Digital Signal Processing Processors

DSPs are special microprocessors designed to execute repetitive math-intensive algorithms. Today many embedded applications require both types of processors.

Digital Signal Processors have approximately the same level of integration, the same clock frequencies as general purpose microprocessors. Pn signal processing tasks DSPs overtake general purpose processors from 2 to 3 order in speed. This is because of architectural differences.

Typical DSP application fields are audio signal processing, video signal processing and telecommunications devices. Digital signal processing requires a large amount of real-time calculations. The most common operation in digital signal processing is the sum of products calculation. Among such operations are well known convolution and Discrete Fourier Transform.

Digital Signal Processors vs. Universal Microprocessors 9 To increase the speed, digital signal processors usually have many specialized arithmetic units, which can operate simultaneously. To calculate the sum of products, typical DSP operation, all DSPs have multiplier and accumulator and two operations multiplication and addition can be implemented during one cycle. Some DSPs can fulfil simultaneously even FFT butterfly. All DSPs contain shifter to shift operands without loss additional time.

Digital Signal Processors are designed for realtime calculation. Fixed sampling rate leads to necessity to have regular instruction cycle. Such regular instruction cycle is achieved in RISC (reduced instruction set computer) microprocessors by restricting the instruction set. But in DSP the same is achieving by hardware increasing the speed of important complex instructions, for example multiplications.

Universal microprocessors were designed simple and cheap personal computers. Universal CISC (complex instruction set computer) microprocessors have a large variety of command cycle duration. For example in 8086 microprocessor addition - 3 clocks and multiplication - more 100 clocks. Some features of DSP in are included in recent universal microprocessors, which makes the leaster processor capable of supporting many applications which earlier needed special DSPs.