JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

FALL 2020 CEAFM VIRTUAL SEMINAR

"Computational Approaches for Passive Control of Inertial Microfluidic Flows"

Presented by Prof. Baskar Ganapathysubramanian
Iowa State University - Applied Physics Laboratory
Hosted by Claire Hur (JHU - MechE)

Microfluidic flows in the inertial regime exhibit a fascinating range of phenomena (inertial migration and focusing, secondary flows). These phenomena can be leveraged to enable passive control of flow as well as the localization of particles (cells, precipitates, particles) in flow, with applications to biological processing, chemical reaction control, and for creating structured materials. In particular, inertial flow deformations induced by sequences of pillars that disrupt the flow provide a simple, lego-like strategy for passive flow control. Several groups have shown the ability to passively engineer the cross-sectional shape of a fluid by placing a sequence of pillars that disrupt flow. A challenge is to efficiently identify an (near) optimal sequence of pillars that accomplish a desired flow transformation, or particle localization. This talk gives an overview of our work in the past few years focused on fast computational approaches for pillar sequence design. We utilize high throughput approaches for CFD (including immersed boundary approaches), Markov matrices, and applied machine learning to accomplish near real time design exploration.

This work is collaborative work with the DiCarlo group (UCLA), Sundar group (Utah), and Sarkar group (ISU).

Baskar Ganapathysubramanian is the Anderlik professor of engineering at Iowa State University. He directs a curiosity driven, computational sustainability group. The group leverages applied mathematics, scientific computation and machine learning to model, design, and control complex systems with application to food, energy and environment, and health. Recent applications include LES simulations of aerosol transport in classrooms for risk assessment, high resolution simulations of electrokinetic phenomena (Navier Stokes with Poisson Nernst Plank equations) for saliva based COVID tests. He graduated with a BTech from IIT Madras, and a PhD from Cornell University.

Friday, September 11, 2020 at 3:00

https://wse.zoom.us/j/93762992307