

PIV Applications in Bioengineering

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Visualization plays an essential role for a better understanding of flow phenomenon and their associated mechanisms. PIV is one of the most suitable flow measurement techniques since it enables us to measure velocity distributions instantaneously with good space resolution without disturbing the flow. Due to these advantages, PIV has been applied to researches in the field of bioengineering such as *in vitro* experiments of cardiovascular flow or microfluidics.

The lecture presents an overview of the recent PIV applications in bioengineering, mainly hemodynamic and microfluidic researches in Japan. Blood flow is multi-scale phenomena and its flow features drastically changes depending on a size of blood vessel. Thus, it is very important to develop a visualization technique to capture the most distinctive flow physics in the particular scale of interest. One of flow visualization techniques based on PIV is a stereo-PIV system to visualize flow structure in an *in vitro* model of cardiovascular flow such as flow in a cerebral aneurysm, which is in the scale of milli-meters[1]. Since an *in vitro* model can be constructed from medical image data, it is challenging to capture complex three-dimensional flow in realistic geometry.

The lecture touches upon a micro PIV system to visualize and measure flow in a droplet in a micro channel or micro multi-phase flow in an arteriole of 100 micrometers[2]. Even though the flow is in a microscopic scale, flow may have complicated three-dimensional features. The paper presents recent advancement in micro PIV such as confocal micro-PIV to examine micro multi-phase flow in a micro scale.

References

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