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Background-oriented schlieren: Techniques and applications for multi-scale flow visualization and measurement MICHAEL HARGATHER, GARY SETTLES, Penn State University — Background oriented schlieren (BOS) is a new and versatile technique for imaging refractive fluid flows. This simplistic and low-cost flow visualization technique can be applied over a range of geometric scales, from typical laboratory setups to large outdoor experiments. The basic principles underlying BOS are briefly reviewed, including: background selection, sensitivity estimation, optimal geometric arrangement of optics, and analysis techniques. The influence of optical depth-of-field and geometric placement of the test specimen are also explored. Laboratory-scale applications and results include supersonic wind tunnel and candle-plume visualizations. The technique is also expanded to include "natural-background-oriented schlieren," wherein naturally-occurring pseudo-random backgrounds such as trees and a cornfield are used to image outdoor explosions, gunshots, and thermal plumes. A wide range of potential backgrounds and applications is considered.

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