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# RBF-BASED COLLOCATION METHOD FOR NAVIER STOKES EQUATIONS

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## ABSTRACT

Radial Basis Function (RBF)-based collocation method is a recently developed meshless technique that has attracted attention in recent years, especially in the area of computational mechanics. The roots of RBF go back to the early 1970s, when it was used for fitting scattered data [1]. The method, however has not been applied directly to solve partial differential equations until 1990 by Kansa [2,3]. Since then, many researchers have suggested several variations to the original method. A number of recent studies on the application of RBF to Navier Stokes equations are given in references [4-6].

In this paper, the direct RBF collocation method is applied to the problem of two dimensional steady state, viscous, incompressible flow problem (Navier Stokes equations). The Navier Stokes equations are formulated in terms of the stream function and its derivatives. The stream function is interpolated by global radial basis functions centered at some selected points inside the domain and on the boundary of the problem. The amplitudes of the used radial basis functions are obtained by collocating the governing equations and their boundary conditions at the selected boundary and domain points. The collocation process produces a system of nonlinear algebraic equations which are solved using an incremental-iterative procedure. The numerical examples show that the addition of the fundamental solution to the radial basis functions improves the accuracy of the solution, especially for problems involving high gradients.

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