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**A new meshless local B-spline basis functions-FD method for two-dimensional heat conduction problems.** (English) [Zbl 1356.80064](#)  
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Summary: Purpose

- The purpose of this paper is to present a new approach of meshless local B-spline based finite difference (FD) method for solving two dimensional transient heat conduction problems.

Design/methodology/approach

- In the present method, any governing equations are discretized by B-spline approximation which is implemented in the spirit of FD technique using a local B-spline collocation scheme. The key aspect of the method is that any derivative is stated as neighbouring nodal values based on B-spline interpolants. The set of neighbouring nodes are allowed to be randomly distributed thus enhanced flexibility in the numerical simulation can be obtained. The method requires no mesh connectivity at all for either field variable approximation or integration. Time integration is performed by using the Crank-Nicolson implicit time stepping technique.

Findings

- Several heat conduction problems in complex domains which represent for extended surfaces in industrial applications are examined to demonstrate the effectiveness of the present approach. Comparison of the obtained results with solutions from other numerical method available in literature is given. Excellent agreement with reference numerical method has been found.

Research limitations/implications

- The method is presented for 2D problems. Nevertheless, it would be also applicable for 3D problems.

Practical implications

- A transient two dimensional heat conduction in complex domains which represent for extended surfaces in industrial applications is presented.

Originality/value

- The presented new meshless local method is simple and accurate, while it is also suitable for analysis in domains of arbitrary geometries.

**MSC:**

[80M20](#) Finite difference methods applied to problems in thermodynamics and heat transfer Cited in 5 Documents

[65M70](#) Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs

[80A20](#) Heat and mass transfer, heat flow (MSC2010)

**Keywords:**

[meshless](#); [B-spline](#); [complex domains](#); [generalized finite difference](#); [heat conduction](#); [transient](#)

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