5. Conclusions and future works

In this paper a three dimensional non-linear ODT model to locate particles has been presented, as part of a fluid velocimetry technique. Two numerical experiments, with different observation configuration but identical illumination set-up, have been considered. They illustrate that multiple scattering influences the object visualization in a different way depending on the recording configuration. These experiments also demonstrate the advantages of NLODT-P vs LODT performance. It has been shown that multiple scattering due to the particle finite size can be tackled with a suitable matched filter, but multiple scattering between particles have to be addressed with an iterative optimization method such as NLODT-P.

We have implemented the NLODT-P model using MATLAB combined with GPU computing by means of MEX-files due to the fact that MEX-files allow the combination of CUDA-GPU programming and MATLAB. Acceleration factors range up to 37 × with respect to the approach that only uses MATLAB framework. Additionally, the use of a specific format to store the large sparse matrix (M), involved in the BCG method, has reduced the memory requirements by a factor of ten with respect to the traditional format for specifying sparse matrices in MATLAB. In this line, we are currently working on the implementation of a hybrid code of the *Forward* procedure, based on the combination of CPUs and GPUs in order to take advantage of the heterogeneity of the resources of the modern high performance architectures [25]. This hybrid implementation could allow us to extend the resolution of this kind of problems.

As consequence of this work we can say the NLODT-P is a good approach to improve the accuracy of linear ODT methods in locating seeding particles in fluid velocimetry applications. High Performance Computing platforms and tools are essential to develop and apply this approach. However, further work is needed towards a multiscale model for embedding these proposals in production environments.

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