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CONSERVATIVE DIFFERENCE SCHEMES FOR SINGULARLY PERTURBED PARABOLIC EQUATIONS [1]

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A Dirichlet problem is considered on a vertical strip for a singularly perturbed parabolic reaction-diffusion equation. The spatial derivatives in the differential equation, having *divergent form*, are multiplied by the perturbation parameter ε^2, where ε takes arbitrary values in the open-closed interval $(0,1]$. The parabolic boundary layer appears in a neighbourhood of the strip boundary as $\varepsilon \to 0$.

Using the *integro-interpolational method*, a *conservative* finite difference *scheme* is constructed on piecewise-uniform meshes condensing in a neighbourhood of the boundary layer. The solution of the difference scheme and its normalized derivatives in x_1 and x_2 converge ε-uniformly at the rate $\mathcal{O}\bigl(N^{-2}\ln N + N_0^{-1}\bigr)$. Here $N = \min(N_1, N_2)$, $N_1 + 1$ and N_0 are the number of nodes in x_1 and t, respectively, $N_2 + 1$ is the maximal number of nodes in x_2 per unit length.

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