World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:12, No:12, 2018

Prediction of the Transmittance of Various Bended Angles Lightpipe by Using Neural Network under Different Sky Clearness Condition

Authors : Li Zhang, Yuehong Su

Abstract : Lightpipe as a mature solar light tube technique has been employed worldwide. Accurately assessing the performance of lightpipe and evaluate daylighting available has been a challenging topic. Previous research had used regression model and computational simulation methods to estimate the performance of lightpipe. However, due to the nonlinear nature of solar light transferring in lightpipe, the methods mentioned above express inaccurate and time-costing issues. In the present study, a neural network model as an alternative method is investigated to predict the transmittance of lightpipe. Four types of commercial lightpipe with bended angle 0°, 30°, 45° and 60° are discussed under clear, intermediate and overcast sky conditions respectively. The neural network is generated in MATLAB by using the outcomes of an optical software Photopia simulations as targets for networks training and testing. The coefficient of determination (R^2) for each model is higher than 0.98, and the mean square error (MSE) is less than 0.0019, which indicate the neural network strong predictive ability and the use of the neural network method could be an efficient technique for determining the performance of lightpipe.

Keywords : neural network, bended lightpipe, transmittance, Photopia
Conference Title : ICAIAE 2018 : International Conference on Artificial Intelligence and Architectural Engineering
Conference Location : Vienna, Austria
Conference Dates : December 27-28, 2018