Development of light distribution measurement tool using digital single-lens reflex camera for high quality visual environment designs

YAMAGUCHI Hideki (Ph.D. in Engineering), Senior Researcher,
Equipment Standards Division, Building Department

(Keywords) Light and visual environment, visual comfort, energy efficient, evaluation tool

1. Introduction

Development and promulgation of energy-efficient design methods are important today because the energy efficiency of buildings is expected to be further improved. The comfort of the indoor environment must also be ensured at the same time. Expected environmental performances vary for purposes of building spaces, especially, for the light and visual environment. Measurement and forecasting of light distribution in building spaces are required to create high quality visual environment designs that provide both comfort and energy efficiency.

This paper introduces the development of a light distribution measurement tool that uses a commercially available digital single-lens reflex camera. It also discusses how the tool can be used to evaluate the visual environment.

2. Overview of the light distribution measurement tool

The Equipment Standards Division is developing tools to measure light distribution without depending on camera types. This requires a calibration method that is compatible with any camera, which is also being developed in the Equipment Standards Division. Light distribution (distributions of luminance and colors) can be obtained using any camera when the obtained calibration data are imported to the measurement software (Fig. 1).

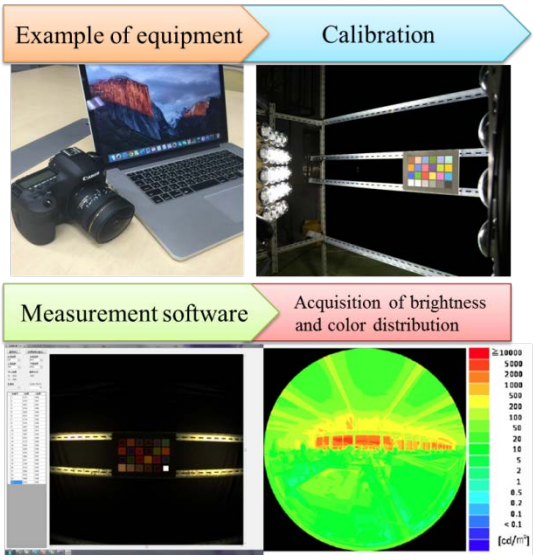


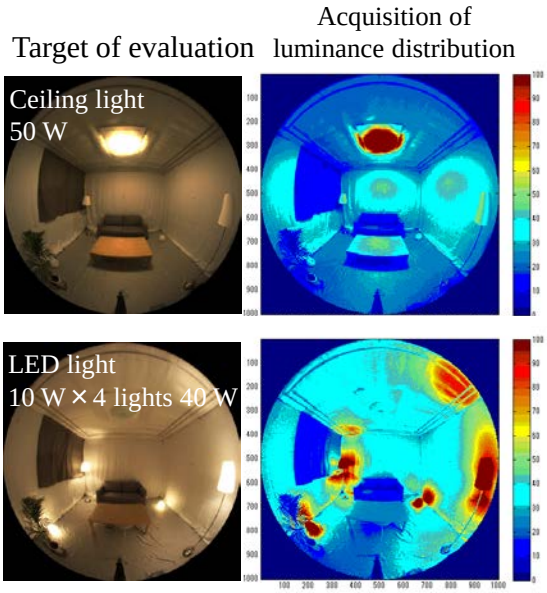
Figure 1 Overview of the light distribution measurement tool

3. Use of the light distribution measurement tool for the evaluation of the visual environment

This tool enables the production of luminance distribution to express differences in the brightness of a space and the brightness on a desk in two lighted environments shown below as examples (Fig. 2). It is expected to become useful as an evaluation tool to produce high quality visual environment designs.

4. For the release and utilization of the outcomes

The developed measurement tool is going to be released through documents from the National Institute for Land and Infrastructure Management or through other channels. The team is going to further explore methods to convert obtained light distribution data into visual environment evaluation indexes.



	One ceiling light	Four LED lights
Sense of brightness as a space	△	○
Brightness on a desk	○	△
Power consumption	△	○

Figure 2 Examples of the use of the tool to evaluate the visual environment