PARAMETER-UNIFORM FITTED OPERATOR B-SPLINE COLLOCATION
METHOD FOR SELF-ADJOINT SINGULARLY PERTURBED TWO-POINT
BOUNDARY VALUE PROBLEMS

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Abstract. In this paper, we develop a B-spline collocation method for the numerical solution of a self-adjoint
singularly perturbed boundary value problem of the form
\[ -\varepsilon (a(x) y')' + b(x) y(x) = f(x), \quad a(x) \geq a^* > 0, \quad b(x) \geq b^* > 0, \quad a'(x) \geq 0, \quad y(0) = \alpha, \quad y(1) = \beta. \]
We construct a fitting factor and use the B-spline collocation method, which leads to a tridiagonal linear system. The
method is analyzed for parameter-uniform convergence. Several numerical examples are reported which demonstrate
the efficiency of the proposed method.

Key words. B-spline collocation method, self-adjoint singularly perturbed boundary value problem, parameter-
uniform convergence, boundary layer, fitted operator method

AMS subject classifications. 34D15, 30E25, 20B40

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