Listed are abstracts from recent papers by IBM authors. Inquiries should be directed to the publications cited.

Abstracts

Functions of a man-machine interactive information retrieval system, J. H. Williams, Jr., *Journal of the American Society for Information Science* **22,** No. 5, 311–317 (September–October 1971). An effective man-machine interactive retrieval system is not achieved by simply placing a terminal on each end of an existing machine retrieval system. An interactive system requires a sequence of steps in which man and machine alternately take action. It should also provide different levels of services to experienced and inexperienced searchers, recognize the difference between a narrow and broad query, furnish clues as to the next direction to be searched, reorganize the data base dynamically as the searcher changes his viewpoint, provide a ranking of responses in the most likely sequence and offer the searcher the option of overriding the ranking when a particular term is of extreme significance. An on-line interactive system meeting many of these needs has been developed and tested. The objectives of the development of this system, BROWSER, was to investigate the effectiveness of a free-form query with a combinatorial search algorithm and the effectiveness of various techniques and components to facilitate online browsing.

Logic design for dynamic and interactive recovery, W. C. Carter, D. C. Jessep, A. B. Wadia, P. R. Schneider, and W. G. Bouricius, *IEEE Transactions on Computers* **C-20,** No. 11, 1300–1305 (November 1971). Recovery in a fault-tolerant computer means the continuation of system operation with data integrity after an error occurs. This paper delineates two parallel concepts embodied in the hardware and software functions required for recovery; detection, diagnosis, and reconfiguration for hardware, data integrity, checkpointing, and restart for the software. The hardware relies on the recovery variable set, checking circuits, and diagnostics, and the software relies on the recovery information set, audit, and reconstruct routines, to characterize the system state and assist in recovery when required. Of particular utility is a hardware unit, the recovery control unit, which serves as an interface between error detection and software recovery programs in the supervisor and provides dynamic interactive recovery.

On-line estimation of traffic densities from time-series of flow and speed data, D. C. Gazis and C. H. Knapp (University of Connecticut), *Transportation Science* **5,** No. 3, 283–301 (August 1971). A method is discussed for estimating the number of vehicles on a section of a roadway from speed and flow measurements at the entrance and exit points of the section. The method consists of obtaining rough estimates of this count at regular intervals, and then filtering random errors of these estimates by means of a sequential correction scheme. Emphasis is placed on economy in instrumentation and data processing.

Optimal and suboptimal capacity allocation in communication networks, W. Oettli and W. Prager (Brown University), *Journal of Optimization Theory and Applications* **8,** No. 5, 396–411 (November 1971). Gomory and Hu formulated the optimal allocation of capacities to the links of a communication network as a problem in linear programming. The application of this formulation to the solution of problems of realistic size does, however, require an excessive amount of computation. In the present paper, a slightly different formulation is given. The resulting optimality conditions readily lend themselves to the construction of problems with known optimal solutions, thereby providing suitable examples for the assessment of the efficiencies of approximate methods. An approximate method that has been found highly efficient in many cases is illustrated by an example.

A pilot on-line data system for general practitioners, E. O. Lippmann and J. F. Preece (Exeter, England), *Computers and Biomedical Research* **4,** 390–406 (August 1971). This paper describes the design and implementation of an on-line medical data system for general practitioners which was developed in a joint effort by the Institute of Biometry and Community Medicine in Exeter, the surgery of Dr. Preece, and IBM United Kingdom. The system is designed to permit general practitioners to create, access, and maintain centrally stored clinical records via remote terminal devices. The pilot version of this retrieval system was established in the city of Exeter, Devon, where three terminals and control equipment in a surgery were connected by telephone lines to an IBM 360-40 data processing system at Croydon, Surrey, 200 miles away. During the trial period, the users have found that by employing computerized medical recordkeeping, day-to-day patient management proved superior to the conventional paper record organization.

Proving programs to be correct, J. C. King, *IEEE Transactions on Computers* **C-20,** No. 11, 1331–1336 (November 1971). This paper formally describes a technique for proving that computer programs will always execute correctly. In order to do this, an abstract model for a program and its execution is given. Then, correctness of programs and proofs of correctness of programs are defined with respect to that model.

Reliability modeling for fault-tolerant computers, W. G. Bouricius, W. C. Carter, D. C. Jessep, P. R. Schneider, and A. B. Wadia, *IEEE Transactions on Computers* **C-20,** No. 11, 1306–1311 (November 1971). Reliability modeling and the mathematical equations involved are discussed for general computer systems organized to be fault tolerant. This paper summarizes the work done over the last four years on mathematical reliability modeling by the authors.