1078-65-352 **Elisabeth Larsson*** (Elisabeth.Larsson@it.uu.se), Uppsala University, Dept. of Information technology, Box 337, SE-751 05 Uppsala, Sweden, and **Alfa Heryudono**. *A partition of unity radial basis function collocation method for partial differential equations.*

For partial differential equations with smooth solutions, radial basis function approximation methods are attractive due to the potentially spectral convergence rates. However, in practice, the success is hampered by ill-conditioning as the problem size grows and as the kernels are made flatter. Furthermore, the computational cost when direct solution methods are used for the arising full linear systems is prohibitive for large-scale problems.

We propose a partition of unity approach where radial basis function approximation is employed within each partition. The introduced locality reduces both memory usage and computational cost compared with the global method. However, in order to achieve numerical convergence, we also need stable evaluation of the approximants for nearly flat kernels. This is achieved through employment of the recently developed RBF-QR algorithm (Fornberg, Larsson, Flyer 2011).

We provide numerical experiments showing spectral convergence with respect to the local problem resolution and algebraic convergence with respect to the partition size. We also discuss how far these results are supported by theory and what the important restrictions are. Furthermore, we discuss how these techniques perform for problems formulated on manifolds. (Received December 13, 2011)