Advanced numerical treatment of an accurate SPH method

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The summation of Gaussian kernel functions is an expensive operation frequently encountered in scientific simulation algorithms and several methods have been already proposed to reduce its computational cost. In this work, the Improved Fast Gauss Transform (IFGT) [1] is properly applied to the Smoothed Particle Hydrodynamics (SPH) method [2] in order to speed up its efficiency. A modified version of the SPH method is considered in order to overcome the loss of accuracy of the standard formulation [3]. A suitable use of the IFGT allows us to reduce the computational effort while tuning the desired accuracy into the SPH framework. This technique, coupled with an algorithmic design for exploiting the performance of Graphics Processing Units (GPUs), makes the procedure promising as shown by preliminary numerical simulations.

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