Anatoly Yagola
Department of Mathematics, Physical Faculty, Moscow State University,
Moscow, 119991, Russia
E-mail: yagola@inverse.phys.msu.ru

Error estimation for ill-posed problems with a priori information

The theory of solving linear and nonlinear ill-posed problems is advanced greatly today (see, e.g., [1, 2]). A general scheme for constructing regularizing algorithms using Tikhonov's variational approach is considered in [2].

It is very well known that ill-posed problems have unpleasant properties even in the cases when stable methods (regularizing algorithms) of their solution exist. E.g., it is impossible to estimate an error of an approximate solution of an ill-posed problem without very strong assumptions concerning the unknown solution. The following assumptions are under consideration: 1) the unknown solution is an element of the given compact set; 2) the unknown solution is sourcewise represented with a compact operator. For these cases the theory of error estimation or a posteriori error estimation was developed and applied for solving operator equations including integral equations and some inverse problems for differential equations. Numerical methods for solving ill-posed problems and their error estimation are based on convex programming.

The results above were used for the solution of the practical problems in acoustics, nuclear physics and electron microscopy.

REFERENCES

1. Tikhonov A.N., Goncharsky A.V., Stepanov V.V., Yagola, A.G. Numerical Methods for the Solution of Ill-Posed Problems. Kluwer Academic Publ., Dordrecht, 1995.
2. Tikhonov A.N., Leonov A.S., Yagola, A.G. Nonlinear Ill-Posed Problems. Chapman and Hall, London, 1995.