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GUEST EDITORIAL: SPECIAL ISSUE ON MULTIMEDIA INFORMATION SYSTEMS

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Multimedia Information Systems (MIS's) have become the focus of intense academic and industrial interest. Large industries like the computer, telecommunications, consumer electronics, publications, movie and broadcasting, see multimedia information systems in the core of their business, and a common technology across traditionally separate industries. Many recent strategic alliances across industries have as objective to strengthen their multimedia capabilities and information resources, as well as the appropriate business positioning in an expanding application environment.

Multimedia Information Systems are concerned with the capturing, the storage, the manipulation, the retrieval and effective presentation of multimedia information such as traditional data, text, still images, graphics, animations, sound and video. Computer and communication hardware and software has been recently developed, that makes the management and presentation of good quality multimedia data effective, and advances in the development of multimedia standards have paved the road to multimedia information publication and to open access to multimedia information. Multimedia information systems will provide the integrated environments for effective and efficient management of large multimedia information repositories.

MIS's have to address difficult performance problems due to the massive volume of multimedia, as well as due to their real-time and synchronization requirements. Multimedia data typically require very large storage capacity and the use of multi-level storage devices. These storage devices should be uniformly modeled and integrated under a single storage manager which should be capable to handle efficiently the long multimedia data and their placement across the levels of the storage hierarchy while exploiting parallelism for the final delivery of data. Appropriate scheduling algorithms should be developed that allow good performance with a mixture of delay-sensitive and non delay-sensitive data. The presentation of complex multimedia objects imposes dependency relationships among the information units of different streams. Appropriate coordination during stream delivery is required for the satisfaction of these constraints.

A key performance aspect for the user is the mechanisms provided by the system for effectively finding the desired information in a large multimedia information base. To support queries by content, multimedia data should be analyzed and description of their content should be extracted and stored in the database together with the original data. Because content-based queries tend to be imprecise, database search expresses similarity rather than exact match. This implies the definition of some distance measure between the query and the stored multimedia objects which captures what humans perceive as similarity between the objects. Browsing functionality is necessary to complement a multimedia retrieval language because in most cases users will be unable to describe precisely the objects they want. This involves structuring of information in the multimedia database in order to provide for effective navigation.

This special issue on Multimedia Information Systems contains five papers, covering significant aspects of the multimedia information technology, including: delay-sensitive data, video-on-demand services, queries based on image content, hypermedia versioning and multimedia object synchronization.

Given the real-time requirements of each client, the fixed bandwidth of the disks, and the available buffer space, a multimedia server must employ an admission control algorithm to decide whether a new client can be admitted. In the paper "Schemes for Implementing Buffer Sharing in

Continuous-Media Systems" by Makaroff and Ng, an intelligent buffer sharing scheme is proposed that can lead up to a 50 % improvement in the total buffer space. The scheme allows multiple streams to share the same buffer space by taking advantage of the temporal behaviour of the concurrent streams.

Viewers that subscribe to Video-on-Demand (VOD) services can watch a movie and apply VCR operations like pause, resume, fast-forward, and rewind, whenever they wish to do so. Since hot videos are requested by many viewers, performance is improved by batching concurrent viewers together in a single video stream. Yet, pause and resume operations cause difficulties in batching viewers. The conventional approach to support on-demand pause-resume provides one video access stream to disks for each video request. In the paper "A Disk-based Storage Architecture for Movie on Demand Servers", by Özden, Biliris, Rastogi and Silberschatz, an interesting strategy is proposed for striping movies that enables simultaneous access and transmission of different portions of the movie. The scheme eliminates random seeks on the disk by reading each movie portion sequentially into a RAM buffer. Client requests for the same movie portion are batched together. Schemes for implementing fine granularity pause, resume, fast-forward, and rewind operations are presented.

In the paper "Dynamic Inverted Quadtree: A Structure for Pictorial Databases", by Vassilakopoulos and Manolopoulos, an efficient structure is presented for indexing images based on their bitmap representation. The structure is suitable for answering content-based queries of the form: "Given a rectangular pattern, find all images in the database that contain an identical pattern (exact match) or a similar pattern (inexact match)".

Content addressability of multimedia objects has to be supplemented with good browsing techniques. Hypermedia systems structure the contents of the information base and suggest a method of navigation for retrieving information by linking multimedia objects based on their relationships. Hypermedia authoring is facilitated by versioning the structure and content of hypermedia objects. The extension of a conceptual hypermedia data model with version support is proposed in the paper "Nested Composite Nodes and Version Control in an Open Hypermedia System", by Soares, Rodriguez and Casanova. Specifically, versions of the same object at some level of abstraction are grouped together in version context nodes. Cooperative work is supported through the use of private bases in addition to a public hyperbase that corresponds to stable information.

The delivery of synchronized delay-sensitive streams requires both intra and inter-stream synchronization. In the paper, "The RT-LOTOS formal specification of the conditional delivery mechanism", by Courtiat, Oliveira and Costa Carmo a stream is viewed as a sequence of information units associated with temporal and conditional delivery constraints. A formal conditional delivery mechanism is presented that for every information unit received from the transport service, creates an object with the delivery constraints of the information unit. These objects are called Restricters and are re-evaluated whenever an information unit is delivered. An information unit is delivered when its restricter constraints are satisfied.

All five selected papers make a significant contribution to the field of Multimedia Information Systems and can serve as a basis for further research and development.

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