# DIFFERENCE SCHEMES ON ADAPTED MESH FOR THE INITIAL BOUNDARY VALUE SOBOLEV PROBLEMS WITH BOUNDARY LAYERS

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## Abstract

In this paper, a new adaptive mesh strategy has been developed for solving the linear singular initial-boundary value Sobolev type differential equation in the domain $D = (0, l) \times (0, T]$, form as follows:

$$Lu \equiv -\varepsilon \frac{\partial^4 u}{\partial t^2 \partial x^2} + a(x) \frac{\partial^2 u}{\partial t^2} - \varepsilon \frac{\partial^2 u}{\partial x^2} + b(x,t)\, u = f(x,t), \quad (x,t) \in D, \quad (1)$$

with the initial data

$$u(x,0) = u(x), \quad \frac{\partial u}{\partial t}(x,0) = \psi(x), \quad (2)$$

and boundary conditions

$$u(0,t) = u(l,t) = 0. \quad (3)$$

Here $\varepsilon$ is a small positive parameter $(0 < \varepsilon \ll 1)$, $a(x) \geq \alpha > 0$, $|b(x,t)| \leq b$, $u(x)$, $\psi(x)$ and $f(x,t)$ are sufficiently smooth functions. For the numerical solution of this problem, we use an finite difference schemes on B-mesh on a non-uniform mesh which is accomplished by the method of integral identities with the use of basis functions and interpolating quadrature rules with weight and remainder term in integral form. The error estimates for the numerical solution are obtained.

**Keywords:** Singular Perturbation, Sobolev problem, Uniform Convergence, Difference Schemes, Bakhvalov Mesh.

## References

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