



COLOR CODING FOR PARTICLE IMAGE VELOCIMETRY

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ABSTRACT: One of widespread methods of measurement fluid and gas flow field now is the laser method based on digital photographing tracer particles, that visualizing a field of speed, with the subsequent computer analysis of their images (PIV-method) [1]. There are two variants of the yielded method. In the first two-pulse laser illumination of a stream is used, the image of particles collects on one shot. In this case the received images consists of set of pairs particles and by means of calculation of autocorrelation function their shift in time between two impulses of illumination is defined. The second variant consists in record separately two consecutive divided image of a stream and further cross correlation function is calculated.

The first who has suggested to use different colors in the PIV-method for definition direction of flow was Ronald J. Adrian [2]. In this paper it is offered to use color for control the form of correlation function. Two lasers, for example, red and green, the control mean lasers and a color video camera for this purpose is required. Accumulating some flashes of the laser during one exposition, we receive the images similar presented on Fig. 1 (left). If from the received images get separate color components and to summaries them with certain factors, it is possible to receive sequences of various impulses on a sign, that is codes. There is an encoding possibility for autocorrelation, and cross correlation functions. For codes of three, four and five symbols have been found optimum coding sequences and it is shown, how they can be realized by means of a color code. In Fig. 1 (right) the example cross correlation function is shown for two coded sequences. It has been shown that if enough low signal-to-noise ratio is present it is possible to receive a significant rise in accuracy of measurements with color coding at use.

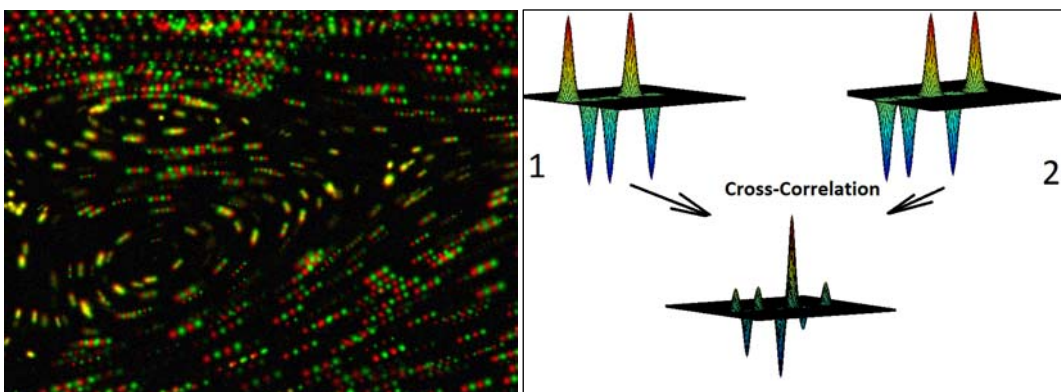


Fig. 1 A fragment of a color image of flow visualization (left) and an example of coding cross correlation functions (right)

References

1. Raffel M. et al. *Particle Image Velocimetry: A Practical Guide, Second Edition*. Springer, Berlin, 2007
2. Adrian R. J. *Image shifting technique to resolve directional ambiguity in double-pulsed velocimetry*. Applied Optics. 1986, 25, p. 3855-3858