A STUDY OF STANDARD SKIES
CLASSIFICATION

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DECEMBER 2008
A STUDY OF STANDARD SKIES CLASSIFICATION
標準天空分類之研究

Submitted to
Department of Building and Construction
建築學系
in Partial Fulfillment of the Requirements
for the Degree of Master of Philosophy
哲學碩士學位

by

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December 2008
二零零八年十二月
ABSTRACT

In 2003, the International Commission on Illumination adopted 15 standard sky distributions which cover the whole spectrum of usual skies found in the world. Sky conditions of the same category would have similar sky luminance patterns and the corresponding climatic variables and indices would be within certain ranges. These analyses can help the identification of sky patterns. Once the standard skies are identified, the solar irradiance and outdoor illuminance at any surfaces of interest can be obtained for subsequent investigations and complicated expressions for inclined surface models are not required. Nevertheless, sky luminance data are not always readily obtainable in many parts of the world. The objective of this study is to identify the 15 CIE standard skies using various techniques based on Hong Kong measured data.

Sky luminance data and other climatic parameters collected by the measuring station in City University of Hong Kong from 1999 to 2005 were used to evaluate the CIE standard sky models. A set of 15 CIE standard skies which represent the general sky conditions was identified by using statistical approach. Based on these findings, a subset of 6 standard skies including overcast, partly cloudy and clear conditions were selected to represent the prevailing sky standards in Hong Kong.

In this study, sky conditions were identified using various techniques. Climatic parameters including solar altitude and ratio of zenith luminance to diffuse illuminance were selected for the characterization of sky conditions. Their characteristics, strengths and limitations in sky categorization were analyzed. A series of range of climatic
parameters was proposed to recognize the 15 CIE standard skies. The results were further compared with techniques proposed by other researchers. The proposed approach produced an overall RMSE of less than 33% without data reduction.

A special type of artificial neural networks, namely probabilistic neural networks was introduced. To investigate the feasibility of using probabilistic neural networks in sky type recognition, two different neural network models with the same test set were built to classify the 3 general sky conditions (i.e. overcast, partly cloudy and clear conditions) and the 15 CIE sky standards. Parametric analysis has also been carried out to investigate the essentiality of various climatic variables. The findings suggested that the neural network is an appropriate tool for sky classification and the ratio of zenith luminance to diffuse illuminance is the most essential input parameter to discriminate each of the standard sky type.
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