Preface to the Second Edition

This new edition contains substantial new material as well as extensive revision of the original material. In the decade since the publication of the first edition several factors have prompted changes to the teaching of biomedical signal processing and physiological system modeling. First and foremost have been the developments in technology. While in the 1990s the availability of personal computers meant that such a course on signal processing and physiological systems modeling could be taught with a lot of programming assignments, in the decade of 2000 the availability of high-end graphics in personal computers meant that physiological modeling could really move into the realm of virtual physiology experiments. Indeed with help from colleagues in the department of physiology at CMC-Vellore, several of the assignments and demonstration programs in this book have been used as supplementary physiology experiments for medical students. These virtual experiments have proved useful to compensate for the decreasing use of animal experiments in classroom teaching. I think it is safe to say that at least in some modest ways, virtual experiments enable students to gain an intuitive understanding of physiology. The use of virtual experiments and computer graphics can also extend the reach of real experiments by showing that graphs and curves from a single set of experiments are really samples from a family of curves. As in chemistry teaching where traditional textbook diagrams are yielding to stereoscopic computer graphics, illustrations in physiology textbooks need to move beyond simple flat graphs on paper. The chapters on nerve action potential propagation and muscle contraction and movement illustrate this vividly.

Accordingly, in this second edition the signal-processing chapters have been trimmed down (into a "crash course in signal processing"), and the physiological modeling chapters have been expanded. This edition is also accompanied by a set of programs for signal-processing demonstration and simulation experiments with interactive graphics. These supersede the set of programs provided with the first edition. Although the text can be used without the demonstration experiments, since they have been used extensively in the departments of physiology and

neurophysiology at CMC-Vellore, the reader is very likely to find them useful. The source code is also provided so that the interested reader may adapt them for her or his own use.

Engineering and physiology represent two important confluences of theory and experiment. Therefore, if the student has the means of actually working with real signals and trying out many of the theoretical ideas developed in the book, the learning will be better. The appendix contains a short description of data acquisition with a PC (along with sample programs) and instructions on how to make a simple biopotential amplifier to acquire real physiological signals.

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