Gisela and Erwin Sick Chair of Micro-Optics

Prof. Hans Zappe

Research Area
Optical Microsystems

Relevant Tasks
☒ Optical experiments
☐ Test setup development
☒ Device characterization
☐ Material characterization
☐ Optical simulations
☐ FEA simulations
☒ Clean room fabrication
☒ CAD/CAM
☒ Polymer fabrication
☐ Programming
☐ Analytical analysis / Theory
☒ Literature research
☐ Teaching

Eligible Departments
☒ Microsystems technology
☒ Mechanical engineering
☒ Process engineering
☐ Chemistry
☒ Physics
☐ Electronics and IT
☐ Computer science
☐ Industrial engineering

Requirements
Ability to work independently

Basic microfabrication skills

Starting Date
Immediately

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Master's Thesis

A New Method to Manufacture Freeform Optics

Freeform optics refer to optical designs with at least one freeform surface which has no translational or rotational symmetry. Integration of freeform optics and surfaces into imaging systems remains as a major challenge. However, the new degrees of freedom introduced by freeform optics designs are the driver to overcoming these challenges. In this project, we aim to develop a new method to manufacture optical components with arbitrary surface profiles using ultraviolet-curing polymers.

Traditional Rotationally Symmetrical Lens — Not a free-form lens

Non-rotationally Symmetrical Lens — Free-form Lens

Traditional optical components, spherical or aspherical, are almost exclusively rotationally symmetric. With the increasing functionality and reducing size of modern optical systems, manufacturing and characterization of non-rotationally symmetric (free-form) optical surfaces have become an active research field.

Here is what is expected from the prospective student:

- A material study to identify commercially available UV-curable optical polymers best suited for the application,
- Using FEA simulations, the effect of shrinkage and humidity absorption will be analysed for geometrical shape compensation.
- Development of a simple optical setup to manufacture the proof-of-principle demonstrators,
- Manufacturing and surface characterization of the demonstrators with emphasis on shape fidelity.

The prospective candidate will have the chance to join a highly motivated team working on various aspects of static and dynamic waveform shaping, who will assist the project along the way.

If you are interested in further information, please contact Dr. Çağlar Ataman.