

Instrument and method for calibrating illumination uniformity with reflectance measurement application with multispectral or hyperspectral imaging

Description

Instrument and method for calibrating illumination uniformity with application in reflectance measurement with multispectral or hyperspectral imaging.

The present invention relates to an instrument for calibrating the uniformity of the illumination of a sample (9) that allows to extract the illumination pattern on a surface by displacing the light source (1) with respect to the sample (9) to be tested, which does not need to be moved, without the need to use a quasi-Lambertian calibrated white screen of the sample size. The pattern obtained is determined by calculating differences between image A and image B. This pattern can be used to obtain the distribution of light on any surface and can be used for the calibration of illumination in reflectance measurements with hyperspectral cameras.

How does it work?

The proposed invention eliminates the need to have a calibrated Lambertian screen of the sample size since it will allow to know the distribution of illuminance using the sample to be tested and a sample of uniform material calibrated in reflectance.

The multispectral camera captures two images, and , varying between them the position of the light source on the horizontal or vertical axis through the mechanical system of horizontal or vertical displacement. The offset can be an arbitrary distance, as long as there is at least a difference of one row (n) or columns of pixels (m) between the two images.

Since the sample must be the same in both situations, dividing both images yields the matrix k corresponding to the multiplying factor that includes the variation of illuminance on the sample. In order to obtain the illuminance standard, it is necessary that the calibration zone consisting of the calibrated uniform material is located in the lateral area of the sample in the case in which the displacement is horizontal, or in the upper or lower zone of the sample, in the case in which the displacement is vertical. The size of the calibrated sample must be wide enough for the image to occupy an area of at least 5 pixels. Length must cover the vertical extension of the sample or horizontal in the case where the displacement is horizontal.

Next, it is necessary to know the illuminance parameter on the calibration zone of the sample, called . To do this, we will select the area of the image corresponding to that calibration area and, since we have previously calibrated that material and know its reflectance, through the gray levels obtained by the camera.

Advantages

It calibrates the lack of uniformity, being currently necessary to put a white Lambertian or quasi-Lambertian surface that has the size of the sample and this surface must be measured point by point to know the distribution of light.

Where has it been developed?

In the Faculty of Optics and Optometry of the Complutense University of Madrid.

And moreover

It is part of the reference project RTI2018-097633-A-I00 and of title PHOTONIC RESTORATION APPLIED TO CULTURAL HERITAGE: APPLICATION TO THE PAINTING OF DALI TWO FIGURES, of very satisfactory qualification.

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