

THE SMOOTH PIECEWISE POLYNOMIAL  
PARTICLE SHAPE FUNCTIONS  
CORRESPONDING TO PATCH-WISE  
NON-UNIFORMLY SPACED PARTICLES FOR  
MESHFREE PARTICLE METHODS

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**Abstract**

In the previous papers ([12],[24]), for uniformly or locally non-uniformly distributed particles, we constructed highly regular piecewise polynomial particle shape functions that have the polynomial reproducing property of order  $k$  for any given integer  $k \geq 0$  and satisfy the Kronecker Delta Property. In this paper, in order to make these piecewise polynomial particle shape functions to be more useful in dealing with problems on complex geometries, we introduce highly regular piecewise polynomial particle shape functions corresponding to the particles that are mostly non-uniformly distributed within the domain, and their supports are proper subsets of the given domain. An error estimate of the interpolation associated with such flexible piecewise polynomial particle shape functions is proven.