Multimedia Databases

- In the years ahead multimedia information systems are expected to dominate our daily lives.
  - Our houses will be wired for bandwidth to handle interactive multimedia applications.
  - Our high-definition TV/computer workstations will have access to a large number of databases, including digital libraries, image and video databases that will distribute vast amounts of multisource multimedia content.

Module - 4

Multimedia Databases

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Source:
Pearson Education, Inc. 2011, Elmasri/Navathe, Fundamentals of Database Systems, Sixth Edition

Types of multimedia data are available in current systems

- **Text**: May be formatted or unformatted. For ease of parsing structured documents, standards like SGML and variations such as HTML are being used.
- **Graphics**: Examples include drawings and illustrations that are encoded using some descriptive standards (e.g. CGM, PICT, postscript).
- **Images**: Includes drawings, photographs, and so forth, encoded in standard formats such as bitmap, JPEG, and MPEG. Compression is built into JPEG and MPEG.
  - These images are not subdivided into components. Hence querying them by content (e.g., find all images containing circles) is nontrivial.

Multimedia Databases

- DBMSs have been constantly adding to the types of data they support.
- Today many types of multimedia data are available in current systems.

Types of multimedia data are available in current systems (contd.)

- **Composite** or mixed multimedia data: A combination of multimedia data types such as audio and video which may be physically mixed to yield a new storage format or logically mixed while retaining original types and formats. Composite data also contains additional control information describing how the information should be rendered.

Types of multimedia data are available in current systems (contd.)

- **Animations**: Temporal sequences of image or graphic data.
- **Video**: A set of temporally sequenced photographic data for presentation at specified rates– for example, 30 frames per second.
- **Structured audio**: A sequence of audio components comprising note, tone, duration, and so forth.
- **Audio**: Sample data generated from aural recordings in a string of bits in digitized form. Analog recordings are typically converted into digital form before storage.

Characterization of applications based on their dat management characteristics:

- **Repository** applications: A large amount of multimedia data as well as metadata is stored for retrieval purposes. Examples include repositories of satellite images, engineering drawings and designs, space photographs, and radiology scanned pictures.

Nature of Multimedia Applications

- Multimedia data may be stored, delivered, and utilized in many different ways.
- Applications may be categorized based on their data management characteristics.

Characterization of applications based on their data management characteristics:

Collaborative work using multimedia information: This is a new category o applications in which engineers may execute a complex design task by merging drawings, fitting subjects to design constraints, and generating new documentation, change notifications, and so forth. Intelligent healthcare networks as well as telemedicine will involve doctors collaborating among themselves analyzing multimedia patient data and information in real time as it is generated.

Characterization of applications based on their data management characteristics:

- **Presentation** applications: A large amount of applications involve delivery o multimedia data subject to temporal constraints; simple multimedia viewing of video data, for example, requires a system to simulate VCR-like functionality. Complex and interactive multimedia presentations involve orchestration directions to control the retrieval order of components in a series or in parallel. Interactive environments mus support capabilities such as real-time editing analysis or annotating of video and audio data.

Data Management Issues(2)

- Multimedia information systems are very complex and embrace a large set of issues:
  - Modeling
    - Complex objects
  - Design
    - Conceptual, logical, and physical design of multimedia has not been addressed fully.

Data Management Issues

- Multimedia applications dealing with thousands of images, documents, audio and video segments, and free text data depend critically on
  - Appropriate modeling of the structure and content of data
  - Designing appropriate database schemas for storing and retrieving multimedia information.

Data Management Issues(4)

Multimedia information systems are very complex and embrace a large set of issues (contd.):

- Performance
  - Multimedia applications involving only documents and text, performance constraints are subjectively determined by the user.
  - Applications involving video playback or audio-video synchronization, physical limitations dominate.

Data Management Issues(3)

Multimedia information systems are very complex and embrace a large set of issues (contd.):

- Storage
  - Multimedia data on standard disk like devices presents problems of representatio compression, mapping to device hierarchies, archiving, and buffering during th input/output operation.
- Queries and retrieval
  - "Database" way of retrieving information is based on query languages and internal inde structures.

Multimedia Database Applications

- Large-scale applications of multimedia databases can be expected encompasses a large number of disciplines and enhance existing capabilities.
  - Documents and records management
  - Knowledge dissemination
  - Education and training
  - Marketing, advertising, retailing, entertainment, and travel
  - Real-time control and monitoring