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An enriched subspace finite element method for convection-diffusion problems

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*Keywords:* second order one dimensional singularly perturbed equation; finite element method; uniform mesh; enriched subspace finite element method

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*Review text:*

The authors present a new finite element scheme for a second order one dimensional singularly perturbed equation. They first derive a convenient expansion for the exact solution. This expansion is the sum of two parts. The first part is satisfying some estimate which allows us to approximate it as usual using the standard finite element method. The second part is spanned by some known functions. Therefore, the approximation suggested by the authors is the sum of two terms. The first term is the standard finite element approximation of the first part of the above stated expansion and the second term is spanned by the above known functions. The error is computed in energy norm associated with the problem. The convergence order is proved to be optimal and uniform with respect to the singular perturbation parameter. Numerical results are presented.

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