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3-D Digitization of Stereoscopic Jet-in-Crossflow Vortex Structure Images via Augmented Reality[1] LORENZ SIGURDSON, CHRISTOPHER STRAND, GRAEME WATSON, JOSHUA NAULT, RYAN TUCKER, Vortex Fluid Dynamics Lab, Mechanical Engineering Department, University of Alberta
— Stereoscopic images of smoke-laden vortex flows have proven useful for understanding the topology of the embedded 3-D vortex structures. Images from two cameras allow a perception of the 3-D structure via the use of red/blue eye glasses. The human brain has an astonishing capacity to calculate and present to the observer the complex turbulent smoke volume. We have developed a technique whereby a virtual cursor is introduced to the perception, which creates an "augmented reality." The perceived position of this cursor in the 3-D field can be precisely controlled by the observer. It can be brought near a characteristic vortex structure in order to digitally estimate the spatial coordinates of that feature. A calibration procedure accounts for camera positioning. Vortex tubes can be traced and recorded for later or real time supersposition of tube skeleton models. These models can be readily digitally obtained for display in graphics systems to allow complete exploration from any location or perspective. A unique feature of this technology is the use of the human brain to naturally perform the difficult computation of the shape of the translucent smoke volume. Examples are given of application to low velocity ratio and Reynolds number elevated jets-in-crossflow.

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