Preface

This book is primarily for learning the operation principles of micromechanical devices. The book is aimed at senior level undergraduates or graduate students as well as practicing microsystem engineers. Although some understanding of microdevice fabrication is assumed, the book is practically self-contained. It is written for engineers from all disciplines, focusing on physical principles of device operation.

The book is fashioned after a textbook I was hoping to read when I first encountered micromechanics. While several textbooks cover the fabrication and the device applications, the analysis of merits and limitations of the microdevices is lacking in the literature. For example, many books describe how accelerometers work and the steps to fabricate them, but quantitative performance analysis is not carried out. The analysis of expected performance level is especially important in micromechanical systems, as the fabrication tools can be used to make almost any structure. Yet, only a handful of devices (accelerometers, pressure sensors, gyroscopes, microphones, and optical mirror displays) have been proven commercially successful.

To address this gap in the existing literature, this text focuses on systematic analysis of large volume or high potential MEMS applications. This book's mission is show why some microdevices have been successful. In addition to the commercially proven applications, "failed" applications are also covered to understand why the large research effort has not translated into profits.

The theory in this book is supported by over 100 analysis examples. By working through the examples, the reader will learn how to do the "back-of-an-envelope" calculations that are invaluable in complex task of optimizing microsystem designs. In addition, each chapter has a number of carefully selected problems. Most problems have been classroom tested and lead the reader to further investigate the exciting microsystem technology.

This book was written over three years while the author was teaching the microsystem design class at the Louisiana Tech University. A special thank you (and apology) to all the students who were forced to participate in debugging this book.

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Best efforts have been taken in checking and double checking the book. If you do come across a typo and an error, please let the author know by sending him an e-mail at `ville@kaajakari.net`. Errata and additional supporting material for this book can be found at author's web-site `www.kaajakari.net/PracticalMEMS`.

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