Chapter 12

Lighting Simulation Algorithms in Real–World Sacral Building Visualisation

Grzegorz Osinski
College of Social and Media Culture, Poland

Błażej Świętek
College of Social and Media Culture, Poland

Zbigniew Chaniecki
Lodz University of Technology, Poland

ABSTRACT
The most commonly used rules of modeling are limited to determine the level and direction beam of the light. However, such an approach does not reflect the real impact of lighting on the object. More accurate selection of lighting parameters is important, especially in the case of design objects, when it is still possible to change the structure or any selection of location and type of lighting. The chapter presents the use of specialized numerical methods in the design of modern sacred buildings as well as visualization methods used in communication between professionals creating and managing such models.

INTRODUCTION
The works on the information visualization usually focus on the measures and methods of graphical presentation of large sets of data (BIGDATA). However, it is not the only current within a wide spectrum of issues that is currently embraced by the visualization paradigm. The visualization methods are well-known and widely applied in engineering disciplines that deal with designing technological equipment as well as industrial processes. Since it is a domain strictly associated with technical sciences, it is usually being ignored in discussions on issues concerning humanities. This is a reasonable approach, for the literature on the subject covering issues on technological visualizations is quite extensive and constitutes a completely remote current within the visualization domain.

DOI: 10.4018/978-1-5225-4990-1.ch012
However, it is quite uncommon to encounter works on the visualizations employed in the reconstructions and developments of new buildings that constitute a cultural heritage of nations, religions or objects relevant for the entire modern civilization. An attempt to support designing sacral buildings featuring large cubic capacity and numerous architectural elements, aiming to ensure appropriate lighting of the interiors of the facility, constitutes an innovative use of the visualization methods. The visualizations works are then being carried out as early as at the stage of building design, in order to ensure a particular atmosphere of the visual effects that is specific for the facilities of this type. In this case, the scope of modelling and computer simulation works that in effect will create the final interior visualizations require the application of particular methods involving issues of visual perception, aesthetic sensations and inclusion of historical and ethnological aspects. These issues go beyond the domain of technical sciences that need to be complemented with a creative in-depth analysis supported by a methodology and by the results of the works of humanistic sciences. In this chapter, we shall discuss the use of specific tools in the process of designing the interiors of The Shrine of Our Lady Star of the New Evangelization and Saint John Paul II that has been built from the ground up over the period of 2012–2016, in Torun. The visualizations works commenced as early as at the stage when the dome has been put over the building, but the interior works have not yet begun (Figure 1). Thus, the carried out visualizations could have been employed as early as at the stage of the constructional changes inside the Shrine (Figure 2).

The detailed works included an assessment of the methodology and the algorithms employed in the visualization process and also the comprehensive visualization design based on designs created by visual artists, such as paintings, frescoes, mosaics, stained glass windows, sculptures and ornaments. The choice of an artificial lighting and its blending with natural lighting aimed to adjust the location of the stained-glass windows in order to obtain the anticipated effect of shading.

Figure 1. The Shrine: Outside view (© 2017, WSKSiM, Used with permission)