THE CALCULATION OF LEAST SQUARES PROBLEM SOLVING ON THE BASE OF AUGMENTED EQUATION SYSTEMS METHOD WITH SPARSE MATRIX

Gogoleva S.Y., Zoteeva O.V.

The Samara State Aerospace University named after academician S.P. Korolev, applied mathematics department, Russia, 443086, Samara, Moscow Shosse, 34. т. (846) 332-56-07, E-mail: gogoleva_s@mail.ru

Many least squares problems result in systems of linear algebraic equations (SLAE) with large and sparse matrices of coefficients. When the large part of matrix coefficients consists of zero, it is quite obvious, that we try to store only nonzero elements. The serious problem at a storage and processing of sparse matrices is represented by fill-in, i.e. occurrence of new nonzero elements. Reduction of fill-in accompany reduction of the requirements to memory volume and work acceleration of method.

In the given work the transformation of least squares problems to equivalent problem of augmented SLAE solving and modification of this system is considered. The direct projection method (DPM) and new pivoting in DPM is considered augmented SLAE solving is considered too.

The classic method of solving least squares problem is the metod of normal equations [2]. The matrix of system is symmetric and positive determinate, that allow use Cholesky decomposition. In the method of normal equations there are two steps where fill-in may occur. The first step is when matrix of system is formed and the second step is in computing the Cholesky factor. Augmented system is equivalent to normal equations system. Application for her solving DPM allow decrease fill-in owing to exception of first step and modification of augmented system and owing to new pivoting too.

Advantage of augmented system befor normal equations consists in decreasing of the augmented system conditioning number if solve DPM with pivoting, considering with conditioning number of normal equations systems.