Writing patterns, logos and lettering in light
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This freeform lens projects the ITWM logo: The upper half contains a negative image of the logo, while in the lower half you can see the letters ITWM as reversed as in a mirror. © Fraunhofer ITWM

It is relatively easy to calculate the shape of an image to be created by a freeform lens. But it is far more difficult to define the surface structure of the lens required to project a specific image, such as a logo. Until now, it was more a case of trial and error. The developers would run a simulation of a lens shaped in approximately the desired pattern, study the image it produces, and gradually adjust the shape of the lens until it focuses the light in exactly the right pattern.

“The process could take several hours,” says Dr. Robert Feßler, a research scientist at the Fraunhofer Institute for Industrial Mathematics ITWM in Kaisers-lautern. Now the same task can be accomplished in a matter of seconds. ITWM researchers have developed a software program capable of calculating the lens geometry corresponding to the coordinates of a desired image in next to no time. It is the first software of this type to be offered on the commercial market.

“Different values can be entered for a variety of parameters. These might relate to the specific operating characteristics of the milling machine, or the material used to produce the lens,” explains ITWM project manager Dr. Nobert Siedow.

Because the software solution is capable of calculating the surface geometry of the lens within seconds, it is easy to optimize the result. For instance, if the curvature of the lens required for a specific image is too great, this may cause technical problems when it is manufactured. A limit value for the curvature can be set in the software, and the lens geometry can be recalculated with a few mouse clicks.

A demonstration version of the software is already available, and will be presented live at the Vision trade fair in Stuttgart from November 4 to 6. Visitors can have their photo taken, and the software will calculate the geometry of the freeform lens required to create this image.

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