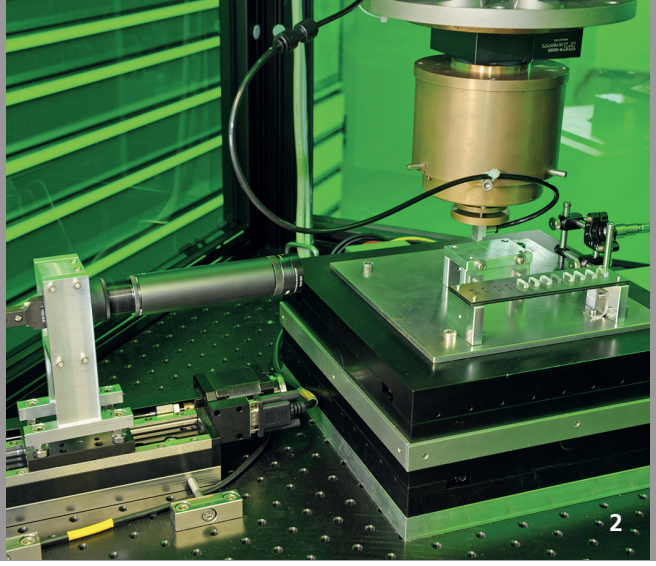

Subject to alterations in specifications and other technical information. 06/2017.

MODEL-BASED, SELF-OPTIMIZING MOUNTING OF OPTICAL SYSTEMS

Task

In many areas, manual production is still needed when optical systems are mounted and adjusted. In some special areas, however, individual lenses can be mounted and adjusted (e. g. FAC lenses) in large numbers fully automatically, but manual processes dominate in small series. The project presented here aims at developing a fully automatic, cost-effective adjustment and mounting of optical systems, even in small quantities.

Method

In a first step, based on the planar design of an optical system, the mounting sequence of the individual components is calculated using an optimization tool. The main goal in this step is to make the sequence insensitive to component and mounting tolerances. Then, the current actual state of the optical system is determined after each adjustment and mounting step with the aid of a measuring system. Thanks to an optical model, the positions of the remaining components, which are still to be mounted, can be optimized from this state in order to ensure the required optical functionality of the overall system.

Results

Fraunhofer ILT has developed and demonstrated a method to calculate an optimal mounting sequence for different optical systems. Furthermore, the measurement data in the optical model were mapped with an error of less than 1 percent. This was successfully tested using the example of an optical system consisting of three lenses.

Applications

The methods and algorithms developed here make it possible to determine the system state between adjustment and mounting steps and to use the optical model for optimization. Thus, Fraunhofer ILT has provided a system for self-optimizing and function-oriented adjustment and mounting of optical systems.

Contact

Martin Holters M.Sc.
Telephone +49 241 8906-351
martin.holters@ilt.fraunhofer.de

Dr. Jochen Stollenwerk
Telephone +49 241 8906-411
jochen.stollenwerk@ilt.fraunhofer.de

1 Assembly cell for the mounting of planar optics.
2 Kinematic system and measuring system of the assembly cell.

Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
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