NEW IMAGE BASED MEASUREMENTS OF REFLECTION PROPERTIES OF ROAD SURFACES

Buschmann, S.[1], Steblau, J.[1], **Völker, S.**[1]
[1]Technische Universität Berlin, Berlin, Germany
sandy.buschmann@tu-berlin.de

Abstract

A lighting planner designs the installation with the help of the illuminance level if road's reflection properties are unknown. This can result in luminances too high or too low, incalculable luminance distributions and therefore lower safety and/or energy efficiency. The reflection properties are relevant to the research and development community as well, as the quality rating of street lighting scenes, for example by means of visibility level and through revealing power methods, requires an exact simulation of luminance distributions on pavements. In addition, with this knowledge they would be able to fully exploit the potential of new LED optics.
The established measurement method for determining reflection properties of road surfaces is taking a drill core sample out and making precise measurements in the laboratory. The resulting r-tables contain reduced luminance coefficients for defined viewing angles and light incidents. Other, non-destructive in situ measurement methods which use closed boxes and calibrated light sources have not been asserted themselves. Cheap, easy and non-destructive methods are desired by lighting and urban planners.
Hence, the authors are investigating a method where luminance image processing is used to calculate relevant reflection properties of a street lighting scene. It uses a calibrated additional luminaire to eliminate the lack of knowledge about all other light sources and several luminance camera images taken of the measurement field. The reduced luminance coefficient in all relevant points of the measurement field is calculated by dividing the illuminance, caused by the light sources, by the luminance, seen by the standard observer. In this way the measurement and calculation process provides luminance coefficients for the relevant measurement field. The results are compared to simulations where precise measured r-tables and measurements were available. The presented method generates r-tables which provide sufficiently well simulated street lighting scenes.
Finally, this article shows the further need to improve this method to eliminate measurement uncertainties. It also provides ideas of further simplifications of the required measurements and calculation process for planners.

Keywords: Exterior lighting, street surface, reflection properties, luminance coefficient, r-tables, image processing, luminance image, measurements