ON THE REGULARIZED ALGORITHM OF THE INVERSE PROBLEM FOR DIFFUSION EQUATION

Anton Naumov

Keldysh Institute for Applied Mathematics(KIAM),
Russian Academy of Sciences,
125047 Russia, Moscow, Miusskaya square. 4,
e-mail: student@kiam.ru

Abstract

The problem of determining the equation coefficients is an inverse ill-posed problem. The inverse problem for the parabolic equations for example, history matching problem for reservoir simulation, diffusion and thermo-conductivity problems, has been considered. The flow is known to be continuous for the solutions of parabolic equations. It means that the values of the gradient normal components in two neighbouring cells is inversely proportional to the coefficients of the equation. If the ratios of the diffusion coefficients are defined then it is sufficient to determine the value of the diffusion coefficient only for one cell. If needs to receive the smooth values of the data observed for determining the gradients. Because of this the data have been represented with the spline approximations when the splines of the local smooth approximations type (by proff. Ryabenkii V.S) having been used. As a result we have received the system of the linear algebraic equation which is an ill-posed problem especially for the little steps of the grids. If needs to regularise the problem. The grid for the spline approximation is coarse, the steps of this grid are larger than the steps of observed values. The values of the coarse grid steps are the regularization parameters. The steps are determined with the statistical criterion (χ^2, Fisher or the information criterion). The results of the diffusion coefficients reconstruction for the 2D diffusion problem are represented.