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**Tina E. Kidger
Stuart David**
Editors

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Introduction

SPIE's fourth European Illumination Optics conference maintained its previous high standards. The conference was composed of five sessions with a total of twenty four papers presented.

Session 1 - Illumination Applications

Session 1 opens with an invited paper explaining the use of the analytic description of the optical design problem by means of functional differential equations. It is shown that this analytic design method can also be used to solve dynamic optical system problems. A following paper presents an optical design for Precision Approach Path Indicators (PAPIs) in a portable runway lighting system requiring high efficiency and compactness. The advent of LEDs as viable lighting sources offers the opportunity for significantly improved wall-plug efficiency of these lighting systems. Two more papers in this session cover a cross-polarized freeform illumination design for glare reduction in fruit quality inspection, and freeform étendue-preserving optics for light and color mixing.

Session 2 - Optical Modelling I

This session includes four papers beginning with a paper on TIR collimator designs based on point source and extended source methods. The second paper discusses the practical optical design of an LED collimator. Thirdly, the problem of focusing light flux into an arbitrary curve in 3D space using a numerical-analytical approach to design a reflective surface, which efficiently produces the prescribed intensity distribution on the arbitrary 3D curve is addressed. Lastly, micro-freeform array projection is discussed, where the freeform surfaces are designed by a generalized approach of Cartesian Oval representation. Different designs for different illumination tasks (smooth illumination distributions, sharp features), are discussed with the possible implementation of laser lithographic manufacture.

Session 3 - Freeform Techniques

The session opens with an invited paper on freeform surface shape tradeoffs in illumination design. The paper examines some of the common tradeoffs with special emphasis on how the shape of the freeform surfaces change to meet changing performance requirements. This is followed by a paper on freeform aplanatic systems. The author reviews the fact that axisymmetric aplanatic systems have been used in the past for condensers and concentrators. It is then shown that a rigorous solution to the general non-symmetric problem using

freeform technology requires three free form surfaces obtained from a solution of a system of partial differential equations.

The final paper discusses a mapping algorithm for freeform construction using non-ideal light sources. Consideration is also given to freeform designs for clusters of LED-sources.

Session 4 - Trends in Automotive Lighting

An invited paper discusses many new ways that light can be controlled and enhanced for the driver of a modern car. Next is a discussion of the use of matrix light and pixel light arrays in the optical system architecture of automotive light sources. Following is a design discussion of laser based headlights. Blue laser diodes pump a phosphor converter to emit bright white light from an extremely small area, which then facilitates very compact headlight designs potentially revolutionizing automotive forward lighting. The use of multiple single laser diodes, phosphor conversion, and color mixing are also considered. Continuing on is a discussion of design methods for automotive high beam LED optics. Finally, an invited paper covers practical aspects of automotive lighting design. It is proposed that 'innovative design' and 'best practices of optics design and lighting development' need to merge at all stages in Computer Assisted Lighting (CAL) to run efficient development cycles. This need presents a very practical challenge to engineering management in accomplishing optical design and development projects.

Session 5 - Optical Modelling II

The first two papers in this session discuss different solutions using white LEDs and modelling of LEDs by combining ray and wave-optical approaches. The third paper discusses the potential modeling relationship between 'roughness' and the Bidirectional Scatter Distribution Function (BSDF). Results showed a link between roughness and BSDF, with the strength of the link somewhat wavelength dependent, which can be useful for communication between optical designers using BSDF terminology and manufacturers using roughness terminology. Continuing is a presentation of examples of the usage of high luminance LED's, i.e. above 100Mnits, which have been developed following on the achievement of full-LED headlamps. The unique subject of the luminescence of the scorpion cuticle is explored followed by a presentation on steerable patterned OLED backlighting for autostereoscopic displays.

In summary, as evidenced from the proceedings of this 4th SPIE European illumination optics conference, we are continuing to find new ways to model, manipulate, and control light for the benefit of all. Our illumination optics community, a relatively small and expert community, is pushing forward the

frontiers of optical illumination science and technology. This present conference, along with past conferences, has added significantly to the improvements in optical illumination through the communication of developments and the personal interactions that occur with the face-to-face contact that is a large part of our conference format. The success of our conference is a fitting and permanent contribution to this, "The International Year of Light."

Tina E. Kidger
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