



Train Transportation of Digital Microfluidic Droplets for Fast Manipulation

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Abstract: Digital microfluidic biochips (DMFBs) have been widely used for disease diagnosis and drug delivery due to its improved efficiency. As DMFBs continue to increase in its complexity, DMFB with hundreds or thousands of electrodes will become reality. Future large-scale DMFB will handle many droplets simultaneously in the same chip. Current droplet movement are done individually step by step, of which the efficiency is low. In large scale DMFB chip, a batch of droplets may need to be moved from one location to another location simultaneously. How to efficiently transfer multiple droplets becomes a very important issue. In this poster, a train-like transportation style of digital droplets is proposed. By applying proper voltage driving scheme, multiple droplets merged together to form an elongated large droplet. Such train-like elongated droplets can be moved together as a train. This results in improved efficiency in droplet transportation. COMSOL simulation is used to verify the movement of the train transportation of droplets. The simulation results shows the train-like transportation leads to fast transportation speed and improved efficiency. It can be used for high-speed mass transportation for the demand of future DMFB chips.

Keywords: Digital Microfluidic Biochip (DMFB), Electrowetting, High-speed Bus, Droplet, COMSOL Simulation.

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