Preface

This book is an attempt to present, in a systematic way, the development and application of the transmission-line modeling method. The method is commonly referred to as TLM and traces its rapid development from the early 1970s.

It is always difficult to judge the correct time to write a book on a rapidly changing topic. One is painfully aware of the advances made even while writing, and the impossibility of doing justice to all the changing strands of the subject. Yet, it is important to provide interested readers with a comprehensive view of TLM to help them make sense of the more than 300 publications related to this method, and to afford newcomers to the subject a rapid grasp of the fundamentals that will serve as an introduction to more advanced topics.

The development of TLM should be viewed as part of a general trend in recent years to supplement traditional experimental and analytical techniques with numerical simulation. The latter approach is dependent on advances in computer technology and the capacity of researchers to find new ways of constructing models for solution by digital computer. TLM is a method based on this approach, and it has many computational and conceptual advantages.

This book aims to be comprehensive, starting from basic transmission line theory and working through TLM discrete models of lumped components, including one-, two-, and three-dimensional problems. The emphasis is on electromagnetics, but other applications such as in thermal and acoustic problems are also considered. Chapter 9 contains a survey of application areas to guide the reader who may have an interest in a particular topic, while Chapter 10 is focused on more advanced topics in TLM.

The first five chapters should be accessible to a large number of readers, including advanced undergraduates. Certain topics may be omitted on first reading (i.e., Sections 2.3, 3.4 through 3.6, 4.3, and 5.3) without loss of continuity, and the remaining material can be presented in 20 lectures if required. Basic three-dimensional models can be introduced with a minimum of effort (Sections 6.1 and 6.2), but more general and flexible three-dimensional work requires mastery of the material in the remainder of Chapter 6, and also that of Chapter 10. Modifications to TLM to deal with problems in areas other than electromagnetics are described in Chapters 7 and 8. It is hoped that researchers and practitioners in simulation will find the book useful and will make their own contributions to this important engineering simulation method.

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