

## Master Project

# 3D Imaging by Background-Oriented Schlieren Tomography

### Background-Oriented Schlieren (BOS)

BOS is a diagnostic tool that is used to infer the refractive index  $n$ -field. Light travels in straight lines when  $n$  is constant within a region of interest. However, the light rays will bend if the refractive index changes along their path. A variable  $n$ -field can be generated by many sources, for example a flame. In a BOS experiment, a camera is focused onto a background image that contains a random pattern. A reference image of the background pattern is obtained and compared to an image of the pattern when a variable  $n$ -field is placed between the camera and background. Due to bending of the light, specific points on the background image will exhibit deflections which can be calculated from the image pairs (reference and deflection).

### Project description

We are performing flame BOS measurements using multiple cameras that are focused onto multiple patterns, in order to reconstruct the 3D refractive index field within the flame. The aim of this project is to develop an algorithm that calculates the deflections by using different types of backgrounds. Both the pattern on the background and the plane shape, e.g., flat or curved surfaces, should be investigated. The results of the investigation should be discussed in terms of best sensitivity. This project will combine simple experiments with programming. Therefore, the candidate should have a solid programming knowledge, and any previous experimental work will be of benefit. The possibility of publishing the results in a peer-reviewed journal exists.

For further information please contact [khadijeh.mohri@uni-due.de](mailto:khadijeh.mohri@uni-due.de).