



# Real-Time Digital Signal Processing: Fundamentals, Implementations and Applications

By Sen M. Kuo, Bob H. Lee, Wenshun Tian



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*Combines both the DSP principles and real-time implementations and applications, and now updated with the new eZdsp USB Stick, which is very low cost, portable and widely employed at many DSP labs.*

*Real-Time Digital Signal Processing* introduces fundamental digital signal processing (DSP) principles and will be updated to include the latest DSP applications, introduce new software development tools and adjust the software design process to reflect the latest advances in the field. In the 3<sup>rd</sup> edition of the book, the key aspect of hands-on experiments will be enhanced to make the DSP principles more interesting and directly interact with the real-world applications. All of the programs will be carefully updated using the most recent version of software development tools and the new TMS320VC5505 eZdsp USB Stick for real-time experiments. Due to its lower cost and portability, the new software and hardware tools are now widely used in university labs and in commercial industrial companies to replace the older and more expensive generation. The new edition will have a renewed focus on real-time applications and will offer step-by-step hands-on experiments for a complete design cycle starting from floating-point C language program to fixed-point C implementation, code optimization using INTRINSICS, and mixed C-and-assembly programming on fixed-point DSP processors. This new methodology enables readers to concentrate on learning DSP fundamentals and innovative applications by relaxing the intensive programming efforts, namely, the traditional DSP assembly coding efforts. The book is organized into two parts; **Part One** introduces the digital signal processing principles and theories, and **Part Two** focuses on practical applications. The topics for the applications are the extensions of the theories in Part One with an emphasis placed on the hands-on experiments, systematic design and implementation approaches. The applications provided in the book are carefully chosen to reflect current advances of DSP that are of most relevance for the intended readership.

- Combines both the DSP principles and real-time implementations and applications using the new eZdsp USB Stick, which is very low cost, portable and widely employed at many DSP labs is now used in the new edition
- Places renewed emphasis on C-code experiments and reduces the exercises

using assembly coding; effective use of C programming, fixed-point C code and INTRINSICS will become the main focus of the new edition.

- Updates to application areas to reflect latest advances such as speech coding techniques used for next generation networks (NGN), audio coding with surrounding sound, wideband speech codec (ITU G.722.2 Standard), fingerprint for image processing, and biomedical signal processing examples.
- Contains new addition of several projects that can be used as semester projects; as well as new many new real-time experiments using TI's binary libraries – the experiments are prepared with flexible interface and modular for readers to adapt and modify to create other useful applications from the provided basic programs.
- Consists of more MATLAB experiments, such as filter design, algorithm evaluation, proto-typing for C-code architecture, and simulations to aid readers to learn DSP fundamentals.

Includes supplementary material of program and data files for examples, applications, and experiments hosted on a companion website.

A valuable resource for Postgraduate students enrolled on DSP courses focused on DSP implementation & applications as well as Senior undergraduates studying DSP; engineers and programmers who need to learn and use DSP principles and development tools for their projects.

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### Editorial Review

From the Back Cover

This Third Edition of *Real-Time Digital Signal Processing: Fundamentals, Implementations and Applications* has been updated to include the latest DSP applications and introduces new development tools. The software design process has been adjusted to enable readers to concentrate on learning DSP fundamentals and innovative applications by relaxing the intensive programming efforts, namely, the traditional DSP assembly coding efforts. The low-cost, portable TMS320C5505 eZdsp USB stick device is now used in this latest edition as the required development tool for hands-on experiments.

New features of this edition:

- Places renewed emphasis on C code experiments and reduces the exercises using assembly coding; effective use of C programming, fixed-point C code, and intrinsics will become the main focus of the new edition, illustrated by step-by-step hands-on experiments for the complete design cycle.
- Updates to application areas to reflect latest advances such as speech coding techniques used for next generation networks, speech codecs (such as wideband ITU G.722.2), graphic and parametric audio equalizers, several audio effects, 2-D discrete wavelet transform examples used in JPEG2000, variety of 2-D filter kernels, and fingerprint for image processing.
- Contains new addition of several projects as exercise problems that can be used as semester projects, as well as many new real-time experiments using TI's libraries – the experiments are prepared with a flexible interface and are modular for readers to adapt and modify to create other useful applications from the provided basic programs.
- Consists of more MATLAB® experiments, such as filter design, transforms, image color space formatting and conversion, algorithm evaluation, prototyping for C code architecture, and simulations to aid readers to learn DSP fundamentals.

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About the Author

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### Users Review

**From reader reviews:**

**Alice Bowers:**

Real-Time Digital Signal Processing: Fundamentals, Implementations and Applications can be one of your

beginner books that are good idea. We recommend that straight away because this e-book has good vocabulary that can increase your knowledge in words, easy to understand, bit entertaining but nonetheless delivering the information. The copy writer giving his/her effort to place every word into joy arrangement in writing Real-Time Digital Signal Processing: Fundamentals, Implementations and Applications but doesn't forget the main point, giving the reader the hottest along with based confirm resource details that maybe you can be one among it. This great information can certainly drawn you into brand new stage of crucial thinking.

**Paul Norris:**

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