B. Hardware

B.3 MEMORY STRUCTURES

B.3.2 Design Styles

DENNING, PETER J. (NASA Ames Research Center, Moffett Field, CA) 9002-0108

The science of computing.

Am. Sci. **77,** 4 (July–Aug. 1989), 333–335.

The importance of memory, not only as a main hardware resource but as an active element in AI systems, is well recognized. Clearly, the von Neumann architecture does not meet the requirements of such a system regardless of the data structure. Therefore, the concept of associative memory played an important role in designing early AI systems. However, it was not widely adopted. On the other hand, the emergence of parallel systems, especially multiprocessors, shadowed the role of memory.

Therefore, the new concept of sparse distributed memory proposed by P. Kanerva is welcome. Denning's paper clearly presents its architecture and the execution of the two main operations (storage and retrieval of data). Although this is a short paper, it covers the principal aspects of the memory of AI systems; that is, the distributed and sparse one, the connections between the science of computing and biology, and the necessity of simulation and careful evaluation.

I consider the paper of interest not only for computer scientists but also for biologists and psychologists.

—*D. Grigoraş,* Iaşi, Romania

GENERAL TERMS: DESIGN, THEORY

B.4 INPUT/OUTPUT AND DATA COMMUNICATIONS

B.4.4 Performance Analysis and Design Aids

Simulation

See: 9002-0160 [I.6.0]

B.4.5 Reliability, Testing, and Fault-Tolerance

Error-checking

PUTTER, PAUL (AT&T Bell Labs, Summit, NJ); AND WAGNER, NEAL R. (Univ. of Texas, San Antonio) 9002-0109

Error detecting decimal digits.

Commun. ACM **32,** 1 (Jan. 1989), 106–110.

Imagine that you are engaged in consulting work for a firm whose goal is to maximize the efficiency of data processing and minimize the complexity of the solutions on which the system is based. The situation is as typical as it is difficult—you must be prepared for hard interviews with the customer, possibly a senior official responsible for decision making, and you must understand the previous motives and experiences of the firm that will sometimes discard your best and most sophisticated ideas. After all, you may soon realize that even your great expertise is not a big thing in solving these numerous problems.

This paper is by two computer scientists who openly recognize that they were initially far from being experts in coding theory (as a result, their reference list consists primarily of rather fundamental titles). They suggest some good recipes for tackling the above paradigm and present the process of consulting for a large mail-order company and elaborating their recommendations. The authors found themselves looking for the most appropriate error detection scheme for a decimal-oriented environment in a system that is supposed to read, and send for further processing, account numbers (of up to several million clients) keyed in by a human. Such input is prone to various decimal mistakes, of which the most common are incorrect digits and the transposition of two adjacent digits.

The authors consider a whole spectrum of different solutions, ranging from the most common approaches, such as the ISBN mod 11 check and the IBM mod 10 check, to more exotic-seeming solutions like mod 97 and mod 99 checks, and assess their capacity to catch randomly generated errors. They give several recommendations, depending on the desired error rate. The authors put some emphasis on an elegant, but overly academic, scheme originally proposed by J. Verhoeff, who also suggested a full list of possible errors [1]. Among the schemes using two check digits for very low error rates, they recommend the mod 97 check with weights successive powers of 10. This check catches 100 percent of each of the errors on Verhoeff's list.

My overall impression of the presentation is good. It is an excellent instructive example for beginners in the rapidly developing area of scientific consultancy. Finally, one of the key points of the work is "In dealing with commercial firms as a consultant, one should avoid excessively technical or academic recommendations. Companies want workable, simple solutions that they understand and believe in." To this, I can only add that this recommendation itself should be used in an academically clever way.

—*A. Yakovlev,* Leningrad, USSR

REFERENCES

[1] VERHOEFF, J. *Error detecting decimal codes.* The Mathematical Centre, Amsterdam, The Netherlands, 1969.

GENERAL TERMS: RELIABILITY

Consult the November 1989 issue of *CR* for the complete journal titles and publishers' addresses for periodicals received.