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Towards virtual channels in a microfluidic device[1] ANKUR KISLAYA, DANIEL TAM, JERRY WESTERWEEL, Delft University of Technology — Manipulating particles is of interest in diverse fields of engineering and are of interest to the oil, food, and medical industries. Generally, manipulation activities carried out in micro-devices have a fixed design tailored for a specific task. It makes different analyses unfeasible on a single device. To address this issue, we designed a Hele-Shaw flow cell with "virtual" channels generated by uniform flow in the transverse direction and three inlets in the longitudinal axis. These three inlets can inject or withdraw fluid in the flow cell to deviate the streamlines. We use hydrodynamic forces as a way for non-contact particle manipulation because other non-contact techniques rely on complicated control systems which could interact with the particle properties. Since the depth-averaged velocity over the channel in a Hele-Shaw cell is irrotational, we use potential flow theory to predict the flow field. We have developed a particle path optimization algorithm to apriori determine the optimized path while confining the flow rate bounds and the variation in the flow rate. This device provides us the opportunity to integrate multiple functionalities such as particle separation, bringing particles close to each other, trapping onto a single device.

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