

The boundary function method for singular perturbation problems

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Abstrak

This is the first book published in English devoted solely to the boundary function method, which is one of the asymptotic methods. This method provides an effective and simple way to obtain asymptotic approximations for the solutions of certain ordinary and partial differential equations containing small parameters in front of the highest derivatives. These equations, called singularly perturbed equations, are often used in modeling. In addition to numerous examples, the book includes discussions on singularly perturbed problems from chemical kinetics and heat conduction, semiconductor device modeling, and mathematical biology.

The book also contains a variety of original ideas and explicit calculations previously available only in journal literature, as well as many concrete applied problems illustrating the boundary function method algorithms. Quite general asymptotic results described in the book are rigorous in the sense that, along with the asymptotic algorithms, in most cases the theorems on estimation of the remainder terms are presented. A survey of results of Russian mathematicians on the subject is provided; many of these results are not well known in the West.