BOOK REVIEW

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"*Stochastic and deterministic averaging processors*"

IEE Digital electronics and computing series 1, Peter Peregrinus Ltd., 1981, p. 157.

The book is concerned with the design and application of processors based on averaging. The main emphasis is given to serial synchronous systems. The field covered is very interesting because of the ever increasing importance of the error tolerance, reliability, and the processing of data and audio (picture) signals.

The discussion is very clear; the authors are summing up briefly the topic discussed at the beginning of each chapter, giving a very clear picture about the role of each section. Unfortunately the number of printing errors is quite high.

Chapter 1 gives a survey on the main types of averaging processors. The theory of time stochastic processing, bundle and ergodic processing, and burst processing is briefly summarized, together with their advantages. The examples given are very informative, however the comparison of the three main processing types could be a bit more detailed.

Chapter 2 discusses the fundamental theory of stochastic processing. The discussion of input mappings required for the usage of deterministic variables is restricted to the simplest linear mappings. This is regrettable, since the mapping used is one of the major factors determining the hardware realization of the basic arithmetic operations. However, special emphasis is given to the discussion of the basic operations (inversion, multiplication, addition, and integration) based on the single-line bipolar mapping advantageous in practical use. The random number generation is discussed to great depth corresponding to its importance. Perhaps the best section of this chapter is devoted to the output interface design. The optimal estimator problem is formulated very clearly.

Chapter 3 gives several important practical applications for the time stochastic processing, demonstrating its advantageous features. The RASCEL, TRANSFORMATRIX, APE, DISCO, BUM, SABUMA, and ERGODIC machines are briefly shown. The application of the time stochastic processing for deterministic simulation is also briefly shown. The discussion of the simulation of stochastic models is more detailed. The simulation of Markov models (where the parallel nature of computing is important) gives concrete and convincing example of the advantageous features of the time stochastic processing. At the end of this chapter the stochastic transducers are discussed with respect to instrumentation and control applications.

Chapter 4 discusses the basic synthesis methods of stochastic learning automata. The authors show the stochastic processing gives optimal synthesis method for such automata. Synthesis methods are suggested for fixed and variable structures, the latter being especially important. The section discussing the design of automata with hierarchical structures (which are especially important with regard to practical applications) is excellent. The large number of states required is realized by a multilevel approach. The experiments prove definitely the practical applicability of this principle. The example of multimodal performance function optimisation in the presence of noise shows clearly the advantages of the hierarchical stochastic learning automation: rapid optimisation, pure altitude sensitivity over the performance index as opposed to the usual gradient sensitivity. The example of learning automata routing in a telephone network tends to provide equality of service for the call sources, and provides smaller blocking probability as opposed to the fixed rule routing commonly used nowadays.

In Chapter 5 authors discuss the theory and applications of burst processing. The various realizations of arithmetical operations are treated in detail. The digital filtering is emphasized, where the application of burst processing provides definite advantages. A very interesting, unfortunately briefly treated problem is the application of burst processing for picture processing.

The excellent book is closed by detailed and informative references.

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