The Application of Database Technology in Information Society and its Existing Problems

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ABSTRACT
With the development of computer technology and network communication technology and multimedia technology, database technology has become an important technical means and software technology for organizing and managing large amount of data in information society. It is the foundation of network information management system. It not only has a complete theoretical basis, and with the rapid development of hardware technology and software technology, its application is more and more widely. However, the rapid development of information technology is that people face such a situation: CAD / CAM, CIMS, CASE, GIS and other applications require the management of increasingly complex information, such as multimedia data, spatial data, scientific data, and storage, transmission, operation and retrieval methods also have many new features, new requirements, on the one hand, the need for database technology and database systems To manage these complex data in order to obtain the database system has many of the data management functions, such as query, retrieval, recovery, concurrency control, integrity, storage management. On the other hand, due to the vigorous development of network technology, information processing has long been from a single user environment to the development of the network environment, this environment for resources, information sharing provides a great convenience, and because of multi-machine work together to greatly improve the work, The combination of the two requires that the database management system be able to manage complex data objects in a networked environment or heterogeneous environment. Traditional DBMSs cannot effectively handle complex multimedia data, thus requiring the use of new multimedia indexing and retrieval techniques. Multimedia database technology is an important part of computer technology, it can simultaneously acquire, process, edit, store and display text, sound, video, graphics and other different media, while it has diversity, integration and interactivity and so on. Only to solve the key technical issues of multimedia, can be widely used to promote its faster development.

KEYWORDS: Database new technology research, Multimedia database technology, Multimedia database, Multimedia database management system (MMDBMS)


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1. Introduction

The continuous development of computer applications and the development of network communication technology and multimedia technology, the database has become one of the fastest growing and most widely used branches of computer science and technology. The research of database technology has also made a breakthrough. Become the computer information system and the computer application system important technical foundation and the pillar. From the end of the 1960s, the database system has evolved from the first generation database, the reticular database and the second generation relational database system to the third generation object-oriented model as the main feature of the database system. Relational database theory and technology in the 70 ~ 80 years have been developed by leaps and bounds and widely and effectively applied, 80 years, the relationship between the database to become the mainstream of the application, almost all of the new database management system (DataBase Management System, DBMS) products are related. He is an important milestone in the history of computer data management. This database has the advantages of data structuring, minimal redundancy, higher program and data independence, easy expansion, ease of application, and so on. The larger information systems are based on the design of relational database systems. However, these database systems include hierarchical databases, reticulated databases, and relational databases, regardless of their differences in model and technology, but primarily for data management in the areas of business and transactional
The application of database technology is crucial in the Information Society, and it faces existing problems. However, with the improvement of user application requirements, the development of hardware technology and the rich and colorful multimedia communication provided by Internet / Intranet, it facilitates the development of database technology and network communication technology, artificial intelligence technology, object-oriented programming technology, parallel computing technology. Mutual penetration, mutual integration, as the current database technology development of the main features, the formation of a new database technology.

2. The database of new technologies

A variety of disciplinary technology and database technology, so that the database field of new content, new applications, new technologies emerge in an endless stream, the formation of a variety of new database systems: distributed database system, knowledge database system, fuzzy database system, parallel database systems, and multimedia database systems. Database technology is applied to specific application areas, there have been engineering database, interpretation database, tense database, statistical database, spatial database, scientific database, literature database, they have inherited the traditional database Theory and technology, but not the traditional sense of the database, based on the traditional database of existing achievements and technology to be evolved to form a new database system, some people call it 'evolution' of the database system; based on In the new application requirements and the future development of the computer, developed a new database system, some people call it 'innovation' of the database system. A new generation of database technology research, the development of a new generation of database system presents a flourishing situation.

2.1. Distributed database

Distributed database system is based on the centralized database system, distributed database system is a combination of distributed processing technology and database technology, but also the product of database technology and network technology. A distributed database system is a computer system that has the function of managing distributed databases. A distributed database is a collection of multiple logical-related databases distributed over a computer network, with each node in the network (typically every node in the system called a node node) has the ability to handle it independently (Called local autonomy), can be applied locally, at the same time, each node through the network communication system can also perform global applications. The so-called local application is only the node of the database implementation of certain applications. The so-called global application (or distributed application) refers to the implementation of certain applications for more than two nodes of the database. A system that supports global applications can be called a distributed database system. For a user, a distributed database system logically, like a centralized database system, users can perform global applications at any one site.

In the field of database research has been a long history and appeared in a number of distributed data management systems, such as SDD1 system, DINGRES system and POREL system. Conceptually, a distributed database is a collection of data that is physically scattered across the nodes of a computer network and logically belong to the same system. He has the data distribution and coordination between the two major characteristics of the database. The system emphasizes the autonomy of nodes without emphasizing the centralized control of the system, and the system should maintain the transparency of the data distribution, so that the application can be written without regard to the distribution of data. Undoubtedly distributed is the direction of the development of computer applications, but also the actual needs of database technology applications, the technical basis In addition to computer hardware and software technology support, the computer communication and network technology is of course its most important basis. But the distributed system structure, distributed database because of its technical problems, the current is not fully meet the desired goal, and client / server (Client / Server, C / S) architecture is popular, broad understanding, C / S is also a distributed structure, according to the C / S structure, a data processing tasks are distributed at least two different components to complete. The C / S structure divides the task into two parts, one that is run by the front end (Frontend), that provides the user interface, and the other is the backend (Backend, Server) that provides specific services, including databases or files Services, communications services. The client provides the service through a remote call or directly requests the application; the server performs the required functionality, and returns the result to the client, where the client and server work together through the network. C / S structure has the advantages of superior performance, protection of investment, easy to expand and ensure data integrity and so on. At present, C / S technology is improving; the client and server allow a variety of options, so that the computer system can achieve horizontal integration, coming from different manufacturers, different areas of the best products together to form a performance price than the optimal system. There are a variety of database products currently support C / S structure, which Sybase is a typical representative.

2.2. Parallel database

Parallel database system is a combination of parallel technology and database technology, which plays the advantages of multi-processor structure, the database distributed in multiple disks, the use of multiple processors on the disk data in parallel processing to solve the disk `I / O bottlenecks, through the use of advanced parallel query technology, the
development of inter-query parallel, parallel query and parallel operation, greatly improving the efficiency of the query. The goal is to provide a high performance, high availability, high scalability of the database management system, and in terms of cost performance, the corresponding large machine on the DBMS much higher. Parallel database system as a new direction, the need for further study of the problem is still a lot, but can be expected, because the parallel database system can take full advantage of the powerful processing power of parallel computers, will become the parallel computer one of the most important support software. In the field of parallel databases, although some results have been achieved, there are many issues that need to be studied. Parallel architecture, parallel operation algorithm, parallel query optimization, physical design of parallel database, and data loading and reorganization of parallel database.

2.3 Knowledge database

Knowledge database system is how to function by a large number of facts, rules, concepts, knowledge, storage, management, and to provide users with convenient and quick retrieval, query means. Thus, the knowledge database can be defined as a collection of knowledge, experience, rules and facts. Knowledge database system should have the method of representation of knowledge; systematic management of knowledge system; knowledge base operation; library query and retrieval; knowledge acquisition and learning; knowledge editing; library management and other functions. Knowledge database is a combination of artificial intelligence technology and database technology.

2.4 Active database

The primary goal of an active database is to provide the ability to respond to emergencies in a timely manner while increasing the modularity of the data management system. The active database is usually used to embed ECA (event-condition-action) rules in traditional database systems. Equivalent to the system provides an automatic detection mechanism, the key technology to achieve active database is its condition detection technology, can effectively detect the event automatically. In addition, how to expand the traditional database system, so that it can describe, store, manage ECA rules, to adapt to the active database; how to construct the implementation of the model; how to carry out transaction scheduling; how the traditional database management system based on the formation of active data architecture; How to improve the overall efficiency of the system are active database.

2.5 Fuzzy database

Fuzziness is an important attribute of the objective world. The traditional database system describes and deals with the precise or definite objective things, but cannot describe and deal with the concepts of ambiguity and imperfectism, which is a big problem. In this paper, the research of fuzzy database theory and implementation technology is carried out. The goal is to be able to store fuzzy data, data structures and data links in various forms, data operations and operations, data constraints (including integrity and security). The user's database window user view, data consistency and no definition of redundancy are vague, accurate data can be seen as a special case of fuzzy data; fuzzy database system is a combination of fuzzy technology and database technology, Due to the difficulties in theory and technology, fuzzy database technology has not been ideal in recent years, but he has been in the field of pattern recognition, process control, case detection, medical diagnosis, engineering design, nutrition consulting, public service and expert systems. Good application, showing a broad application prospects.

2.6 Spatial database

The spatial database system is mainly used for the GIS system to store and process the spatial data and its attribute data such as electronic map. It is used to represent the data of the location, shape, size and distribution of the space object. It is suitable for the description All two-dimensional, three-dimensional and multi-dimensional distribution of the database system on the phenomenon of the region.

In addition to the above mentioned several typical database of new technologies, as well as object-oriented database system, workflow database, Web database, deductive database, data grid, etc., here only multimedia database, for example, about the database in the information society The application and the existing problems.

3 Multimedia database

A database is a collection of records and documents organized for a particular purpose. The traditional database management system is very successful in dealing with structured data, text and numerical information. However, as time goes on, multimedia information is also on the rise: the Internet is constantly generating and storing large amounts of images and videos, and in order to facilitate processing, distribution and preservation, many printed forms of paintings and pictures are converted into digital form; many televisions And newspapers on the picture has also been transformed into a digital form; people are constantly collecting a large number of medical images every day; satellite detection also
continue to produce more pictures. With the development of storage technology and digital technology, this trend will continue, to manage and use these increased number of multimedia information and data information, only to create a stack of their 'warehouse' is useless, if not right Multimedia information is organized for rapid retrieval, it is impossible to effectively use these multimedia information, how to deal with these information is large, complex structure, the media processing requirements of high multimedia data for effective management and oil, a multimedia information system Big technical problems. Therefore, it is necessary to study and establish a new database - multimedia database that can handle unstructured data.

### 3.1. Multimedia basics

Multimedia, including digital audio, digital graphics and images, multimedia digital video, and multimedia animation, are commonly used multimedia file formats.

Audio file format: wave format, the extension of the WAV; the use of the format recorded sound files and soundtrack is basically the same, high quality, but the file is too large; MOD format, extension MOD, ST3, XT, S3M, FAR, 669 etc., the format of the file stored in the music and music used in a variety of sound samples, with a clear playback effect, the sound type of infinite features; MPEG-3 format, the extension is MP3 now popular sound file format; real audio format, Called RA, this format can be described as the soul of the network, a strong amount of compression and minimal distortion to make it stand out in many formats; there CD Audio format, MIDI format and so on.

Video file format: animated files, GIF format, FLIC format, and FLA format; image format, AVI format, quick time format, MPEG format Real Video format, ASF format.

Image file format: BMP format, PCX format, TIFF format, GIF format.

### 3.2. Multimedia data management system (MMDBMS)

The multimedia database management system (MMDBMS) can effectively store and manipulate multimedia data. The data in the multimedia database is expressed in the form of text, image, voice, graphics and video images. The user can periodically update the multimedia data so that the database the information contained accurately reflects the real world. With the development of database technology, some MMDBMS has been able to store and operate various types of data, allowing users to browse or query data through the MMDBMS, and can access a large amount of related data in a very short time. This MMDBMS is very useful for a variety of applications. Such as CAI, CAD / CAM and air traffic control. Developing MMDBMS involves many problems. These issues include data representation, data manipulation, transaction processing, metadata management, data publishing, storage management, quality of service, data integrity and security, user interface, heterogeneity, and real-time processing.

Multimedia databases are usually accessed remotely over the network. A multimedia object that is authenticated as a query must be retrieved from the server and passed to the client for display. In order to achieve high-quality multimedia display, we must meet the quality of service (QoS) and other factors in a series of requirements. The main performance indicators in the Multimedia Database Management System (MMDBMS) are efficiency. It has the following characteristic:

A) MMDBMS must be able to represent and process a variety of multimedia data, focusing on irregular data such as graphics, images, sound, and video and so on.

B) The MMDBMS must be able to reflect and manage the characteristics of various multimedia data, or the spatial or temporal association between the various media data.

C) MMDBMS must meet the independence of physical data and logical data independence, but also to meet the independence of media data.

D) MMDBMS data manipulation function.

E) The network functions of MMDBMS.

F) The MMDBMS should have an open function, provide an application interface API for the MDB, and provide interfaces independent of peripherals and formats.

G) MDBMS should also provide transaction and version management functions

### 3.3. Multimedia database technology

Because the multimedia system needs to represent different media data as a unified structure stream, and then transform, reorganize and analyze it for further storage, transmission, output and interactive control. Therefore, the traditional key technology of multimedia is mainly focused on the following four categories: data compression
technology, large-scale integrated circuit manufacturing technology, high-capacity CD-ROM storage technology, and real-time multi-tasking operating system. Because these technologies have made breakthrough progress, and become like today, with a powerful voice, text, images, and other media information capabilities of high-tech technology. But it should also include multimedia communication network technology, media processing technology and coding technology, multimedia information organization and management technology, hypermedia technology, and content-based retrieval technology, which are the key technologies that should be used in multimedia database.

1) Digital image coding technology

Run code: Some images, especially computer-generated patterns, tend to have many blocks of the same color. In these blocks, many consecutive lines have the same color, and in this case you do not need to store a pixel color value, and only store a pixel value and the number of pixels with the same color, this is called run-length coding, with RLE said.

Incremental modulation coding: natural images tend to have such a feature: in a relatively large range, the image color is not exactly the same, but little change. The number of pixels per pixel is compressed by the correlation of the adjacent pixel values of the image to finally reduce the image storage capacity, which is called incremental modulation coding.

2) Commonly used data compression technology

Audio compression
Nonlinear quantization
Predictive coding
Use of shielding properties of the compression technology: MPEG audio
Digital image compression
Space block sampling
Predictive coding
Transformation code
Vector quantization method
Fractal image coding
Wavelet compression
Practical coding system

JPEG (Joint Photographic Experts Group), by the International Organization for Standardization (ISO) and the International Telegraph and Telephone Advisory Committee (CCITT) jointly developed. Suitable for continuous tones, multi-level gray scale, color or monochrome still images of international standards.

JBIG
JPEG2000
Digital video compression
Dynamic estimation and compensation
MPEG

4. Multimedia communication technology

The combination of multimedia technology and communication technology are making the communications field such as video phone and other troubled industries, glow with new vitality. Multimedia communication technology combines computer interaction, network distribution and multimedia information in one, breaking the computer, communications, television and publishing and other traditional industries between the boundaries of these human society have a significant impact but relatively independent development Technology integration. Multimedia communication technology provides new information services to human beings, such as multimedia e-mail, real-time video conferencing, computer-supported collaborative work, and distance learning and telemedicine.

Multimedia communication is a comprehensive technology, involving multimedia, computer and communications and other fields, and to these areas have a great impact. Real-time transmission of continuous media on the Internet not only challenges the narrowband network and packet-switched protocols, but also puts forward higher requirements for media technology itself, such as data compression, time and space synchronization among media.
Multimedia network for multimedia communications provides a transmission environment, network bandwidth, information exchange and high-level agreement, will have a direct impact on the quality of transmission and services.

Multimedia networks include: telephone network, integrated services digital network, public data network, computer LAN and so on.

Telephone network using circuit switching, in this way, the channel is exclusive, is conducive to continuous media transmission. However, the transmission on the telephone line is an analog signal; the digital signal must be processed by the modem before transmission. The speed of the telephone network is generally only 19.2Kbits / s, cannot transmit video and other large amount of data media.

The transmission rate of the public data network and the high-speed dedicated line is higher than that of the telephone network, but the use fee is very expensive.

The Narrowband Integrated Services Digital Network (N-ISDN) also uses circuit switching, which has a small delay. Narrowband Integrated Services Digital Network There are two types of user network interfaces: basic rate interface and base rate interface. The structure of the basic rate interface is 2B + D, that is, two B channels and one D channel and B channel rate of 64Kbits / s, for the transmission of standard digital phones and other data; D channel rate of 16Kbits / s, for the transmission of signaling and other control information. Thus, the total data transfer rate is 144Kbits / s. For the group rate interface, its structure in Europe for the 30B + D, in the United States for the 23B + D, B channel and D channel which are 64Kbits / s. From this, narrowband integrated services digital network is a high transmission rate, you can transmit sound and low-quality video signal.

The computer LAN uses packet switching to transfer digital information, which divides the user's data into many small pieces (called packets, packets, etc.) on the Internet. Packet switching is characterized by high transmission rates, and can change the rate as needed, such as the Ethernet nowadays. This network data transfer rate is generally 10Mbits / s. The disadvantage is that the transmission delay is large, not suitable for audio and video signal transmission.

Broadband Integrated Services Digital Network (B-ISDN), the transmission medium using synchronous optical network (SONET), information exchange using asynchronous transfer mode (ATM). This method has the characteristics of small circuit switching delay, high packet switching rate and variable rate. Broadband integrated services digital network transmission rate will reach 2.4Gbits / s, on which you can transmit high-fidelity stereo, ordinary and high-definition video, multimedia communication is the ideal environment.

Due to the limitation of conditions, the research and application of multimedia communication in China will focus on the computer local area network (LAN), including Ethernet, Token Ring and FDDI )Wait. For multimedia on a wide area network (WAN) can only do some tests.

5. Content-based retrieval (Content Based Retrieval, CBR) technology

Refers to the media and media objects based on the content, semantics and context links to retrieve. Is extracted from the media data out of specific information clues, and then according to these clues from a large number of stored in the database in the media to find out, with similar characteristics of the media data out.

1) Based on the general structure of the content retrieval system

A) Insert subsystem: The subsystem is responsible for the media input into the system, and according to the need to provide users with a tool to fully or semi-automatic (both user part of the intervention) the way the media segmentation or segmentation , Identify the required object or content of the key points in order to target the target feature extraction.

B) Feature extraction subsystem: the user or system identified media object feature extraction processing, in the extraction of features, often need knowledge processing module support, by the knowledge base to provide relevant domain knowledge.

C) Database: Media data and feature data obtained at the time of insertion are stored in the media database and the feature database, which contains various media data such as images, video, audio, text, etc. The feature library contains the characteristics of this media user input and preprocessing automatically extracted features.

D) Query subsystem: the main way to query the user to provide a search interface.

2) The retrieval process

A) Initial search Note: When the user starts to retrieve, to form a retrieval format, initially can be used QBE or specific query language to form.

B) Similarity matching: the characteristics and characteristics of the characteristics of the library in accordance with a certain matching algorithm to match.
C) Feature adjustment: the user returns a set of search results that satisfy the initial characteristics of the system, picks out the satisfactory results, completes the retrieval process, or selects one of the closest examples from the candidate results, performs the feature adjustment, and then forms a new query.

D) Re-search: gradually narrow the scope of the query, start again. The process until the user abandons or gets a satisfactory query result.

3.4. Multimedia problems

A) The amount of data is huge and the difference between the media is also great, thus affecting the organization and storage methods of the database.

B) Increased media types increase the difficulty of data processing

C) Multi-solution queries, inaccurate matches and similarity queries in the database will account for a significant proportion

D) User interface support

E) The distribution of multimedia information has had a tremendous impact on the multimedia database system.

F) Short transaction processing and long transaction processing: the traditional affairs are generally short and pithy; in the multimedia database management system should also be used as short as possible.

G) As the multimedia to deal with the sound, map, text a variety of data, service quality requirements are getting higher and higher.

H) Multimedia data management system also consider the issue of version control.

4. Database design in a few questions

The extension and development of database technology provides strong support for the construction of different types of databases, which are useful and necessary for the use and absorption of the following technologies in the near future and in the future:

(1) Large-scale information systems should be based on a distributed multimedia database system; he should be based on remote C / S structure and support multimedia data storage, management and query.

(2) The system should be a rich data resource and provide advanced hardware and software support for data resource redevelopment tools such as auxiliary design, statistical analysis, expert consultation, multimedia display, etc.

(3) System development can be applied to the new technology and methodology as a guide, object-oriented technology, and multimedia technology should be the next generation of database and information system development can use the technology.

(4) In the database construction in the full use of scientific analysis and design methods, the organization and management of data on the formation of norms, give full play to the modern database technology support for the project.

(5) In the development process selected database technology closely follow the international development trend, developed to support the national macroeconomic decision-making, to support enterprises in a comprehensive management, support the Internet shared database, the real circulation of the database, and improve database utilization.

5. Conclusion

For the majority of the database users, there are two main requirements: on the one hand, they want to get their own needs from the data or information; the other hand, they can easily accept and use the data or information. The former requirements should be achieved through engineering hard, software environment support and high quality database design; the latter type of requirements should provide users with a good user interface and perfect application support to achieve. But it is worth noting that any database system construction, the most fundamental problem is the application of basic data in the field of identification and organization, if you cannot do this, it is difficult to make customer satisfaction and recognition of the database system. Therefore, the database system in the construction of data planning, application-oriented comprehensive data analysis and comprehensive database design, system construction will be a top priority. Multimedia database technology With the development of computer technology is becoming more and more important, the application will be more broad, and now communication technology has also been rapid development, based on its multimedia database technology will change our future life.
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