LightTrans' Industry Workshop at SPIE Photonics West 2020

Systematic Design Approach for Lightguide Devices for AR/VR Applications in VirtualLab Fusion

SPIE Industry Workshop
Conference: SPIE AR | VR | MR
Date and Time: Monday, 3 February 2020 | 15:00 – 16:15
Intended audience: Optical engineers, designers, researchers and students interested in lightguide devices for AR/VR applications.

Learning Outcomes
- Construction and modeling of lightguide devices with grating regions for in- and out-coupling of light.
- Systematic design workflow for lightguide devices, from functional design to parametric optimization.
- Evaluation of the performance of the complete lightguide device for different fields of view.

Lightguides in combination with gratings are one beneficial approach to combine the virtual image with the light impinging from the real-world environment. The design and modeling of such lightguides is very different from traditional lens design and there is still a lot of room for new ideas and innovation.
Such devices are quite complex due to the unavoidable handling of a large field of view and different wavelengths and, consequently, numerous parameters must be considered in order to obtain a functional device which provides good image quality.
We present a systematic approach to design lightguide devices which combines the benefits of functional and parametric design and optimization strategies. We will discuss typical design tasks, with emphasis on the trade-off between uniformity and system efficiency in different examples.

The analysis of lightguide devices including the coupling gratings requires a physical-optics modeling approach that goes beyond traditional ray tracing.
The Fast Physical Optics technique in VirtualLab Fusion automatically considers the polarization of the in-coupled light, performs a fully vectorial grating analysis, and accounts for coherence, interference and diffraction effects in the analysis: all within a single software platform.
We will explain the modeling concepts and demonstrate analysis results based on systematic designs with respect to various merit functions.

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