A METHOD OF DIRECTLY DEFINING THE INVERSE MAPPING FOR PARTIAL DIFFERENTIAL EQUATIONS

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In the early nineteenth century, J.H. He proposed the Homotopy perturbation technique, which has been widely used to obtain analytic solutions to non-linear differential equations. If the operator of the non-linear differential equation contains a linear part and non-linear part with a small parameter, then the original non-linear problem can be transferred into an infinite number of linear sub problems. Under this situation, there is no freedom to choose the linear operator. Moreover, the inverse of the linear operator should be calculated to find unknown functions, and it is computationally expensive. To overcome this obstacle, Liao introduced the Method of Directly Defining inverse Mapping (MDDiM) with the freedom of choosing the inverse linear mapping. Therefore, most of the barriers faced when solving the problems can finally be overcome. Recently, Vajravelu *et al*. extended the MDDiM to solve coupled systems of non-linear ordinary differential equations that have been previously used to solve single non-linear ordinary differential equations. In this study, this novel method was further extended to solve systems of non-linear partial differential equations. The results obtained through this method are well in agreement with those obtained with numerical methods in previous studies. As a result of the extended MDDiM, the novel method is able to save computational time. Further, this method can be used to analyze more complicated models in Science and Engineering.

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