Application of a new multivariate spectral quasilinearisation method on a nuclear reactor problem

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Abstract

In this study, for the first time, we apply the new recently developed multivariate spectral quasilinearisation method for solving a system of elliptic type of equations. Specifically, we look at investigating the finite cylindrical catalyst pellet in which first order chemical reaction is taking place in the nuclear reactor. We assumed that the heat transportation is characterized by thermodynamics force of temperature gradient, this implies that the pellet is non isothermal. The resulting system of governing equations are solved using the multivariate spectral quasilinearisation method. Error analysis of the velocity and the temperature profiles are presented. The physical parameters affecting the model are also discussed in details.

Keywords: Multivariable, quailinearisation, thermodynamics, chemical reactor.