

PREFACE

The purpose of this second edition is to update the model building instructions to comply with COMSOL® Version 5.6, MATLAB® R2021a, and later. The MATLAB material contained in the Appendix is revised and updated to facilitate LIVELINK® interaction with COMSOL 5.x. This second edition also introduces five new hands-on model building and problem-solving techniques. In this new book, scientists, engineers, biophysicists, and other readers interested in exploring the behavior of potential physical device structures built on a computer (a virtual prototype), can develop exploratory models, before going to the workshop or laboratory and attempting to physically create the whatever-it-is (a real prototype).

The models presented herein are built within the context of the currently well-established laws of the physical world (applied physics) and are explored in light of widely applied, well-known, First Principle Analysis techniques. As with any other method of problem solution (mathematically computed answer), the information obtained (derived) through the use of such modeled solutions, as these computer simulations (virtual prototypes), can ultimately be only as accurate as the materials properties values and the fundamental assumptions employed to build (create) these simulations.

The primary advantage of the combination of computer simulation (virtual prototyping) and First Principles Analysis to explore artifacts (device structures) is that the modeler can try as many different approaches to the solution of the same underlying problem as are needed in order to get it right (or close thereto) before fabrication of the device components and the assembled device (real prototype) in the workshop or laboratory for the first time.

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