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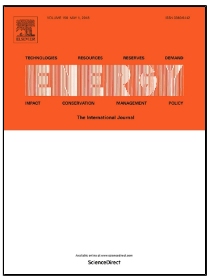

Assessment of indoor illuminance and study on best photosensors' position for design and commissioning of Daylight Linked Control Systems. A new method based on Artificial Neural Networks

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Abstract

Artificial lighting systems have to ensure appropriate illuminance with high energy efficiency according to best design practice and technical standards. These aims can be tackled, by incorporating a Daylight linked control system. However, the system behaviour is strongly influenced by several factors and, in particular, by the sensors' position. Indeed, very often the illuminance on work-plane is not fully correlated with illuminance measured by the photo-sensor used to control the luminaires. This fact leads to wrong information for the Daylight linked control systems affecting its efficacy. The artificial intelligence of Neural Networks can be exploited to provide a method for finding good relationships between the illuminance on workplane and the one measured in another surface. Artificial Neural Networks are able to process complex data set and to give as output the illuminance in a point. By the use of measured values in an experimental set up, the output of several Artificial Neural Networks related to different sensors placements have been analysed. In this way it was possible to find the position of the photo-sensor associated to the best forecast of the workplane illuminance with a mean square error of $2.20E^{-3}$ and R^2 of 0.9583.

Keywords

Indoor artificial lighting, Energy efficient lighting, Intelligent lighting control, Artificial neural network, lighting measures reliability.

1. Introduction

Design and the commissioning of building's plants are very important phases to achieve low energy consumption and comfort conditions. Most of them use automatic controls aiming to adapt systems operation by the means of measures and their processing through tailored control functions. Building automation and control functions should be selected based on their impact on a building's efficiency and capability to provide indoor comfort. Nevertheless, such control

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