. The visualisations were all of the same space but using different styles of lighting (both focused and diffuse). Participants in the experiment assessed the atmosphere for different qualities: cosiness, liveliness, tenseness, and so on. In a second experiment participants evaluated brightness and perceived uniformity. From the results of the investigation it was found that people's perception of atmosphere can be described as a second-order polynomial as a function of two perceptual light attributes.

Huang et al examine the effect of different factors on colour preference, including spectral power distribution (SPD) application, personal colour preferences of observers, cultural difference and gender. LED lighting with differing colour correlated temperature (CCT) values was used to illuminate different objects. Observers were asked to rate the light quality and rank their preference for the different objects under the various lighting conditions.

The authors conclude that the light itself, rather than the object being illuminated, is the most important factor when determining which light an observer will prefer. The authors also note that some gamut-based colour metrics correlated with the results of their experiment, observing that colour preference is strongly influenced by colour saturation. Object familiarity was also found to influence colour preference.

Also considering colour correlated temperature, Hartstein et al investigated the effects on cognitive task performance in males and females under varying CCTs. An experiment was conducted in which the subjects performed a number of cognitive tasks under both 3500K fluorescent and 5000K LED sources. It was found that under higher CCT illumination females' (but not males') reaction time decreased by 10 per cent on a switching task. Conversely, the reaction time of males (but not females) decreased on a go/no-go task, and that no effect was noticed on the mental rotation tasks. It was also found that higher CCT illumination provided improved reaction time on certain attention/executive function tasks, but that improvement is gender specific.

A very different investigation into colour temperature was conducted by Jia et al. Their paper looks at a specific application: the illumination of Japanese-style gardens in summer and winter. An analysis was conducted into the influence of a change in CCT on different elements within the scene, including vegetation, water, stone and (warm-toned) structures. Seven different CCTs were applied to an image of the same scene, ranging from 2000K to 10,000K, and observers were asked to note their evaluations (for example, beautiful, attractive, clear, calm, and so on).

From an analysis of the results, the authors concluded that in this setting, during summer the optimum CCT values were 2000K for vegetation and stone, 6000K for water and 4000K for structures. In winter for the same scene, the optimum CCT values were 4000K for vegetation and water, and 3000K for stones and structures. ■

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Lighting Research and Technology: OnlineFirst

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- Relation between the perceived atmosphere of a lit environment and perceptual attributes of light
  M Stokkermans, I Vogels, Y de Kort and I Heynderick
- Light dominates colour preference when correlated colour temperature differs
  Z Huang, Q Liu, S Westland, MR Pointer, M Ronnier Luo and K Xiao
- A comparison of the effects of correlated colour temperature and gender on cognitive task performance
  LE Hartstein, MT Durniak, RF Karlicek Jr and NE Berthier
- The optimum colour temperature for illumination of Japanese-style gardens in summer and winter
  D Jia, T Misawa, M Takamatsu and S Hirobayashi