

Development of an illuminated door handle with status display

Graduate



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Definition of Task:

The aim of this project was to develop and realise a fully functional demonstrator of an illuminated door handle with integrated status display. The demonstrator should not only be aesthetically attractive, but also fulfil all the necessary technical requirements. In order to achieve this goal, the four key aspects - mechanics, electronics, optics and software - were intensively investigated.

Approach / Technology:

To develop the demonstrator, the entire mechanical structure was designed. The structure comprises the following components: Door handle on the power supply side, door handle on the lighting side and the locking mechanism with two short plates. A rechargeable battery was installed on the power supply side, which enables the system to run autonomously. On the electronics side, a circuit board was designed on which the LEDs and the LED controller are located. In addition, the battery voltage, the closing status and the ambient brightness are analysed on the circuit board using a microcontroller. RGB LEDs were selected as light sources for the optical setup. Two light guides were developed to maximise the efficiency of the light generated at the "viewing window". The first light guide ensures uniform light distribution. The second light guide uses cut-outs to create a visible segmentation at the viewing window, allowing the light strip to be divided into its four segments. A diffuser was used to create a homogeneously illuminated surface in order to hide the LEDs under the viewing window. A new software was developed for the status display on the door handle, which supports the three required modes - displaying the status of a door lock, staircase lighting for orientation and displaying the availability of a meeting room.

Result:

As part of the work, a functional demonstrator of an illuminated door handle was realised. The system fulfils the required specifications. The mechanical structure was successfully produced using 3D printing. The implemented electronics and software enable the use of the various required display modes. To demonstrate all functions, a programme was implemented that allows the visible function to be switched by turning the door lock. The overall system fulfils the optical requirements in terms of homogeneity (average $\pm 20\%$) and average luminance (between 50 and 200 cd/m^2). The service life of the system was estimated around 790 hours of active illumination.

Advisor

Prof. Dr. Markus Michler

Co-Examiner

Prof. Dr. Stefan Rinner

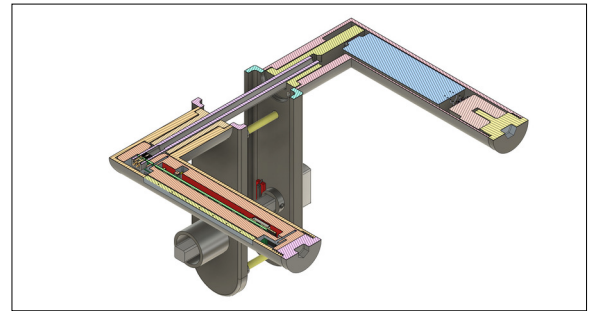
Subject Area

Photonics

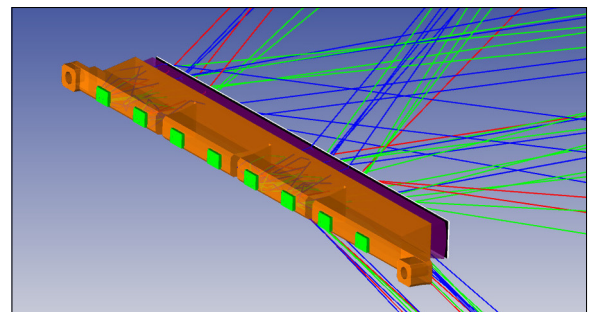
Project Partner

Polycontact AG, Chur, GR

Sectional view of the CAD-designed door handle
Own presentation



Optical simulation for the light guide and diffuser
Own presentation



Final illustrative sample
Own presentation

