Principles Of Multimedia Database Systems The Morgan Kaufmann Series In Data Management Systems

Multimedia Database SystemsManaging and Mining Multimedia DatabasesMultimedia Database Management SystemsMultimedia Database SystemsPrinciples of Multimedia Database SystemsMultimedia Database in PerspectiveMultimedia Database Management SystemsMultimedia and Imaging DatabasesDistributed Multimedia DatabasesVideo Database SystemsMultimedia Database SystemsDatabase SemanticsMultimedia Database Management SystemsMultimedia DatabasesIntelligent Big Multimedia DatabasesSearching Multimedia Databases by ContentImage Database Management in a Multimedia SystemDistributed Multimedia Database Technologies Supported by MPEG-7 and MPEG-21Multimedia Database SystemsFuzzy Queries in Multimedia Database Systems V.S. Subrahmanian Bhavani Thuraisingham B. Prabhakaran Kingsley C. Nwosu V. S. Subrahmanian Peter M.G. Apers B. Thuraisingham Setrag Khoshafian Timothy K. Shih Ahmed K. Elmagarmid Kingsley C. Nwosu Zahir Tari Guojun Lu Lynne Dunckley Andrzej Wichert Christos Faloutsos Klaus Meyer-Wegener Harald Kosch V. S. Subrahmanian International Business Machines Corporation. Research Division Multimedia Database Systems Managing and Mining Multimedia Databases Multimedia Database Management Systems Multimedia Database Systems Principles of Multimedia Database Systems Multimedia Database in Perspective Multimedia Database Management Systems Multimedia and Imaging Databases Distributed Multimedia Databases Video Database Systems Multimedia Database Systems Database Semantics Multimedia Database Management Systems Multimedia Databases Intelligent Big Multimedia Databases Searching Multimedia Databases by Content Image Database Management in a Multimedia System Distributed Multimedia Database Technologies

Supported by MPEG–7 and MPEG–21 Multimedia Database Systems Fuzzy Queries in Multimedia Database Systems *V.S. Subrahmanian Bhavani Thuraisingham B. Prabhakaran Kingsley C. Nwosu V. S. Subrahmanian Peter M.G. Apers B. Thuraisingham Setrag Khoshafian Timothy K. Shih Ahmed K. Elmagarmid Kingsley C. Nwosu Zahir Tari Guojun Lu Lynne Dunckley Andrzej Wichert Christos Faloutsos Klaus Meyer–Wegener Harald Kosch V. S. Subrahmanian International Business Machines Corporation. Research Division*

with the rapid growth in the use of computers to manipulate process and reason about multimedia data the problem of how to store and retrieve such data is becoming increasingly important thus although the field of multimedia database systems is only about 5 years old it is rapidly becoming a focus for much excitement and research effort multimedia database systems are intended to provide unified frameworks for requesting and integrating information in a wide variety of formats such as audio and video data document data and image data such data often have special storage requirements that are closely coupled to the various kinds of devices that are used for recording and presenting the data and for each form of data there are often multiple representations and multiple standards all of which make the database integration task quite complex some of the problems include what a multimedia database query means what kinds of languages to use for posing queries how to develop compilers for such languages how to develop indexing structures for storing media on ancillary devices data compression techniques how to present and author presentations based on user queries although approaches are being developed for a number of these problems they have often been ad hoc in nature and there is a need to provide a princi pled theoretical foundation

there is now so much data on the that managing it with conventional tools is becoming almost impossible to manage this data provide interoperability and warehousing between multiple data sources and systems and extract information from the databases and warehouses various tools are being developed in fact developments in multimedia databa

multimedia database management systems presents the issues and the techniques used in building multimedia database management systems chapter 1 provides an overview of multimedia databases and underlines the new requirements for these applications chapter 2 discusses the techniques used for storing and retrieving multimedia objects chapter 3 presents the techniques used for generating metadata for various media objects chapter 4 examines the mechanisms used for storing the index information needed for accessing different media objects chapter 5 analyzes the approaches for modeling media objects both their temporal and spatial characteristics object oriented approach with some additional features has been widely used to model multimedia information the book discusses two systems that use object oriented models ovid object video information database and jasmine the models for representing temporal and spatial requirements of media objects are then studied the book also describes authoring techniques used for specifying temporal and spatial characteristics of multimedia databases chapter 6 explains different types of multimedia queries the methodologies for processing them and the language features for describing them the features offered by query languages such as sql mm structured query language for multimedia picquery and video sql are also studied chapter 7 deals with the communication requirements for multimedia databases a client accessing multimedia data over computer networks needs to identify a schedule for retrieving various media objects composing the database the book identifies possible ways for generating a retrieval schedule chapter 8 ties together the techniques discussed in the previous chapters by providing a simple architecture of a distributed multimedia database management system multimedia database management systems can be used as a text for graduatestudents and researchers working in the area of multimedia databases in addition the book serves as essential reading material for computer professionals who are in or moving to the area of multimedia databases

this volume is a compendium of recent research and development work pertaining to the problems and issues in the design and development of multimedia database systems the design of indexing and organization techniques and the development of efficient and

until recently databases contained easily indexed numbers and text today in the age of powerful graphically based computers and the world wide web databases are likely to contain a much greater variety of data forms including images sound video clips and even handwritten documents when multimedia databases are the norm traditional methods of working with databases no longer apply how do you query a video library or an image database containing x rays or sounds in an audio database principles of multimedia database systems explains how to work with these new multimedia data forms it is the first comprehensive treatment of the skills and techniques required to build maintain and query multimedia databases this book presents the mix of techniques necessary for working with multimedia databases including synthetic solutions for the design and deployment of multimedia database systems because rapid technological developments are constantly changing the landscape of multimedia databases the book teaches basic theoretical principles applicable to any database covers the major issues of multimedia database design with a strong focus on distributed multimedia databases discusses important topics including how to organize the vast data types storage and retrieval and creation and delivery of multimedia presentations organized around the lively scenario of a crime fighting database that evolves as new concepts are introduced includes numerous exercises and suggestions for programming projects additional materials on the web include updates on line supplements and links to downloadable software

during the last decade multimedia has emerged as a major research and de velopment area pushed by advanced technology like huge capacity storage de vices fast networks and powerful work stations new applications have arisen many definitions of multimedia systems exist one of them being computer sys tems that support interactive use of at least one of the following information sources graphics image voice sound and video these systems have caused a boom in the world of entertainment but also in other business areas great opportunities for novel products and services are available the size of multi media data is often huge and the storage of huge amounts of data is a task normally allocated to database management systems although some modern database management systems offer facilities to support development of multi media applications

many problems related to multimedia support are still not well understood this book reports on research efforts to solve some of these problems an in troductory knowledge of databases and also of operating systems and network technology is assumed the book is very suitable as material for courses at senior or graduate level but also for upgrading the skills of computer scientists working on database management systems multimedia systems or applications the book consists of four parts part i is called requirements for a mul timedia database and comprises chapters one to three chapter one presents an outline of the book

multimedia database management systems brings together in one place important contributions and up to date research results in this important area multimedia database management systems serves as an excellent reference providing insight into some of the most important research issues in the field

affordable and mainstream manipulation of multimedia data types will lead to tremendous growth in imaging and multimedia data in general computing environments multimedia and imaging applications can now provide benefits to common business applications by integrating voice sound images animation and digitized video ultimately it will be possible to convert all information that is currently stored on paper video and film into a digitized environment this will allow users to organize search and route multimedia objects over local and wide area networks in real time the authors introductory level presentation of this new class of data types supplies the database technology required for effective manipulation and storage multimedia and database experts khoshafian and baker aptly illustrate the ability of multimedia database systems to concurrently share access and query large collections of multimedia information they introduce the elemental concepts of object and relational databases and then apply them to multimedia and imaging databases fundamental database topics discussed include querying transaction support recovery security and storage this book provides information essential to the incorporation of multimedia databases that will improve the quantity and quality of information manipulated by computer users in many areas including medicine computer aided design and information retrieval systems

multimedia application techniques used in contexts as diverse as business government education entertainment and healthcare are continually challenged by modeling specification analysis and design issues that affect distributed multimedia database systems these challenges are analyzed and practical solutions are offered in this scholarly discussion of database techniques such as image retrieval video abstraction video database and multimedia and multistream synchronization the most recent research findings are presented to facilitate effective database management

great advances have been made in the database field relational and object oriented databases distributed and client server databases and large scale data warehousing are among the more notable however none of these advances promises to have as great and direct an effect on the daily lives of ordinary citizens as video databases video databases will provide a quantum jump in our ability to deal with visual data and in allowing people to access and manipulate visual information in ways hitherto thought impossible video database systems issues products and applications gives practical information on academic research issues commercial products that have already been developed and the applications of the future driving this research and development this book can also be considered a reference text for those entering the field of video or multimedia databases as well as a reference for practitioners who want to identify the kinds of products needed in order to utilize video databases video database systems issues products and applications covers concepts products and applications it is written at a level which is less detailed than that normally found in textbooks but more in depth than that normally written in trade press or professional reference books thus it seeks to serve both an academic and industrial audience by providing a single source of information about the research issues in the field and the state of the art of practice

multimedia database systems design and implementation strategies is a compendium of the state of the art research and development work pertaining to the problems and issues in the design and development of multimedia database systems the chapters in the book are developed from presentations given at previous meetings of the international workshop on multi media data base management systems iw mmdbms and

address the following issues development of adequate multimedia database models design of multimedia database query and retrieval languages design of indexing and organization techniques development of efficient and reliable storage models development of efficient and dependable retrieval and delivery strategies and development of flexible adaptive and reliable presentation techniques

database semantics semantic issues in multimedia systems reflects the state of the art of emerging research on the meaning of multimedia information as presented during ifip s eighth data semantics working conference ds 8 organized by its working group 2 6 on databases and held at rotorua new zealand in january 1999 ds 8 was planned as an active forum for researchers and practitioners focusing on those issues that involve the semantics of the information represented stored and manipulated by multimedia systems depending on the topic and state of research issues may be covered either deeply theoretically or quite practically or even both these proceedings contain twenty one papers carefully selected by an international programme committee and organized in six thematic areas video data modelling and use image databases applications of multimedia systems multimedia modeling in general multimedia information retrieval semantics and metadata for almost every area important topics and issues include data modeling and query languages for media such as audio video and images methodological aspects of multimedia database design intelligent multimedia information retrieval knowledge discovery and data mining in multimedia information multimedia user interfaces three visionary keynote addresses by famous experts ramesh jain hermann maurer and masao sakauchi set the stage for discussion and future directions for the field the collection of papers that resulted now offers a glimpse of the excitement and enthusiasm from ds 8 database semantics semantic issues in multimedia systems is suitable as a secondary text for a graduate level course on database systems multimedia systems or information retrieval systems and as a reference for practitioners and researchers in industry

traditional database management systems can t handle the demands of managing multimedia data with the rapid growth of multimedia platforms and the world wide web

database management systems must now process store index and retrieve alphanumeric data bitmapped and vector based graphics and video and audio clips both compressed and uncompressed the comprehensive systematic approach of multimedia database management systems presents you with current and emerging methods for managing the increasing demands of multimedia databases and their inherent design and architecture issues

this book brings together coverage of sql multimedia metadata image processing computer vision networks and database management it provides an understanding of multimedia data and database technology and explains why advances in both have come together to create the field of multimedia databases exercises and solutions are included dunckley teaches information technology at thames valley university annotation c 2003 book news inc portland or booknews com

multimedia databases address a growing number of commercially important applications such as media on demand surveillance systems and medical systems the book presents essential and relevant techniques and algorithms to develop and implement large multimedia database systems the traditional relational database model is based on a relational algebra that is an offshoot of first order logic and of the algebra of sets the simple relational model is not powerful enough to address multimedia data because of this multimedia databases are categorized into many major areas each of these areas are now so extensive that a major understanding of the mathematical core concepts requires the study of different fields such as information retrieval digital image processing feature extraction fractals machine learning neuronal networks and high dimensional indexing this book unifies the essential concepts and recent algorithms into a single comprehensive volume

searching multimedia databases by content bridges the gap between the database and signal processing communities by providing the necessary background information for the reader and presenting it along with the intuition and mechanics of the best existing tools in each area the first half of searching multimedia databases by content reviews the most successful database access methods in increasing complexity reaching up to

spatial access methods and text retrieval in all cases the emphasis is on practical approaches that have been incorporated in commercial systems or that seem very promising the second half of the book uses the above access methods to achieve fast searching in a database of signals a general methodology is presented which suggests extracting a few good features from each multimedia object thus mapping objects into points in a metric space finally the book concludes by presenting some recent successful applications of the methodology on time series and color images searching multimedia databases by content is targeted towards researchers and developers of multimedia systems the book can also serve as a textbook for a graduate course on multimedia searching covering both access methods as well as the basics of signal processing

a general concept for the representation of multimedia data by unformatted and formatted data is introduced it leads to a basic function approach to the design and development of multimedia database systems which extends a relational database management system with new attribute types in this paper raster or bitmap images are used as an example the structure of image values is defined and a basic set of operations for access and manipulation is proposed these operations can be integrated into a query language like sql to facilitate a contents oriented search on multimedia data in general and on images in particular text descriptions are introduced into the database that allow users to indicate the contents of an image the well established techniques of information retrieval can be applied to search for these descriptions the proposed system allows us to model images that are assigned to objects as well as stand alone images the paper finally sketches a prototype implementation on top of an existing relational database management system ingres keywords multimedia databases image databases theses mjm

a multimedia system needs a mechanism to communicate with its environment the internet clients and applications mpeg 7 provides a standard metadata format for global communication but lacks the framework to let the various players in a system interact mpeg 21 closes this gap by establishing an infrastructure for a distributed multimedia

frame

abstract there are essential differences between multimedia databases which may contain complicated objects such as images and traditional databases these differences lead to interesting new issues and i particular sic cause us to consider types of queries for example in a multimedia database it is reasonable and natural to ask for images that are somehow similar to some fixed image furthermore there are different ways of obtaining and accessing information in a multimedia database than information in a a sic traditional database for example in a multimedia database it might be reasonable to have a query that asks for say the top 10 images that are similar to a fixed image this is in contrast to a relational database where the answer to a query is simply a set in this paper we survey some new issues that arise for multimedia queries with a particular focus on recent research by the author developed in the context of the garlic system at the ibm almaden research center

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Introduction

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