APPROXIMATION OF NOT A FUNCTION BUT ITS EQUATION GIVES A LINEAR INVERSE PROBLEM INSTEAD OF NONLINEAR ONE

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A generalization of the linear least squares method to a wide class of parametric nonlinear inverse problems [1] is presented. The idea of the proposed approach to parameter estimation is based on the fact that for many functions there always exists an equation (and not a single equation) that this function satisfies. If the equation is linear in the parameters of this function, estimates of the parameters can be found by minimizing the sum of squares of the finite difference residuals or some other approximation of this equation, the residual being the difference between the fitted value and the experimentally measured value of . As a result, we can apply the linear least squares method to a non-linear parametric problem. The approach is based on the consideration of operator equations, the solution of which is the chosen function of parameters. The generalization is based on two mandatory conditions: the operator equations are linear in the estimated parameters and the operators have discrete approximations. Not requiring the use of iterations, this approach is well suited for hardware implementation, as well as for constructing a first approximation for the nonlinear least squares method. Examples of numerical simulation of inverse problems, including problems of estimating the parameters of some higher transcendental functions, are given.

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REFERENCES

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