

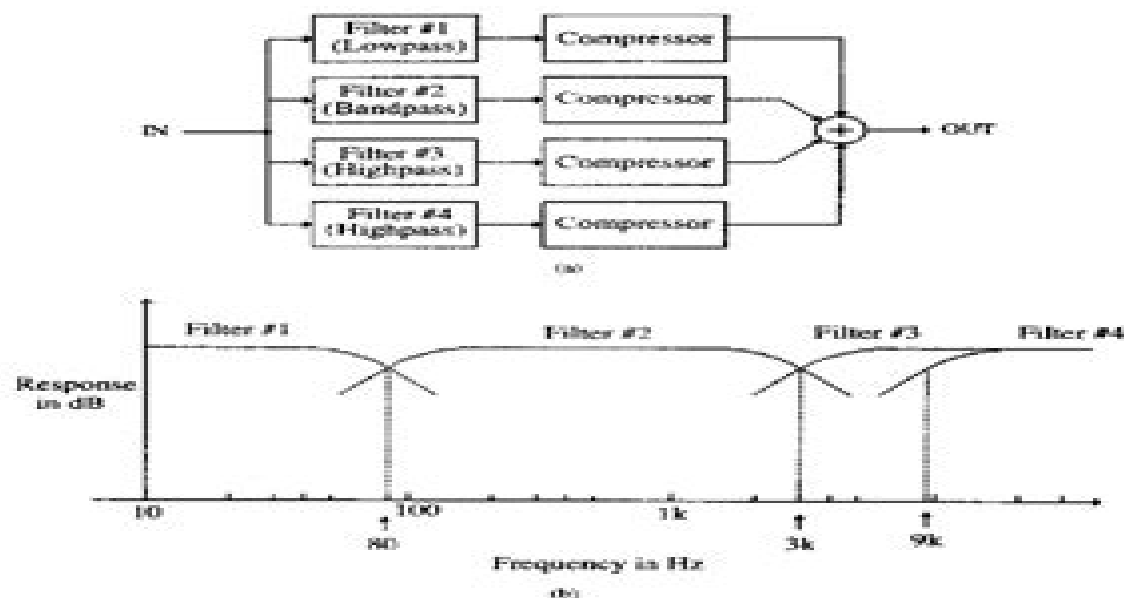


Figure 1.30: The Dolby A-type noise reduction scheme for the recording mode. (a) Block diagram, and (b) frequency responses of the four filters with cutoff frequencies as shown.

Noise reduction system. The overall dynamic range of human hearing is over 120 dB. However, most recording and transmission mediums have a much smaller dynamic range. The music to be recorded must be above the sound background or noise. If the background noise is around 30 dB, the dynamic range available for the music is only 90 dB, requiring dynamic range compression for noise reduction.

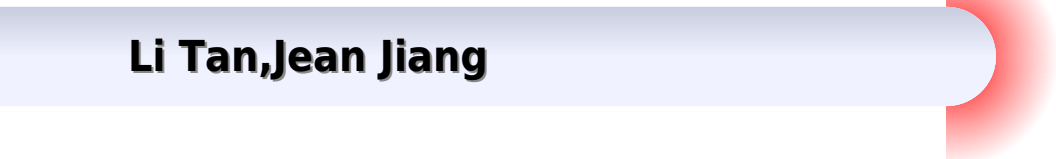
A noise reduction system consists of two parts. The first part provides the compression during the recording mode while the second part provides the complementary expansion during the playback mode. To this end, the most popular methods in musical recording are the Dolby noise reduction schemes, of which there are several types [Ear76], [Hub89], [Wor89].

In the Dolby A-type method used in professional recording, for the recording mode, the audio signal is split into four frequency bands by a bank of four filters; separate compression is provided in each band and the outputs of the compressors are combined, as indicated in Figure 1.30(a). Moreover, the compression in each band is restricted to a 20-dB input range from -40 to -20 dB. Below the lower threshold (-40 dB), very low level signals are boosted by 10 dB, and above the upper threshold (-20 dB), the system has unity gain, passing the high-level signals unaffected. The transfer characteristic for the record mode is thus as shown in Figure 1.31.

In the playback mode, the scheme is essentially the same as that in the recording mode, except here the compressors are replaced by expanders with complementary transfer characteristics, as indicated in Figure 1.31. Here, the expansion is limited to a 10-dB input range from -30 to -20 dB. Above the upper

Digital Signal Processing A Computer Based Approach

Li Tan, Jean Jiang



Digital Signal Processing A Computer Based Approach:

Digital Signal Processing Sanjit Kumar Mitra,1998 This text introduces the tools for the analysis and design of discrete time systems Starting with a review of fundamental theory it includes methods for the design of linear time invariant discrete time systems to meet prescribed design specifications It also provides coverage of the analysis and effects of quantization of signal and system parameters due to finite word length base implementation of systems MATLAB exercises are used throughout the text to illustrate important concepts difficult analytical results and typical practical problems The final chapter of the text focuses on important practical applications of digital signal processing

Digital Signal Processing Sanjit Kumar Mitra,2010-02 *Digital Signal Processing* Sanjit Kumar Mitra,2007 Digital Signal Processing: A Computer Based Approach (with Cd) Mitra,2006 □□□□□□ □□□,2001 **PSpice for Digital Signal Processing** Paul Tobin,2022-05-31 PSpice for Digital Signal Processing is the last in a series of five books using Cadence Orcad PSpice version 10.5 and introduces a very novel approach to learning digital signal processing DSP DSP is traditionally taught using Matlab Simulink software but has some inherent weaknesses for students particularly at the introductory level The plug in variables and play nature of these software packages can lure the student into thinking they possess an understanding they don't actually have because these systems produce results quickly without revealing what is going on However it must be said that for advanced level work Matlab Simulink really excel In this book we start by examining basic signals starting with sampled signals and dealing with the concept of digital frequency The delay part which is the heart of DSP is explained and applied initially to simple FIR and IIR filters We examine linear time invariant systems starting with the difference equation and applying the z transform to produce a range of filter type i.e. low pass high pass and bandpass The important concept of convolution is examined and here we demonstrate the usefulness of the log command in Probe for giving the correct display to demonstrate the flip n slip method Digital oscillators including quadrature carrier generation are then examined Several filter design methods are considered and include the bilinear transform impulse invariant and window techniques Included also is a treatment of the raised cosine family of filters A range of DSP applications are then considered and include the Hilbert transform single sideband modulator using the Hilbert transform and quad oscillators integrators and differentiators Decimation and interpolation are simulated to demonstrate the usefulness of the multi sampling environment Decimation is also applied in a treatment on digital receivers Lastly we look at some musical applications for DSP such as reverberation echo using real world signals imported into PSpice using the program Wav2Ascii The zero forcing equalizer is dealt with in a simplistic manner and illustrates the effectiveness of equalizing signals in a receiver after transmission

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Laboratory Experiments Using C and the TMS320C31 DSK offers users a practical and economical approach to understanding DSP principles, designs and applications. Demonstrating Texas Instruments' state-of-the-art low-priced DSP Starter Kit DSK, this book clearly illustrates and integrates practical aspects of real-time DSP implementation techniques and complex DSP concepts into lab exercises and experiments. The TMS320C31 digital signal processor provides substantial performance benefits for designs that have floating-point capabilities supported by high-level language compilers. Most chapters begin with a theoretical discussion followed by representative examples. With numerous programming examples using TMS320C3x and C code included on disk, this is easy to read text. Covers DSK tools, the architecture and instructions for the TMS320C31 processor. Illustrates input and output. Introduces the z transform. Discusses finite impulse response (FIR) filters, including the effect of window functions. Covers infinite impulse response (IIR) filters. Discusses the development and implementation of the fast Fourier transform (FFT). Examines utility of adaptive filters for different applications. Bridging the gap between theory and application, this book furnishes a solid foundation for DSP lab or project design courses for students and serves as a welcome, practically oriented tutorial in the latest DSP techniques for working professionals.

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