

Preface

This monograph is concerned with problems of mathematical modeling of distributed parameter systems in which mass/energy transport or wave propagation phenomena occur and which are described by partial differential equations of hyperbolic type. The case of linear (or linearized) 2×2 *hyperbolic systems of balance laws* is considered, i.e., systems described by two coupled linear partial differential equations with two variables representing physical quantities, depending on both time and one-dimensional spatial variable. Based on practical examples of a double-pipe heat exchanger and a transportation pipeline, two typical configurations of boundary input signals are analyzed: *collocated*, wherein both signals affect the system at the same spatial point, and *anti-collocated*, in which the input signals are applied to the two different end points of the system.

The results of this book emerge from both my practical experience gained during the studies conducted in the experimental installation of a heat exchange center as well as from my research experience in the field of mathematical and computer modeling of dynamic systems. It brings some valuable (in my opinion) results concerning their state space, transfer function and time domain representations, which can be useful both for the open-loop analysis as well as for the closed-loop design. Therefore, this book is primarily intended to help professionals as well as undergraduate and postgraduate students involved in modeling and automatic control of dynamic systems.

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Balance Laws

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