

國立中山大學應用數學系

學術演講

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講題：Numerical solutions of elliptic partial differential equations by method of particular solution and trigonometric functions

時間：2017/05/04（星期四）15:30 ~ 16:30

地點：理學院四樓理 SC 4009-1 室

茶會：15:00 於理 SC 4010 室（系辦公室）

Abstract

In this presentation, the method of particular solutions (MPS), based on trigonometric functions, is proposed to accurately analyze two-dimensional boundary value problems, which are governed by elliptic partial differential equations. The inhomogeneous term of the governing equation is approximated by two-dimensional Fourier series and the closed-form particular solutions of trigonometric functions are derived by method of undetermined coefficients. The numerical solution of the MPS is expressed as a linear combination of the derived closed-form particular solutions and then can be efficiently acquired by enforcing the satisfactions of governing equation at interior nodes and boundary conditions at boundary nodes via a simple collocation approach. In comparing with using radial basis functions and polynomials to approximate inhomogeneous term in MPS-related researches, to use trigonometric function and its closed-form particular solutions in the MPS can provide another simple approach to accurately and efficiently solve two-dimensional elliptic partial differential equations. Five numerical examples are provided in this talk to verify the merits of the proposed meshless method. In addition, some factors in the proposed approach are systematically investigated by adopting a series of numerical experiments.

Keywords: method of particular solutions, trigonometric functions, elliptic partial differential equation, closed-form particular solution, meshless method.

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