hp-Clouds - A Meshless Method in Boundary Elements

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In the very few last years a number of numerical procedures called as meshless methods have been proposed. In this work a meshless procedure applied to boundary integral equations is proposed. A 2D domain geometry is defined by a set of b-splines contours. An arbitrary set of nodes is distributed over them. Associated with these nodes, overlapping regions, hereby referred to as Clouds, are defined in order to cover the domain boundary. The support of the Galerkin interpolation functions are then constructed by the intersection of these clouds with the geometric definition of the boundary. Interpolation functions are formed by the Partition of Unity (performed by using Moving Least Square interpolants) and their p enrichments. Also, an h-refinement is implemented by increasing the number of clouds accordingly to error indicators.

The boundary integral equations to be solved are presented together with the procedures for evaluating the POU and interpolation functions along the boundary. Convergence results are presented for successive h- and p-refinements. Since the new basis functions differ from the traditional polynomial ones, an adaptive integration procedure is employed. The efficiency of several types of basis functions is verified. The rates of h and p convergence are determined as functions of other parameters. Finally, some computational aspects concerning Object Oriented Programming applied to an *hp*-Clouds code are discussed.