Computational assessment of the energy performance of a predictive simulation-based lighting and shading systems control approach in buildings

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1   ABSTRACT

This paper presents a daylight-responsive predictive lighting and shading systems control in buildings that makes use of real-time sensing and lighting simulation. This system can control the position of window blinds and the status of the luminaires.

Specifically, the paper compares the performance of this predictive simulation-based lighting and shading systems control method with five other – more conventional – control methods. All six options are virtually implemented and tested in an office building. The performance comparison considers electrical energy use for lighting as well as visual performance criteria (illuminance, UGR). The results of the virtual implementation and comparison of these control methods demonstrate the significant potential of the predictive simulation-assisted lighting systems control method toward reducing electrical energy use for lighting in office buildings, while offering satisfactory visual performance.