國立中山大學應用數學系
學術演講

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講　題：Homotopy method of fundamental solutions for solving some nonlinear problems
時　間：2020/10/08（Thursday）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 study, the homotopy analysis method (HAM) is combined with the method of fundamental solutions (MFS) and the augmented polyharmonic spline (APS) to solve Poisson-type nonlinear PDEs and nonlinear heat conduction problems. The method of fundamental solutions with high-order augmented polyharmonic spline (MFS–APS) is a very accurate meshless numerical method which is capable of solving Poisson's equation since the fundamental solution and the analytical particular solutions of the APS associated with the harmonic operator are known. In the solution procedure of the Poisson-type nonlinear PDEs, the HAM is applied to convert the considered nonlinear PDEs into a hierarchical system of linear Poisson's equations, which can be sequentially solved by the MFS–APS. On the other hand, in the solution procedure of nonlinear heat conduction problems, the Kirchhoff transformation is employed to transform the nonlinear governing partial differential equation into the Laplace equation with nonlinear boundary conditions. Sequentially, the HMFS is applied to solved the prescribed the Laplace equation with nonlinear boundary conditions. In order to solve strongly nonlinear problems, auxiliary parameters are introduced to ensure the convergence of the HAM. Therefore, the homotopy method of fundamental solutions can be applied to solve problems of strongly nonlinear PDEs. Several numerical experiments were carried out to validate the proposed method. Therefore, it can greatly enlarge the application areas of the MFS.

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