Nitsche-mortaring for singularly perturbed convection-diffusion problems

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A finite element method for a singularly perturbed convection-diffusion problem with exponential boundary layers is analysed. Using a mortaring technique we combine an anisotropic triangulation of the layer region (into rectangles) with a shape regular one of the remainder of the domain. This results in a possibly non-matching (and hybrid), but layer adapted mesh of Shishkin type. We study the error of the method allowing different asymptotic behavior of the triangulations and prove uniform convergence and a supercloseness property of the method. Numerical results supporting our analysis are presented.

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