



IMPROVEMENTS OF SPACIAL RESOLUTION OF CORLORED-GRID BACKGROUND ORIENTED SCHLIEREN (CGBOS) TECHNIQUE BY INTRODUCING TELECENTRIC OPTICAL SYSTEM AND RECONSTRUCTION OF DENSITY FIELD

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ABSTRACT: The Background Oriented schlieren (BOS) technique is one of the novel visualization techniques that enable the quantitative measurement of density information in the flow field with very simple experimental setup [1]. The principle of BOS is similar to conventional Schlieren technique, it exploit the bending of light caused by refractive index change corresponding to density change in the medium and both techniques are sensible to density gradient. Colored-Grid Background Oriented Schlieren (CGBOS) technique using colored-gird background is applied to supersonic flow field and reconstruction of 3D density field [2]. In this report we propose a novel approach for BOS technique by introducing telecentric optical system as shown in Fig. 1 (left). Parallel light ray can be corrected by using telecentric optical system and we expect that spatial resolution of BOS measurement can be improved with this approach. We have to focus on background for BOS measurement, however sometimes it is difficult to put the background close to test section to satisfy setting the distance between background and test model within the focal depth of camera lens because of wind tunnel geometry or some restrictions for experiments, etc. The gray-scale image of calculated vertical displacement of background is shown in Fig. 1, center image is obtained from normal CGBOS and right image is obtained from telecentric CGBOS. Mach number of free stream is set to 2.0 and test model is asymmetric model and it is same as previous report [2]. The scale of gray level is set to the same range as shown in both images for a comparison. Telecentric CGBOS image shows that flow phenomena, *e.g.*, thickness of shock waves, sharpness of expansion wave and reattachment shock, are captured clearly than normal CGBOS image. The advantages of telecentric CGBOS will be discussed by comparison with normal CGBOS result. Furthermore reconstruction of density field obtained by telecentric CGBOS and Computed Tomography (CT) technique will be reported.

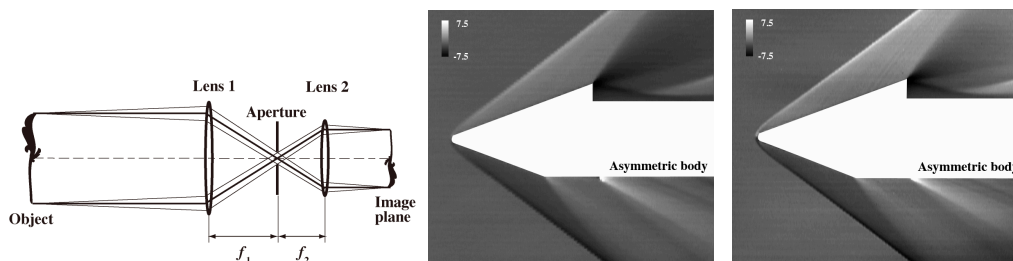


Fig. 1 Telecentric optical system (left), vertical displacement of background obtained from normal CGBOS (center) and telecentric CGBOS (right)

References

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