SGN-2156 SYSTEM LEVEL DSP ALGORITHMS

Final Examination 22.03.2006

NO literature in the examination, short, compact, and pithy answers are preferred.

ANSWER TO SIX OUT OF THE FOLLOWING SEVEN QUESTIONS:

1. How to generate efficient DSP algorithms for VLSI and signal processor implementations.
2. Why and when is it a good idea to use identical building blocks in synthesizing FIR and IIR filters? Why are the coefficients of the building blocks representable in very simple forms?
3. In the lecture notes a two-step optimization procedure for various constrained problems has been considered. First, a suboptimum solution is found using a simple tecnique. Second, this solution is improved with the aid of an effective nonlinear optimization algorithm. When and why is this two-step procedure effective?
4. In one part of the lecture notes (one article) we considered a recursive implementation of an averaging filter (takes the average of K consecutive samples). What are the benefits of the recursive implementation when 2's complement arithmetic is used.
5. Why are the effects of the coefficient rounding for FIR filters rather simple to estimate? How to utilize this fact when rounding the filter coefficients?
6. What are the basic differences in the coefficient rounding effects for the amplitude responses of cascaded-form IIR filters and for those of IIR filters implemented as a parallel connection of two allpass filters? How to utilize these facts when rounding the filter coefficients?
7. Is the model developed for estimating the output noise variance due to the multiplication roundoff errors always valid? Does it depend on the input signal? Is it prerrable to use rounding or truncation in the case of two's complement arithmetic? Why?