On a relation of Least-Squares and discontinuous Petrov-Galerkin methods

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The discontinuous Petrov-Galerkin (DPG) method can be seen as Galerkin method with optimal test functions, mixed method, and non-standard minimal residual method. This talk shows a fourth characterization: the DPG method as least-squares finite element method (LSFEM). This novel interpretation allows to extend LSFEM result to the DPG method and vise versa. The talk exemplifies the benefits of this possibility by asymptotic exactness results for a DPG method for the Helmholtz equation, the design of a locking-free DPG method for linear elasticity, and an investigation of the spectral condition number.