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Quantifying the role of noise on droplet decisions in bifurcating microchannels MASOUD NOROUZI DARABAD, MARK VAUGHN, SIVA VANAPALLI, Texas Tech University — While many aspects of path selection of droplets flowing through a bifurcating microchannel have been studied, there are still unaddressed issues in predicting and controlling droplet traffic. One of the more important is understanding origin of aperiodic patterns. As a new tool to investigate this phenomena we propose monitoring the continuous time response of pressure fluctuations at different locations. Then we use time-series analysis to investigate the dynamics of the system. We suggest that natural system noise is the cause of irregularity in the traffic patterns. Using a mathematical model, we investigate the effect of noise on droplet decisions at the junction. Noise can be derived from different sources including droplet size variation, droplet spacing, and pump induced velocity fluctuation. By analyzing different situations we explain system behavior. We also investigate the "memory" of a microfluidic system in terms of the resistance to perturbations that quantify the allowable deviation in operating condition before the system changes state.

Masoud Norouzi Darabad
Texas Tech University

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