Indoor Ligthing System Design Considering Reflections

SAGE

Rudolf Bayer[1] and Michal Brejcha[2]

Abstract
The paper deals with problems concerning indoor luminaire placement by genetic algorithm. In contrast to outdoor illuminance calculations multiple reflections from walls must be taken into account. Therefore a basic reflection calculation has been proposed and a genetic algorithm script tested in software MATLAB on a model room. It appeared that requirements laid out by the Czech national standards do not restrict solutions of luminaire placement too much, hence several solutions met the requirements. The most suitable solution is always chosen by the designer's preferences. Implementing these preferences into the algorithmic solution is quite a big deal, nonetheless some methods how it can be accomplished are presented in the paper.

Keywords
Genetic Algorithm, Lighting, Luminaire placement, Illuminance

Introduction

Designing interior lighting systems for indoor working places from a photometric point of view requires fulfilling two contradictory criteria, i.e. providing enough light for persons occupying the given room at a reasonable power consumption. These and more parameters have been taken into account while composing standards such as $^?$, being mandatory on the territory of the Czech Republic.

Model Room Illuminance Calculation

Genetic Algorithm Introduction

The genetic algorithms (GA) are the part of the evolutionary computing. Similary to the living organism are the solutions represented by their genotype, that represents the genetic coding and by phenotype, that represents beahiviour, response and features of the solutions. Each soution is considered according to its phenotype.

Design Requirements

Fitness Function

Luminaire Placement Problems

[1]CTU in Prague, Faculty of Electrical Engineering, Department of Electrical Power Engineering
[2]CTU in Prague, Faculty of Electrical Engineering, Department of Electrotechnology

Corresponding author:
Rudolf Bayer, CTU in Prague, Faculty of Electrical Engineering, Department of Electrical Power Engineering, Technick 2, Praha 6, 166 27, Czech Republic

Email: bayerrud@fel.cvut.cz