R for finite element analyses of size-dependent microscale structures

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Abstrak

This book addresses the static and dynamic analysis of linear elastic size-dependent structures based on the modified couple stress theory. It focuses on establishing the governing equations of the size-dependent structures, deriving the associated finite element models, and implementing those models using the R programming language. The implemented functions are employed to develop a special R package (equivalent to a MATLAB toolbox) called microfiniteR for this book.

In each chapter, the governing equations are formulated using the variational method, and the behaviour of the structures is examined on the basis of their load-deformation characteristics (in the case of static analyses) and by evaluating their eigenvalues (in the case of dynamics and buckling problems). The first chapter introduces readers to the R programming language, beginning with the resources needed to make use of the language and ending with a list of recommended texts. The remaining chapters cover the requisite linear elastic theory and highlight the implemented R functions. Each chapter concludes with a brief summary and relevant references.