Generalized Polyharmonic Multiquadrics

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In this paper, we derive the two- and three-dimensional generalized polyharmonic multiquadrics (GPMQ), which are the analytical particular solutions of generalized multiquadrics (GMQ) associated with the polyharmonic operators. By observing the first few orders of the GPMQs, the methods of undetermined coefficients are constructed. Then, the unknown coefficients of the GPMQs are determined to ensure the GPMQs hierarchically unique and infinitely differentiable. *Mathematica* codes are provided for obtaining the GPMQs of arbitrary orders. The derived GPMQs are validated by numerical solutions for the Poisson's equation. Numerical results indicate that the solutions obtained by the GPMQs are more accurate than those by the GMQ.

Keywords: Generalized multiquadrics, Radial basis function, Dual reciprocity method, Polyharmonic operator