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Transport of Cellular Vesicles in Bone-like Environment[1] TRUNG LE, LAHCEN AKERKOUCH, North Dakota State University — Transport of cells in fluid flow plays a critical role in cancer metastasis. Recent development of microfluidic devices has enabled the understanding of cellular dynamics in vitro conditions such as tubes and channels. However, it is challenging to obtain precise characteristics of cellular dynamics using experimental method alone in complex situation such as human bone. This challenge motivates our new development of computational methods to provide hemodynamic data of cellular flows in complex geometries. Past computational works have utilized either particle-based methods (Disspative Particle Dynamics, Lattice-Boltzmann Method) or continuum approach (Finite Element Method). Since there exists a large disparity in spatial and temporal scales in this problem, it is highly desirable to develop a hybrid continuum-particle approach to resolve local dynamics of cells while providing large-scale flow patterns in the vicnity of bone and the vascular vessel. In this work, a new Fluid-Structure Interaction formulation is proposed based on the use of DPD model for the cellular membrance and the use of the Immersed Boundary Method for the fluid plasma. This hybrid approach allows accurate descriptions of cell deformation as well as resolving flow structures in details.

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Trung Le
North Dakota State University

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