Editorial

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Automotive lighting

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Dear reader,

It is a pleasure for me to have the chance to act as a guest editor for an Advanced Optical Technologies edition on lighting for the third time.

This topical issue deals with automotive lighting technology. Within the two years that passed after the last such issue, new ideas and technologies emerged and now they are on their way from research to application.

However, the basic task remains the same: to see and to be seen. Advanced headlamp functionalities guarantee a better illumination of the road ahead of us, and signal functions are still main drivers of nighttime styling. In the interior, the ambient illumination has gained a firm place in interior design.

But what will be next? The seven contributions in this issue will present you a selection of what is going on right now.

Developing new head lamps, especially with high resolution, is always a combination of design and lighting simulation, together with the use of prototypes to get a realistic impression how the new head lamp performs on the road. The first article presents new high-power projectors as rapid prototyping tools that allow the designers and lighting experts to see and edit simulated lighting functionalities without building several prototypes. This reduces development time and costs and provides a chance to "see what you get" in a very early stage of development.

A totally new way to contribute to the security of Vehicle-to-X communication is presented in the second article. The V2X communication allows new safety and comfort functionalities and a proper way to steer traffic flows in the future. But it is a (sometimes wide open) backdoor for hackers, too. With the intent to make the V2X communication safer and more robust against attacks, the authors discuss an additional way to communicate by adding information onto the emitted light of signal functions as a second channel between communication partners in direct sight.

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As an "old laser guy" I was always convinced that holography is something beautiful for manipulating coherent light but not for incoherent sources. But the new way to manufacture holographic arrays for the use as optics for LEDs presented in this issue proved, that holograms can be used even in automotive lighting with in-coherent LEDs.

The fourth article deals with the combination of lighting communication with prediction of driver intention. In order to learn how an automated car will communicate with other road users in the future and to get an additional "trust"-signal for manually controlled vehicles, the described system can analyze and predict the driver's behavior e.g. in front of a pedestrian crossing. If the driver tends to stop, the pedestrian is given a signal to pass the crossing.

Communication with light is something new for head lamps. With high resolution systems not only the road can be illuminated individually according to the traffic situation, but signs and symbols can be projected onto the road for communication purposes, too. In article number 5 a newly developed prototype of a scanning RGB-Laser headlamp with high resolution is presented and analyzed as a proof of concept.

Laser safety is always a major issue when dealing with (partly) coherent light sources in open environments. It is a fairly simple calculation if you use lasers as coherent sources, but not that easy if you use a laser as the primary source for a phosphor converted white light emitter. However, the remaining coherence is a relevant property for the classification of such a light source.

Last but not least, possible nonvisual effects of illumination on car passengers are investigated. This could be an often-discussed way to support the passengers in a car, and it is quite interesting whether such influences can be found in the presented experiments.

Let me add a few words on the origin of this issue, please. It was planned to have an automotive lighting conference in June 2020, but due to corona, it was cancelled. So, the editors and the publisher of AOT decided to give the best contributions a platform for a reviewed publication of their work and most of the authors accepted this offer with pleasure.

Therefore, I would like to thank not only the contributing authors but also the responsible people at AOT to enable this special issue!

Enjoy reading …

Bionote

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