Meeting: 1003, Atlanta, Georgia, SIAMMINI 2, SIAM Minisymposium on Discontinuous Galerkin Methods: Theory and Applications

1003-65-1580 **Khosro K. S. Shahbazi*** (shahbazi@mie.utoronto.ca), 5 King's College Road, Toronto, Ontario M5S 3G8, Canada. *On the penalty parameter of the interior penalty method.*

The interior penalty (IP) method (Arnold, 1982), devised for the spatial discretization of elliptic PDEs, gives a symmetric, locally conservative, and small-stencil discretization. Despite its advantages, the IP method has not been popular. One drawback to this scheme is that it requires the user to specify a mesh-dependent parameter, known as a penalty parameter. If the value of this parameter is not sufficiently large, the approximate solution is unstable. On the other hand, an arbitrarily large value of the penalty parameter degrades the performance of the iterative solver of the linear system arising from the IP discretization. In real applications, it is difficult to know *a priori* the minimum acceptable value of the penalty parameter. Therefore, we derive an explicit expression for the value of the penalty parameter guaranteed to give a stable solution. Our derivation is based on the results of Warburton and Hesthaven (2003) on trace inverse inequalities for simplicial elements. Our explicit expression μ_e is defined for each face e of the triangulation Γ and depends on the geometries and approximating polynomial orders within the elements sharing e. μ_e is sharp, which we demonstrate by a numerical experiment. (Received October 05, 2004)