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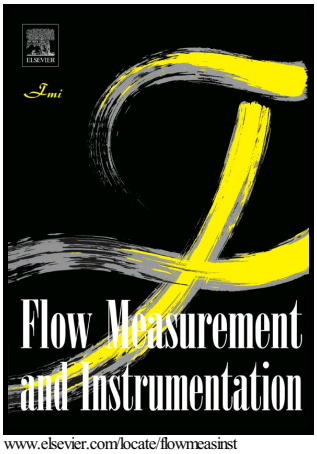

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Abstract

In this paper, we develop a new method to track the evolution of bubbles or droplets in jet flow. Proposed tracker fuses shape and motion features of the individually detected droplets in 2D shadow images and employs the Bhattacharyya distance to assign the closest one among candidate droplet regions. Distinct from the existing droplet tracking techniques in the literature, shapes of the target droplets were not assumed to be circles or ellipses. Instead evolving droplet contours were extracted and analyzed. Proposed tracking algorithm could achieve real time performance with 16 fps in MATLAB environment. Single, double and triple droplets were tracked with the average accuracy of 87%, 87% and 83%, respectively. Experimental results were then evaluated to explain the underlying jet phenomena.

Keywords: jet flow, droplet, bubble, segmentation, tracking, Bhattacharyya distance

1. Introduction

Analysis of jet flow offers important opportunities to clarify several physical phenomena in experimental studies of biology and chemistry. Obtaining kinetical and structural information about small size particles, bubbles or droplets generated in jet flow serves for better understanding of the flow characteristics and enables manipulation of these entities in several microfluidic applications [1, 2]. Recent studies in droplet-based microfluidic systems necessitate to localize the droplets in fluidic systems and track them throughout the flow to extract their unique features [3, 4, 5, 6].

With the rapid improvements in visualization technology, several advanced measurement techniques have been developed to gather information about par-

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