Solving Multidimensional Computational Geometric Problems on Graphics Processing Units

L. T. Dechevsky, B. Bang, A. Lakså, J. Bratlie, J. Gundersen

In previous part of this research (L.T. Dechevsky, B. Bang, J. Gundersen, A. Lakså, A.R. Kristoffersen, Solving nonlinear systems of equations on graphics processing units, In: I. Lirkov, S. Margenov, and J. Wasniewski (Eds.) LSSC'2009, LNCS 5910, Springer-Verlag, Berlin-Heidelberg, 2010, to appear) a method for isometric immersion of smooth multivariate multidimensional vector-fields onto fractal curves and surfaces was used for solving nonlinear systems of equations on graphics processing units (GPUs) used as general-purpose parallel computing architectures. From the point of view of computational geometry these results translate as solving multidimensional intersection problems where the dimension is typically higher than 3. In the present communication we consider for the first time the more general problem of computing closest points between multidimensional manifolds, where the dimension is $2, 3, 4, \ldots$. We briefly discuss also the possibility to use the same approach for solving other multidimensional geometric problems and doing comparative analysis of the geometric properties of multidimensional manifolds.