

ACM Multimedia '94 Conference Workshop on Multimedia Database Management Systems

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Abstract

This paper describes the *ACM Multimedia '94 Conference Workshop on Multimedia Database Management Systems* held on 21 October 1994 in San Francisco, California. The workshop consisted of four sessions: designing multimedia database management systems, video and continuous media service, multimedia storage and retrieval management, and miscellaneous topics in multimedia data management. The workshop concluded with a discussion session on directions for multimedia database management. Twenty-eight participants from U.S.A., U.K., Germany, Norway, and Egypt attended the workshop.

1. Introduction

A multimedia database management system (M-DBMS) should provide for the efficient storage and manipulation of data represented as text, images, voice, graphics and video. This goals of this workshop were to explore issues on various aspects of multimedia database management including data models, architecture, storage management, query and update processing, and real-time multimedia database management. The workshop attendees submitted papers that addressed their work related to the workshop theme. Section 2 summarizes the papers presented at the workshop (the information is taken from the papers published in the Proceedings). Summary of the discussions is given in section 3. Future directions are discussed in section 4.

2. Summary of the Presentations

SESSION 1: Designing Multimedia Database Management Systems

Presentation 1: Design of a Distributed Object-Oriented Multimedia Database Management System

C. Y. Roger Chen

Syracuse University, Syracuse, NY

Mark D. Foresti

Rome Laboratory, Griffiss AFB, NY

This presentation described the design of a multimedia database management system with a powerful and friendly user interface and a distributed object manager with a multimedia transport protocol. The features of the system include efficient multimedia information retrieval, real-time support, temporal control, multi-client multi-server architecture, object-based locking, and an integrated design of object-oriented DBMS and multimedia data processing.

Presentation 2: On Optimization of Multimedia Queries

Surajit Chaudhuri

Hewlett-Packard Laboratories, Palo Alto, CA

This presentation described two critical aspects of query optimization that are novel in multimedia databases. These are media-specific schedulers and intermedia optimization. A framework for the optimization of multimedia queries was also discussed.

Presentation 3: Views as Metadata in Multimedia Databases

Greg Speegle

Baylor University, Waco, TX

This presentation showed how views of stored objects could eliminate the wastage of space when creating new objects from existing multimedia objects. Views use specifications to define media objects instead of storing the data. The paper also discussed the implementation of views through view hierarchy and specification through BLOB manipulations or scripts for multimedia editing tools.

Presentation 4: MOONBASE - A Complete Multimedia Database Solution

Felipe Carino Jr., Warren Sterling,

Ion Tim Leong

AT&T Global Information Solutions,

El Segundo, CA

This presentation described the design of MOONBASE, a multimedia database management system. It is an extensible federated relational database coordinator that adds multimedia capabilities to existing relational database management systems

for mission-critical environments. It uses a parallel multimedia object server called Prospector to store and manipulate multimedia objects.

Presentation 5: MOODS: A Multimedia Information Modeling System

*James Griffioen, Raj Yavatkar, Robert Adams
University of Kentucky, Lexington, KY
Rajiv Mehrotra
University of Missouri-St. Louis.
St. Louis, MO*

This presentation described an object-oriented data modeling approach called MOODS that integrates multimedia information processing component with the data modeling technique. MOODS supports dynamic data semantics, function groups, and composition. The application of this approach to pictorial information systems was also discussed.

SESSION II: Video and Continuous Media Service

Presentation 1: Video Mail Retrieval by Voice: An Overview of the Cambridge/Olivetti Retrieval System

*M. G. Brown
Olivetti Research Limited, Cambridge, UK
J. T. Foote, G. J. F. Jones, K. Sparck Jones,
S. J. Young
Cambridge University, Cambridge, UK*

This presentation described the project on video and audio document retrieval. This project integrates text retrieval methods to high performance word spotting. A goal is to develop a practical retrieval system to work with Medusa, a high bandwidth multimedia environment which is used daily. Experimental results were also presented.

Presentation 2: Sharing and Reuse of Video Information

*Rune Hjelsvold
Norwegian Institute of Technology, Trondheim,
Norway.*

This presentation described VideoSTAR, a video database framework for video information sharing. It handles redundancy as well as provides consistency and integrity.

Presentation 3: The Calico Project for Continuous Media Services

*Bruce Hillyer, Alexandros Biliris,
Euthimios Pangos
AT&T Bell Laboratories*

This presentation described the Calico continuous media storage system being implemented at AT&T Bell Laboratories. It is a testbed to examine issues such as scheduling, admission control, hierarchical storage, resource management, and the application/service interface.

Session III: Multimedia Storage and Retrieval Management

Presentation 1: Indexing Multimedia Data Streams

*Walid G. Aref, Daniel Barbara,
Matsushita Information Technology Laboratory,
Princeton, NJ*

This presentation described indexing techniques based on Hidden Markov Models for answering match queries of streams. The applicability of the techniques for a broad spectrum of multimedia streams in the multidimensional space was also discussed.

Presentation 2: Multimedia Content Storage and Management

*Scott T. Campbell
AT&T Global Information Solutions,
Dayton, OH
Soon M. Chung
Wright State University, Dayton, OH*

The presentation described a temporal query script methodology to provide the database system with information about future requests. This information can be used by the system to generate efficient access plans for the storage manager.

Presentation 3: Performance Estimates of Video and Image Storage and Retrieval

*Oleg Panfilov, Duke P. Hong
AT&T Global Information Solutions,
San Diego, CA*

This presentation analyzed the performance of video and image retrieval to characterize real-time and non real-time multimedia applications. Issues such as the effect of video frame size on the number of clients supported by a server and contiguous storage of video frames were also examined.

Session IV: Miscellaneous Topics in Multimedia Data Management

Presentation 1: Multimedia Storage Subsystem in Operational Applications

W. M. Culver

ShadowFax Inc., Pollock Pines, CA

H. M. Gladney

IBM Almaden Research Center,

San Jose, CA

This presentation described the document storage subsystem called DocSS to manage multimedia data for applications such as clinical patient care management and causality insurance management. Issues on the store and forward network delivery of video/audio/image/text data were discussed.

Presentation 2: Dynamic Program Creation and Execution for Distributed Multimedia Data Management

Satya Prabhakar, Mukul Agrawal, Jiandong Huang, James Richardson

Honeywell Technology Center, Minneapolis, MN

Mark D. Foresti

Rome Laboratory, Griffiss AFB, NY

This presentation described the PRESTO project. Issues on developing object-oriented techniques to manage distributed multimedia resources, operations on multimedia streams, real-time multimedia file system, and resource manager were discussed.

Multimedia Services in Information System Reference Models

Michael Swan

The MITRE Corporation, Bedford, MA

This paper was published in Proceedings and was not presented. It describes the need for a model to define a coherent information infrastructure for multimedia data exchange between applications. Various standards are also analyzed.

3. Summary of Discussions

Several aspects of multimedia database management were discussed. Here are some of the questions.

- Are object-oriented models better for multimedia database systems or are extended relational data models needed?
- Are specifications such as the Object Management Group's CORBA (Common Object Request Broker Architecture) useful?

- Is there a need for new query languages for multimedia database management or will extensions to SQL be sufficient?
- Can multimedia database management system benefit from the developments in real-time database management?
- Is multimedia transaction processing an issue? For example, is it possible for two users to update video data concurrently? What does it mean to update video databases?

The group examined each question. No definitive answers were given. For example, in the case of a data model for multimedia database systems, some felt that object-oriented models were better while others felt that due to the tight integration of object-oriented database systems with programming languages, these systems were not flexible and one could not use various tools in a straightforward manner. The need for query languages for multimedia databases were important, and some felt that the standards groups are moving in the right direction by proposing extensions to SQL. CORBA is showing promise, although it is too early to determine its impact on multimedia data management. The issue of real-time was discussed at length. It was felt that quality of service was the key factor. If one could live with data not synchronized, then real-time processing was not a major issue. There was also a discussion on what is meant by "multimedia". Should continuous media be supported by a multimedia system? Multimedia transaction processing issues were not clear. It was felt that issues such as concurrency control may not be different from those for non-multimedia database systems.

4. Future Directions

The participants were keen on having a similar workshop as part of the ACM MULTIMEDIA '95 Conference. The group will be submitting a proposal to the program committee for hosting such a workshop. An international informal working group on this subject was also formed following the workshop. The plan is to continue with the discussions so that developments are made in the field. Finally, the group will be planning on editing a book on this topic.