

Optimizing the Window Geometry Using Fractals

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Abstract : In an internal building space, daylight becomes a powerful source of illumination. The challenge therefore, is to develop means of utilizing both direct and diffuse natural light in buildings while maintaining and improving occupant's visual comfort, particularly at greater distances from the windows throwing daylight. The geometrical features of windows in a building have significant effect in providing daylight. The main goal of this research is to develop an innovative window geometry, which will effectively provide the daylight component adequately together with internal reflected component(IRC) and also the external reflected component(ERC), if any. This involves exploration of a light redirecting system using fractal geometry for windows, in order to penetrate and distribute daylight more uniformly to greater depths, minimizing heat gain and glare, and also to reduce building energy use substantially. Of late the creation of fractal geometrical window and the occurrence of daylight illuminance due to such windows is becoming an interesting study. The amount of daylight can change significantly based on the window geometry and sky conditions. This leads to the (i) exploration of various fractal patterns suitable for window designs, and (ii) quantification of the effect of chosen fractal window based on the relationship between the fractal pattern, size, orientation and glazing properties for optimizing daylighting. There are a lot of natural lighting applications able to predict the behaviour of a light in a room through a traditional opening - a regular window. The conventional prediction methodology involves the evaluation of the daylight factor, the internal reflected component and the external reflected component. Having evaluated the daylight illuminance level for a conventional window, the technical performance of a fractal window for an optimal daylighting is to be studied and compared with that of a regular window. The methodologies involved are highlighted in this paper.

Keywords : daylighting, fractal geometry, fractal window, optimization

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