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Scanning Laser Image Correlation (SLIC) Measurements in Zebra Fish Larvae

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Scanning Laser Image Correlation (SLIC) is a technique to measure the flow of small particles and to observe local flow patterns over an area. SLIC can be applied to situations including blood cells flowing through blood vessels or tracer particles flowing through microfluidic channels. The main advantage of SLIC over other flow measurement techniques is that SLIC can be scaled to measure flow in areas ranging from microns to centimeters wide. To accomplish this, an image is first acquired through laser scanning and analyzed with number and brightness analysis (N&B) to identify regions of flow. This is used as a guide to manually (or potentially automatically) select a pattern within the image, such as a line along the center of a channel, that
is then scanned repeatedly with the laser beam. Since the entire image is not scanned in each measurement SLIC measurements can be obtained quickly and efficiently. The results of these scanned patterns are analyzed with the recently developed pair correlation technique to extract the rate of flow and to identify characteristic flow patterns such as turbulence, particles that adhere to the channel walls, and variable velocity along the length of the channel. In the work presented here we demonstrate the effectiveness of SLIC by measuring blood flow in a zebra fish model. With SLIC, we are able to obtain blood flow measurements equivalent to those obtained with other techniques. We are also able to map the rate of flow and to observe variability in flow rate over time. This indicates that SLIC has potential to measure blood flow in other animals as well and may hold potential as the basis of a medical device.

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