Numerical solution of functional nonlinear Feredholm integral equations by using RBF interpolation

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Abstract

The main aim of this study is to obtain numerical solution of functional nonlinear Fredholm integral equations using meshless Radial Basis Function (RBF) interpolation which is based on linear combinations of terms. Applying RBF in functional integral equation, a linear system $\Psi C = G$ will be obtain which by defining coefficients vector C, target function will be approximiated. Finally, validity of the method is illustrated by some examples.

Keywords: Functional nonlinear Fredholm integral equations, Radial basis functions, Multi quadric functiones, Meshless method
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1 Introduction

RBFs are computationally means to approximate functions which are complicated or have many variables, by other simpler functions which are easier to understand and readily evaluated. One of the outstanding advantages of interpolation by RBF, unlike multivariable polynomial interpolation or splines [1], is applicability in scattered data aspect of existence and uniqueness results since there is little restrictions on dimension and also high accuracy or fast convergence to the target function. As another advantage of RBF there are not required to triangulations of the data points, while other numerical methods such as finite element or multivariate spline methods need triangulations [1, 2]. This requirement computationally cost, especially in more than two dimensions. In this paper, we consider functional nonlinear integral equations of Fredholm type with unknown function $y(x)$. To approximate the target function, we employ RBF interpolation in distinct grids from a definite domain. To this purpose, consider N distinct points as $(x_1, x_2, \ldots, x_N) \in R^d$, in an d dimensional Euclidean space at which the function to be approximated is known

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