

멀티미디어 데이터베이스 기술현황과 발전방향

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Multimedia Management

- Naive View**
 - images, audio, and video**
 - store these as BLOBs, along with a tag, in an RDB for read retrieval**

Multimedia Management (cont'd)

- Full View**
 - store arbitrary structure of arbitrary types of data, from arbitrary data sources, from arbitrary data devices, on arbitrary data devices**
 - retrieve desired data based on tags or content patterns**
 - process data with arbitrary new programs**

Multimedia Management (cont'd)

- Definitions**
- arbitrary data types**
 - static data:**
alpha numeric, text, spread sheet, still photograph, image, static wave form
 - dynamic data:**
audio, video, motion picture, animation, music, dynamic wave form
- arbitrary operations**
 - seek, forward, fast forward, rewind, insert, append, delete, etc.**

Multimedia Management (cont'd)

- Definitions (cont'd)**
- arbitrary data sources**
 - native database, external files**
- arbitrary data devices**
 - capture device:**
 - video camera, OCR device, keyboard, microphone, etc.**
 - storage device:**
 - magnetic disk, CD ROM, video disk, tape, etc.**
- presentation device:**
 - computer monitor, printer, etc.**

Multimedia Management (cont'd)

- Definitions (cont'd)**
- arbitrary external programs**
- text processing system,**
- full-text search system,**
- image compression/decompression programs,**
- image processing program,**
- content recognition systems,**
- multimedia device drivers,**
- etc.**

Multimedia Applications

- **Unlimited Potential**
 - **email with voice annotations**
 - **word-processing document with video sequences**
 - **hospital patient record with X-ray and CAT scan images**
 - **etc.**
- **matching finger prints, voice prints, and head shots**
- **finding tumors in CAT scan images**
- **trademark search**
- **finding a red automobile in a video**
- **finding similar words to a given word in an RFP**
- **etc.**

Multimedia Applications

- Many Many Markets**
- government**
- military**
- law enforcement**
- manufacturing**
- telecommunications**
- entertainment**
- security systems**
- medical/pharmaceutical**
- Internet/WWW service**
- others**

- Database Technology
for Multimedia Management**
- Simple Storage and Retrieval of Primitive Multimedia Data**
 - text, image, audio, graphics**
 - file systems or RDB BLOB mechanism**
 - Multimedia Content Search**
 - finding stored primitive multimedia data that match user-supplied data**
 - multimedia data indexing technology**

**Database Technology
for Multimedia Management (cont'd)**

- Management of Compound Multimedia Documents**
 - document consisting of other documents and primitive multimedia data**
 - object–relational multimedia database technology**
- Full Multimedia Management**
 - management of compound multimedia documents, with content search, comprising of data from arbitrary sources and devices, with ability to interact with arbitrary external programs**
 - object–relational multimedia database systems, plus extensible multimedia framework, plus multimedia content search**

Database Technology (cont'd)

- **Simple Storage and Retrieval of Primitive Multimedia Data**
 - **store digitized images and audios as BLOBs in an RDB, along with tags**
 - **retrieve data using tags as index keys**
 - **store videos in a separate VOD system, and use RDB for keeping data about videos**
- (- RDBs typically store text in a long field, and allow regular-expression search of word combinations; also allow incremental updates to BLOB data.)
- **problem: RDB merely provides file space for digitized data in a BLOB, but knows nothing about the structure or semantics of data; no content search is possible either.**

Database Technology (cont'd)

- Multimedia Content Search**
 - for fast search, create and maintain an index on stored multimedia data**
 - index should be created automatically; human cost of conventional indexing approach can be prohibitively high**

Database Technology (cont'd)

- Multimedia Content Search (cont'd)**
- APRP technology (Adaptive Pattern Recognition Processing technology from Excalibur Technologies)**
 - neural-net-based pattern recognition and learning technology and supports exact and fuzzy matching**
 - an index is created based on the binary pattern of a stored multimedia data**
 - index may be created on any type of multimedia data (text, photograph, graphics, image, audio, video)**
 - an index pattern is created for the binary pattern of a query, and is used for matching against stored indexes**
 - proven technology, but today limited by hardware power, memory, environment, etc.**

Database Technology (cont'd)

- **Management of Compound Multimedia Documents**
- **two object-relational multimedia database systems support this (UniSQL and Illustra)**
- **users may dynamically**
 - **add new multimedia data types**
 - **combine different types of data into compound documents that contain other documents and primitive multimedia data**
 - **retrieve components of a compound document, and re-structure the document**
- **full database system facilities are brought to bear**
 - **queries, transaction management, authorization, triggering**

Object-Relational Foundation for Multimedia Framework

- Object-Relational Database
= Relational Database +
Object-Oriented (Hierarchical) Modeling**
- Enables Complex Data Management**
 - complex structure (set, complex object)**
 - arbitrary data types (ADTs, classes)**

Relational Database Technology

- Major Problems (Fixed with Object–Oriented Extensions)
 - a field contains only one data item
 - leads to duplication of records (and performance penalty)
 - the data item may be alphanumeric
 - no support for multimedia data
 - a record cannot contain a pointer to any other record
 - difficulty in representing and accessing complex nested data
 - no record fetch via pointer chasing

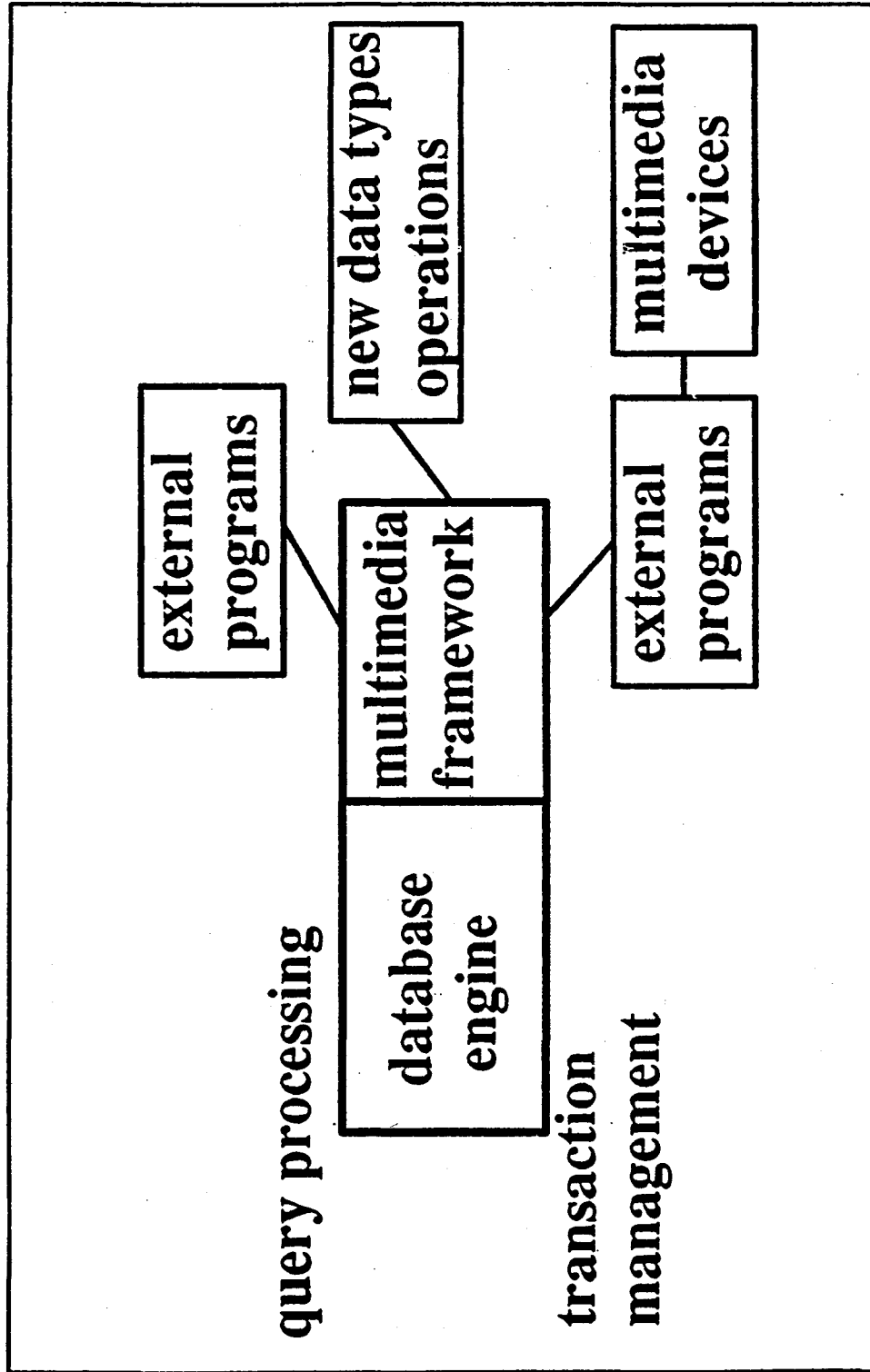
Object--Oriented Extensions and Multimedia Data Management

- Object--Oriented Model Enables**
 - uniform treatment of arbitrary data types**
 - dynamic composition and management of arbitrarily complex data (compound multimedia documents)**
 - extensibility**
 - dynamic creation of arbitrary data types**
 - dynamic specification of procedures (methods) on data**
 - dynamic specialization of data types and methods**

Database Technology (cont'd)

- Full Multimedia Management**
 - two object–relational multimedia database systems support this to different degrees (UniSQL and Illustra)**
 - users may add new multimedia data types (classes) and operations on them (methods) to the system–provided framework**
 - users may cause the database system to interact with arbitrary external programs**

Database Technology (cont'd)

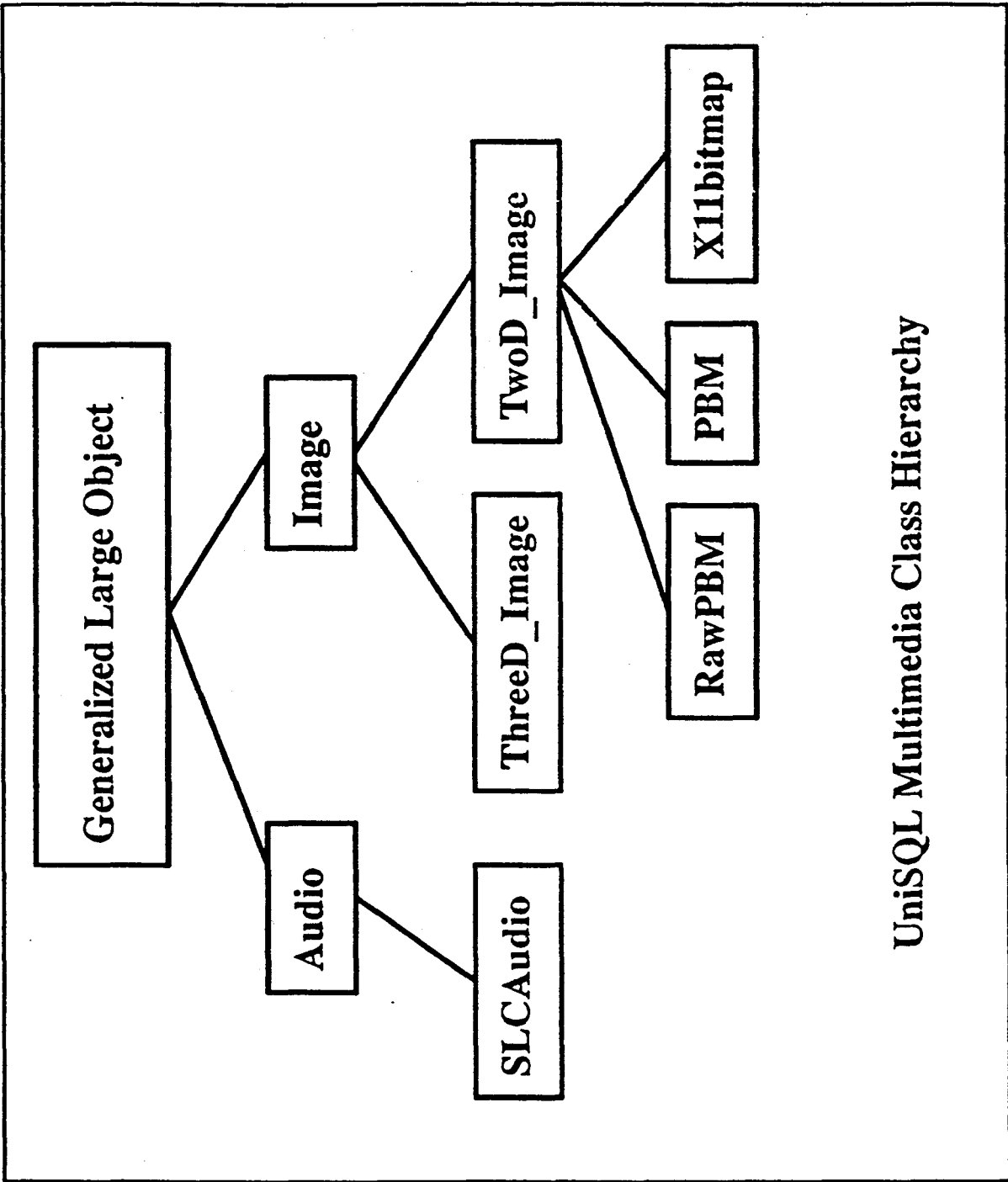


UniSQL Multimedia Framework

- Uniform Treatment of Arbitrary Data Types**
 - storage and retrieval of arbitrary data types**
 - dynamic addition of arbitrary data types**
 - multiple inheritance from existing data types**
 - to create new data types tailored to applications**
 - dynamic composition of compound multimedia data**

UniSQL Multimedia Framework (cont'd)

- Built-In Multimedia Class Hierarchies**
- Generalized Large Object class hierarchy**
 - large object in native database**
 - large object in a host file system**
- built-in methods for a GLO class**
 - new, seek, search, insert, append, copy, etc.**



UniSQL Multimedia Class Hierarchy

UniSQL Multimedia Framework (cont'd)

- Built-In Agent Class Hierarchy
 - mechanism for triggering arbitrary external programs
 - agent is defined in terms of a program to invoke and arguments for the program
 - the arguments may be GLOs
 - e.g. "MIGRATE host-file audio-object to UniSQL/X-database"

UniSQL Multimedia Framework (cont'd)

- Uniform Treatment of Data Sources**
 - same GLO methods for data stored in database and data stored in external files**
 - Agents for triggering arbitrary programs that interact with arbitrary capture, presentation, storage devices**
- Uniform Treatment of Data Migration**
 - data capture (via GLO methods)**
 - data presentation (via Agents and GLOs)**
 - data move (via Agents and GLOs)**

UniSQL Multimedia Framework (cont'd)

- Database System Functionality on Stored Data**
 - storage and retrieval of arbitrary size data**
 - incremental retrieval and update of data**
 - pattern match on textual data**
 - query based on descriptors of multimedia data**
 - transaction management**
 - concurrency control**
 - recovery**

UniSQL Plan for Extending Its Multimedia Framework

- Add Additional Classes and Methods for Primitive Multimedia Data Types**
- Extend Method/GLO Support to the Server**
- Integrate Its Framework with Multimedia Content Search Technology (Excalibur or Something Comparable)**