Homotopy perturbation method and Trefftz functions in the source function identification

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The homotopy perturbation method (HPM) is employed to find an approximate solution of a nonlinear stationary problem in a domain Ω with unknown source term, and with the prescribed boundary conditions and some measured or anticipated values of the solution in some inner points. The source term is assumed to have a form of a polynomial with unknown coefficients. Number of the coefficients determines the number of functions in HPM resulting from expansion of $H(v,p)$ with respect to the parameter p in order to find the components of the approximate solution of the problem. The components consist of Trefftz functions for the linear parts of the resultant equations based on powers of p-terms.. Minimization of the difference between the values prescribed or measured inside the considered domain and the approximate solution of the problem, leads to the values of coefficients describing in an approximate way the source term.

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