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A novel upwind-based local radial basis function differential quadrature method for convection-dominated flows. (English) Zbl 1391.76529

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Summary: In this paper, a new upwind technique for local radial basis function differential quadrature (LRBF-DQ) method is proposed to solve the convection-dominated flow problems. By using a modified Euclidean distance function according to the local flow direction and the value of parameter that controls the convection effect, the local support in the formulation of LRBF-DQ can be chosen in a way shifting towards the upstream direction to form a comet-like shape. The upwind effect is therefore naturally incorporated when computing the weighting coefficients for LRBF-DQ method. The capability of the proposed method is examined by solving two-dimensional convection-diffusion equation with various Peclet numbers and magnetohydrodynamics (MHD) problems with very high Hartmann numbers. The results show that remarkable improvement of accuracy can be achieved by the current upwind-based LRBF-DQ method than the conventional ones.

MSC:

76M25	Other numerical methods (fluid mechanics) (MSC2010)	Cited in **8** Documents
65N99	Numerical methods for partial differential equations, boundary value problems	
76W05	Magnetohydrodynamics and electrohydrodynamics	

Keywords:

upwind scheme; localized meshless method; radial basis function; differential quadrature; convection-diffusion; MHD flow

Software:

Mfree2D

Full Text: DOI

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