

Optical Flow Visualization Using the Modular Background-Oriented Full-Scale Schlieren Technique

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Abstract

Background-oriented full-scale schlieren (BOFSS) with large test sections is a famous technique, specially developed for optical flow visualization. This article presents the technique using a modular background-oriented light source instead of the retroreflective method. The modular background-oriented light source is convenient to enlarge the area of the light source and providing a larger testing section, thus the test sections become flexible. Moreover, the article also focuses on investigating the BOFSS sensitivity with different percentages of cutoff grid. The setting composed of fluorescent lamp Philips-865, atomizing films, and linear grating mask. The linear grating mask is alternated with black lines with width of 6 mm. The area of light source and test section are 2×2 and 1×1 m², respectively. The present study applies different percentages of cutoff grid to block light source, and 50, 60, 70, 80, and 90% percentages of cutoff grid are been tested. The test subjects are heat flux from burning candles and Bunsen burner, acetone gas flow, LPG flow and compressed butane gas. The results show that a cutoff grid with 90% of light blockage presented the best result for conventional Z-arrangement schlieren technique. Whereas, cutoff 60 percent light shows the best results for full-scale schlieren technique.

Keywords: full-scale schlieren, background-oriented light source, cutoff grid, atomizing film, grating mask

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