Book Review:

Digital Signal Processing, A Computer Based Approach. 2nd Edition
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Digital signal processing (DSP) has been a very active area of R&D for more than 3 decades. Initially seen as an exotic discipline only used in high-end electronic systems and understood by highly skilled scientists, DSP methodologies have been broadly applied to consumer electronics, communications, automotive, instrumentation, medical electronics, tomography and acoustic imaging, cartography, seismology, speech recognition, robotics etc. Today, DSP has gone beyond the electronics engineering (EE) field towards computer-science (CS) and many other disciplines, and an ever-increasing assortment of software specifically tailored to perform common DSP functions is now available as friendly system building blocks, accesibles to everybody.

Designed for a one-year course on DSP, the book **Digital Signal Processing, A Computer Based Approach** aims to give seniors or first-year graduate students strong foundations of the analysis and design of discrete-time systems for digital signal processing. Anyway, is also suitable for self-study by practicing engineers or scientists. Numerous practical examples using real life signal processing problems are given, emphasizing the mastery of concepts and tools rather than rigor of mathematics.

The text introduces the tools used for DSP analysis, and almost every point of theory is not only demostrated but it has also attached a MATLAB based example, to show its capability for solving signal processing problems. This is a key feature of this book, which contains more than 200 examples, 500 problems and 150 MATLAB exercises.

Each chapter is built with a four-stages pedagogical structure:
* it begins by developing the essential theory and algorithms.
* the material is illustrated with examples solved by hand calculation.
* solutions are derived using MATLAB.
* a complete set of exercises is proposed to fix concepts and masterize the use of the tools

Chapter 1 provides an overview of the field of Signal Processing. Chapter 2 discusses discrete-time signals and systems in the time-domain. It analyzes the representation of discrete signals a sequences of numbers and describes classes of such signals and systems commonly encountered. Also, time domain characterization of dicrete-time random signals is presented. Chapter 3 is devoted to transform-domain representations of discrete-time signals, specifically the DTFT, DFT and Z-Transform, together with their properties and applications. Chapter 4 is concerned with transform-domain representations of Discrete-Time Linear Time Invariant systems (DTLTI). Chapter 5 discusses dicrete time processing of band-limited continuous-time signals. Conditions for ideal sampling and exact reconstruction are derived and some practical circuits are presented. Chapter 6 reviews the FIR and IIR basic digital filter structures, presenting a method for the realization of IIRs. Chapter 7 considers deeply the issues associated to digital filter design, and different approachs to filter synthesis. Chapter 8 and Chapter 9 are devoted to the implementation aspects of DSP algorithms, including the analysis of finite wordlength effects. Chapter 10 reviews the basic concepts of rate alteration, such as multirate filter bank design, decimation and interpolation filters. Finally, chapter 11 presents some simple practical applications of digital signal processing

The main text is packaged with an additional lab book **Digital Signal Processing Laboratory Using MATLAB**, which is intended for a computer-based DSP laboratory course that supplements a lecture course on Digital Signal Processing. This lab book includes 11 laboratory exercises, each one containing a number of projects to be carried out on a computer. The book assumes that the reader has no background in MATLAB and teaches the reader, through tested programs in the first half of the book, the basics of this powerful language in solving important problems in signal processing. In the second half of the book, the student is asked to write the necessary MATLAB programs to carry out the projects.

Dr. Mitra is a very recognized scientist. He has a Ph.D. in electrical engineering from the University of California, Berkeley, and an Honorary Doctorate of Technology from Tampere University of Technology in Finland. He has published more than 500 journal and conference papers, 11 books, and holds 5 patents. He served as president of the IEEE Circuits and Systems Society and is currently member of the editorial board for four journals. Dr.Mitra has received many distinguished industry and academic awards.

Summary: a GREAT book, where difficult things become easy!.

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