Optimization of Optical Design for LED Lens Module

陳文欽,許勝超,曾文柏
Industrial Management
Management
wenchin@chu.edu.tw

Abstract

The research proposes an optimal process flow for LED lens module and applies multi-light source
module as the research carrier. The study falls into two stages. In the first stage, Taguchi orthogonal array and
TracePro optical analysis software can be applied on optical analysis and obtain the initial optimal parameters
settings. The optical quality characteristics are viewing angle and average luminance. This is further combined
with analysis of variance (ANOVA) to identify the relationships between multi-objective optical quality
characteristics and size-dimension parameters. The second stage adopts the first-stage optimal parameters settings
of LED lens module to resume L25(56) orthogonal array and optical simulations. Then, the experimental
data created by Taguchi orthogonal experiments can be served as the back propagation neural network
(BPNN) training and testing samples, and build up an optical-quality predictor of LED lens modules. Finally,
the optical quality predictors combined with genetic algorithm (GA) and particle swarm optimization (PSO)
obtains the optimal parameters settings, completely in conformance with the sound optical quality. The research
results show that the proposed optimal process flow of optical design can not only achieve the viewing
angle reaching up to 20 degree in accuracy, but also can boost the average luminance and greatly reduce the
development cycle time of the products

Keyword：LED lens module; analysis of variance; back propagation neural network; genetic algorithms; particle swarm optimization