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Development of real time digital holographic microscope for cell flow interactions using a High Performance Computing (HPC) cluster
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Real-time imaging and analysis of 3D cell migration and locomotion is crucial to understand the underlying physics of cell environment interactions. In addition, such a microscopy would provide vital diagnostic capability in cell detection, particle sorting and drug screening with large throughput. However, 3D holographic imaging and subsequent analysis are computational intensive and up-to-date prohibitive for real-time applications. With the advances in high performance computing, we are developing a real-time digital holographic microscope (DHM) that includes an in-line DHM, a large format CCD camera, and a 24-node windows-based HPC cluster. The cluster is organized as the master-slave parallel computing paradigm with Message Passing Interface (MPI) as its communication protocol. The holograms are recorded, streamed and analyzed by the HPC cluster in real time, the 3D distributions and in focus images are rendered back on the data acquisition computer. The system will be applied to study marine protest interacting with oil droplets. Supports from GoMRI are acknowledged.

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