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利用有限差分法配合試算表求解滲流、壓密與波傳問題

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摘　　要　本研究探討如何應用有限差分法配合試算表求解偏微分方程式，對於一般常見之橢圓型、拋物線型、雙曲線型等三種偏微分方程式，舉出地下水滲流、土壤壓密沉陷、地盤震動與波浪傳遞等工程問題的應用案例，由試算表快速地建立有限差分法之網格點進行求解，並與解析解加以驗證，其結果顯示以有限差分法配合試算表計算所得之數值與解析解相當接近。有限差分法以試算表語法來撰寫相當快速容易，且可即時繪圖檢視結果。本研究所建立之試算表程式富修改彈性以反應各種不同的起始與邊界條件，可直接應用在滲流、壓密沉陷與波傳等實際工程問題之分析上，爲一有效率的工具。

關鍵詞：有限差分法、試算表、偏微分方程式、滲流、壓密、波傳。

Application of Finite Difference Method with Spreadsheet to Solve Seepage, Consolidation and Wave Propagation Problems

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ABSTRACT　This paper discusses how to apply the finite difference method (FDM) with spreadsheet to solve partial differential equations (PDE) of the elliptic, parabolic and hyperbolic types. Examples of groundwater seepage, soil consolidation, earthquake shear stress wave propagation and sea wave propagation are illustrated. They are solved by the FDM with the proposed spreadsheet models. The numerical results obtained by the spreadsheet model are verified by analytical or other numerical solutions to a satisfactory level. The setup of the spreadsheet model for solving PDEs is quick and easy and the plots can be viewed immediately. The spreadsheet for PDEs in this study is full of flexibility for modification to reflect various initial and boundary conditions. The spreadsheet model developed is an effective tool and can be readily applied in solving practical engineering problems such as seepage, consolidation and wave propagation.

Key Words: finite difference method, spreadsheet, partial differential equation, seepage, consolidation, wave propagation.

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