

## 9. Development of 1-Frame 3-D PTV and its Application to Measurement of a Backward-Facing Step Flow

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In this paper, a new three-dimensional PTV(Particle Tracking Velocimetry) technique using the concept of match probability between two-field (1-Frame) images has been developed to obtain an instantaneous three-dimensional velocity field of high speed flows. The measuring system consists of three CCD (Charge Coupled Device) cameras, an optical instrument called AOM (Acousto-Optical Modulator), a digital image grabber, and a host computer. For verification of the developed technique, moving particles which are spatially installed on a rotating plate are tracked by the developed technique and are compared with those of actual rotating speed.

The developed 1-Frame 3-D PTV system is applied to the measurement of turbulent backward-facing step flow and the results are compared with those of a Panoramic-PIV system which has been developed in this study. The performance of the developed algorithm is verified by a benchmark test using the three-dimensional velocity vectors obtained by the experiment on the backward-facing step flow. An uncertainty analysis associated with the present 1-Frame 3-D PTV technique is quantitatively evaluated. The capability of the developed technique is validated by probing three-dimensional velocity fluctuation components ( $u'$ ,  $v'$ ,  $w'$ ) of a relatively high speed backward-facing step flow.

