Arnoldi orthogonalization to tackle Sobolev least squares problem

Amin FAGHIH

KU Leuven

`amin.faghih@kuleuven.be`

Although the increase in the approximation degree leads us to fit the data better in attacking Sobolev least squares problem, the ill-conditioning of the confluent Vandermonde matrix fuels the dramatic decrease in the accuracy of the approximation at higher degrees. To overcome this drawback, we first show that the column space of the confluent Vandermonde matrix is equivalent to a polynomial Krylov subspace. Then the connection between the Sobolev orthogonal polynomials and orthogonal bases for Krylov subspaces in order to exploit Krylov subspace methods like Arnoldi orthogonalization is established. Indeed, in this research, we reformulate the Sobolev polynomial least squares problem based on Sobolev orthogonal basis which is a better alternative than monomials. Furthermore, an example is provided to illustrate the theory and the performance of the proposed approach.