



IMAGE ANALYSES OF NATURAL CONVECTION USING COLOR-STRIPES BACKGROUND ORIENTED SCHLIEREN (CSBOS) METHOD

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Fluid: air

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Other keywords: stripe deviation, image processing, computed tomography, temperature gradient

ABSTRACT: Due to global awareness of the conservation of natural resources and demand for optimization of energy consumption it is very important to analyze the convective heat flow field and find out the clear view of the convective flow parameters. While on the other hand, due to the complexity of convective flow fields both in forced and natural convection, it has remained very difficult to obtain detailed three dimensional (3D) experimental analyses. Image analyses and processing has got a very important role in the investigating and measuring such type of flow fields. That is the reason, why quantitative analyses of convective flow fields have become more important to be analyzed in detail both in steady and unsteady conditions separately. As both have different intensities for the flow fields. This paper deals with image analyses of natural convection using color-stripes background oriented schlieren (CSBOS) method from a heat generating source in standard atmospheric conditions. As a whole, random dot pattern has been used as background pattern for BOS based experiments. This process heavily depends on the position change, between two designated regions and by comparison of these designated regions between two images, obtained in two conditions, one without flow as reference and second with flow [2]. This technique is commonly employed in PIV and PTV measurements. In our BOS base method, color stripes or grids are employed as background pattern. In comparison to the PIV-related BOS, the CSBOS needs only one image which includes the main flow field. The pattern stripes begin to deviate with the density variation caused by natural convective flow [1]. During this process, with the help of color stripes, stripe deviation measurement is carried out and data for 3D quantitative measurement has been obtained for natural heat convection. Candle flame has been utilized as heat generating source for this experiment and temperature gradient has been measured. Detailed discussion will be made in symposium.

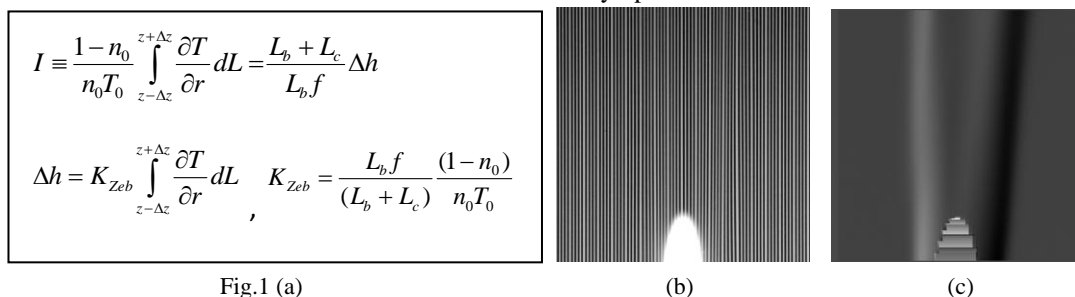


Fig. 1 Equation used for convective phenomena (a). Captured image recorded on camera sensor during natural convection (b), processed image after calculating stripe deviation (c).

References

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