Simple and precise measurement of the field of depth of an optical setup by placing a calibration and measurement pattern on the slide

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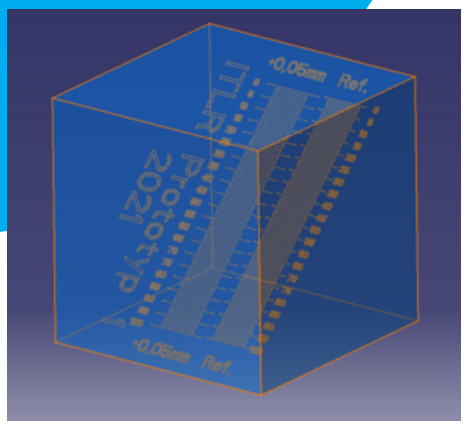
The invention relates to a device and a method for determining the field of depth of an optical setup, in particular anoptical microscopes, by means of a glass cube in which a calibration or measurement pattern has been engraved.

- Suitable for any optical microscope, especially also for transmitted light microscopy or shadowgraphy
- Easy and accurate determination of the field of depth (during the examination of the object)
- Low-cost production of the glass cube
- Flexible measurement structures possible



Fields of application

The invention could be used for all types of microscopes, especially for applications where the measurement of depth of field plays a significant role.

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Service
Technologie-Lizenz-Büro GmbH has been entrusted with the exploitation of this technology and assists companies in obtaining licenses.

Background

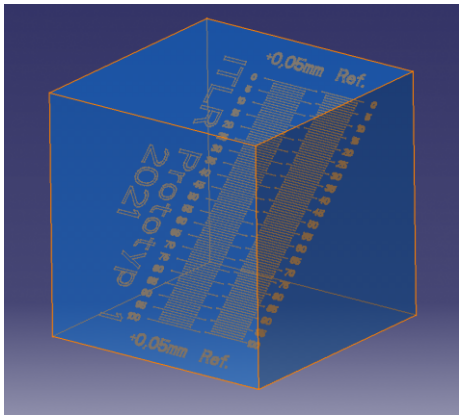
Determining the field of depth of an optical setup (e.g. an optical microscope system) is essential when conducting optical studies, especially in the field of biology, metallurgy, process engineering or in experimental optical setups. It helps provide information about the range of field of depth at which a sharp image can be expected for the objects to be examined. This is especially true for fast-moving objects or those expanding in depth. Examples are studies of droplet impact on surfaces or tracking of particulate matter or organisms in microchannel flows.

Problem

In some cases, especially when using very expensive microscopes, it is possible to use a precise displacement mechanism in order to displace a simple calibration object, e.g. a line pattern, in depth. It is also possible to calculate the field of depth. In this context, auto and multi-focus methods using a sensor, a lens or liquid lenses are not suitable for moving objects, due to the speed of the focusing method. All these methods for determining the field of depth are very time-consuming. They do not generate exact results and even require experimental clarification.

Solution

Researchers at the Institut für Thermodynamik der Luft- und Raumfahrt (ITLR) at the Universität Stuttgart have therefore set themselves the goal of simplifying the experimental determination of the field of depth of an optical setup and improving its accuracy. For this purpose, they use a glass cube which is placed on the slide of any type of microscope. A scale bar, which can have different calibration or measurement structures, is to be engraved diagonally into this glass cube by means of sub-surface engraving. These structures can be scaled in a linear, logarithmic or other format. The depth of field is then visible through the eyepiece, for any microscope settings. Alternatively, the measuring unit can be introduced into the measuring section in the form of a hologram by means of a projection. For this purpose, any technical setup can be used to create holograms (e.g. LASER patterns in fog/spray.).



[Fig.: Patrick Foltyn (M.Sc.), Institute of Aerospace Thermodynamics, UST]