B. P. Poddar Institute of Management & Technology
137, V. I. P. Road, Kolkata – 700052

Ref. No. BPP/Notice/PRC/1838/2025 Date : 04.03.2025

Notice

The following member will be delivering a lecture as detailed below:

Presenter's Name: Mr. Amartya Dutta

Title: ***Hexagonal Digital Microfluidics-based Biochips - Its Design Issues, Optimised Automated Pin Aware Routing with Its Performances and Extensions***

Abstract: *Recent advances in digital microfluidic biochips or DMFBs have enabled its applications in biochemistry, clinical diagnosis, high-throughput DNA sequencing, immunoassays, protein crystallisation, etc. DMFBs ushered in a new era in this domain by establishing a μ-lab-on-chip as a replacement for typical laboratory systems. Handling nanolitre or microlitre volumes of several discrete biochemical fluids is a challenging problem in DMFB synthesis. To address this issue, in this article, we have examined to replace the commonly used square electrode cell used in traditional DMFBs with a regular hexagonal one and analysed the critical factors required to perform several modular operations like droplet routing, mixing etc., safely in the proposed chip array. On-chip droplet routability, which is NP-Complete in nature, is also crucial to find out the droplet pathways, which satisfy the constraints imposed by fluidic properties. Here, we have investigated and model a systematic droplet routing on a hexagonal electrode based DMFB or an HDMFB layout. The discussed algorithm optimises the droplet flow paths by considering all obstacles and without obstacles in the chip layout during the assay runtime; it finds several droplet routes and finally searches for the optimal path that utilises the minimum number of electrodes to reach the target. Various droplet routing algorithms like A* heuristic search-based algorithm, prioritised A* algorithm, network flow-based routing etc., have been studied to implement the droplet routing operations in the digital microfluidic realm. Mixing and routing are two fundamental modular operations in any microfluidic environment design. Active mixing, which can be considered as series of two or more droplet routing operations in any fixed sized mixer region, is the most dominant procedure during any assay completion. Highlighting the mixing functionalities is one of the most significant challenges so that the HDMFB forefronts the conventional square-based DMFB system. Some real-world bioassays have been expanded as test cases for evaluating the correctness and performances of the proposed droplet routing algorithm compared to those using traditional square electrode cells, and the obtained results are satisfactory. Finally, some open research areas in droplet routing problem are discussed.*

Date: 13.03.2025

Venue: B Block Seminar Hall **Time: 4 pm onwards**

This seminar is a part of Faculty Seminar Program of the Institute ***Prosaran***. The faculty, technical and staff members of the Institute are hereby requested to attend the session.

Sd/-
Prof. (Dr.) Sutapa Mukherjee
Principal
B P Poddar Institute of Management & Technology

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