Foreword

Most systems nowadays are designed with multimedia functionalities irrespective of the applications domain, and in many applications, the multimedia component is central to the operation of the system. A key requirement of many multimedia and visual information systems is the ability to locate and retrieve relevant data objects. Compared with conventional database processing, such as OLTP (Online Transaction Processing) and OLAP (Online Analytic Processing), the data intensity in such systems in terms of size and volume tends to be much greater. At the same time, performance constraints on multimedia data delivery are also more stringent, since failure to retrieve data in time may mean that the progress of a song or a movie has to be undesirably interrupted.

Although secondary and tertiary storage technologies have improved substantially in recent years, they are still several orders of magnitude slower than processor speed, and such a substantial performance gap is likely to persist for some time into the future. Therefore, it is vital that algorithms and strategies are developed and deployed to optimize storage performance and behavior. Such performance enhancement strategies generally take a number of forms, some of which are static and some dynamic.

First, data must be judiciously situated and positioned so that their location and retrieval may be carried out efficiently. This involves exploiting the

characteristics of both the data objects and the storage structure. Without a sound data placement strategy, optimal processing will not be possible. Different methods of data placement for multimedia processing are systematically and exhaustively treated in Section IIa of this book. The extension of such techniques for hierarchical storage systems represents a different level of complexity and is carefully developed in Section IIb of the book.

While data placement corresponds to the relatively static aspect of processing, the dynamic operations invariably involve considerable choices and optimizations. These relate to the scheduling of data requests, the staging and migration of data, and cache management so as to meet the performance constraints. These topics as well as the underlying ideas are systematically built up and treated in Section III, Section IV, and Section V of the book, respectively.

Throughout this book, all relevant concepts and principles are systematically and lucidly explained, and the expositions are always accompanied by carefully designed diagrams and illustrations. In any serious performance analysis, the use of mathematical modeling is unavoidable. The mathematics in the book are presented in a lucid style, and the notations adopted are natural, making the mathematical developments easy to understand and follow.

Systems designers will find the wealth of techniques and analysis presented in the book an indispensable resource. Students of multimedia systems and advanced databases will find the treatment of topics and development of ideas in the book valuable to their understanding of efficient multimedia storage systems. Researchers of multimedia and database systems will find the book a vital source of reference. The unique and systematic coverage of topics in the book will make it an important and up-to-date resource for many types of readers.

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Clement Leung: Prior to taking up his present Foundation Chair in Computer Science at Victoria University, Australia, Clement Leung held an Established Chair in Computer Science at the University of London. His publications include two books and well over 100 research articles. His services to the research community include serving as program chair, program co-chair, keynote speaker, panel expert, and on the program committee and steering committee of major international conferences in the U.S., Europe, Australia, and Asia. In addition to contributing to the editorship of a number of international journals, he has also served as the Chairman of the International Association for Pattern Recognition Technical Committee on Multimedia and Visual Information Systems, as well as well as on the International Standards (ISO) MPEG-7 committee responsible for generating standards for digital multimedia, where he played an active role in shaping the influential MPEG-7 International Standard. He is listed in *Who's Who in Australia*, *Who's Who in the World*, *Great Minds of the 21st Century*, *Dictionary of International Biography*, and *Who's Who in Australasia & Pacific Nations*. He is a Fellow of the British Computer Society and a Fellow of the Royal Society of Arts, Manufactures and Commerce.