The Application of Geometry in Finding the Appropriate Area and Angle of Sunshade Model for Enhancing the Usage of Natural Light and Reducing the Temperature Inside the Building in Architecture Fields

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Abstract

Sunshade is one of the most popular solutions for controlling a building's interior light intensity and temperature, as natural sunlight is an important energy resource for Earth's living beings. However, excessive sunlight may negatively affect human health. This project aimed to research and calculate the appropriate angle and size of sunshades by applying geometry alongside modern technology to calculate the solar incidence angle on different days of the year and design sunshades suitable for Thailand's geographical conditions. The results showed that the sunshade with a size of 10.8 × 10.8 cm² and an angle of 0° was the most efficient in controlling light intensity and temperature, with reduction rates of 31.87% and 14.45%, respectively. For the regression equation study, polynomial regression was the most effective in predicting light intensity and temperature control rates, with R^2 values of 0.6831 and 0.8299, respectively. The same sunshade also demonstrated high efficiency under actual sunlight, achieving a light intensity reduction rate of 35.9 ± 1.79% and a temperature reduction rate of 7.06 ± 0.35%. These findings indicate that the selected sunshade sizes and angles enabled accurate regression predictions of light intensity and temperature control rates. The proposed design can serve as a prototype for architectural applications, helping reduce energy consumption and improve the quality of life for building occupants.

Keywords: Sunshade, Applied Geometry, Architecture, Usage of Natural Light, Temperature Reduction