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A General Signal Processing SolutionDSP Acceleration Decisions; Step 3-Understand DSP Basics and Architecture; Models of DSP Processing; Input/Output Options; Calculating DSP Performance; DSP Software; DSP Frameworks; Definition of an Algorithm; 4 Overview of Digital Signal Processing Algorithms; DSP Systems; Analog-to-Digital Conversion; An Audio Example; The Nyquist Criteria; Aliasing; Anti-Aliasing Filter; Sample Rate and Processor Speed; A to D Converters; Digital-to-Analog Conversion; Multirate Applications; Summary of Sampling; Introduction to Filters; Summary of Filter Types
Finite Impulse Response (FIR) FiltersFIR Filters as Moving Averages; A Simple FIR; Generalizing the Idea; Hardware Implementation (or Flow Diagram); Basic Software Implementation; FIR Filter Characteristics; Adaptive FIR Filter; Designing and Implementing FIRs Filters; Basic FIR Optimizations for DSP Devices; Summary of FIR Filters; Infinite Impulse Response Filters; IIR As a Difference Equation; IIR As a Transfer Function; IIR Filter Design; IIR Trade-Offs; DSP Architecture Optimization for Filter Implementation; Fast Fourier Transforms; Time vs. Frequency
The Discrete Fourier Transform (DFT)The Fast Fourier Transform (FFT); The Butterfly Structure; Forms of the FFT Algorithm; FFT Implementation Issues; Summary; Fast, Specialized Arithmetic; 5 DSP Architectures; High Bandwidth Memory Architectures; Data and Instruction Memories; Memory Options; High Speed Registers; Memory Interleaving; Bank Switching; Caches for DSPs; Execution Time Predictability; Direct Memory Access (DMA); DMA Example; Pipelined Processing; Limitations; Resource Conflicts; Pipeline Control; Specialized Instructions and Address Modes; Circular Addressing Bit-Reversed Addressing

Sommario/riassunto

Today's embedded and real-time systems contain a mix of processor types: off-the-shelf microcontrollers, digital signal processors (DSPs), and custom processors. The decreasing cost of DSPs has made these sophisticated chips very attractive for a number of embedded and real-time applications, including automotive, telecommunications, medical imaging, and many others-including even some games and home appliances. However, developing embedded and real-time DSP applications is a complex task influenced by many parameters and issues. This introduction to DSP software development for embedd