ABSTRACT

SOLVING SEPARABLE NONLINEAR LEAST SQUARES PROBLEMS BY DAVIDENKO'S METHOD

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Given the data (x_i, y_i), $i=1,2,\ldots,m$, this paper discusses a method to find the values of the linear and nonlinear parameters a and b which minimize the nonlinear functional

$$\sum_{i=1}^{m}\left[\sum_{j=1}^{p}F_j(b,x_i)a_j - y_i\right]^2$$

over $a \in R^p$, $b \in R^q$ where $m \geq p + q$.

By introducing a real parameter, this problem is imbedded into a one-parameter family of problems. Then, a method is presented for solving it by following its solution path using Davidenko's continuation methods. In the course of iterations, the original problem containing $p + q + 1$ variables is transformed into a problem with $q + 1$ nonlinear variables by taking the separable structure of the problem into account. By doing so, the new method reduces to solving a series of equations of smaller size and a considerable saving in the storage is obtained.

Results of numerical experiments are reported to demonstrate the effectiveness of the proposed method.