

Delos Integration Proposal on Semantic Multimedia Management

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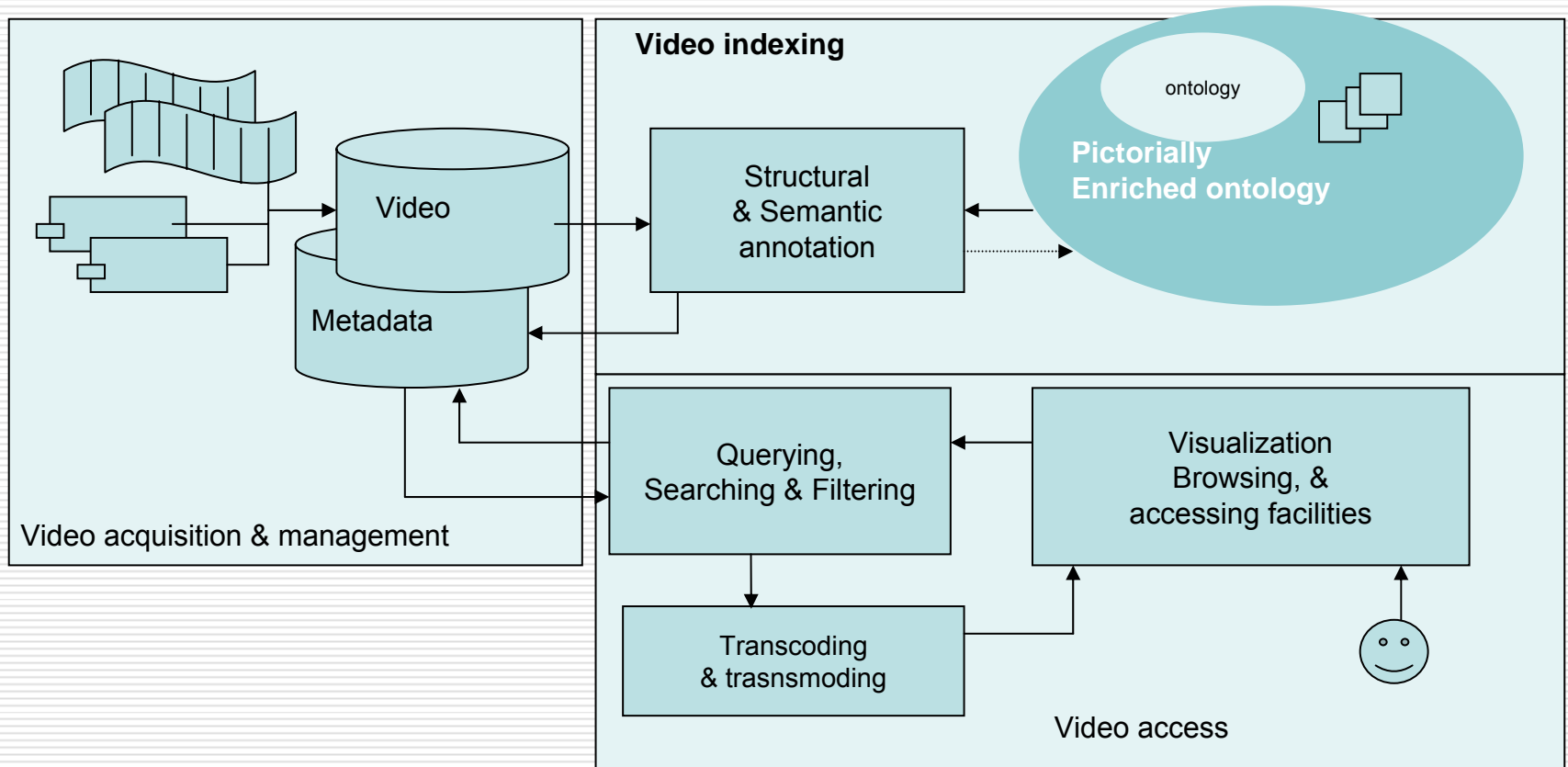
Objectives

- Investigate how the Delos II Tasks and Subtasks are related in an overall Architecture that provides Semantic Multimedia Management Functionality
 - Identify the Common Components and Software currently used
 - Explore what each Task could provide to other Tasks to facilitate:
 - The objectives of Semantic Multimedia Management
 - Interoperability across Delos II Tasks or Subtasks
 - Identify a set of Components across Tasks that:
 - Provide Semantic Multimedia Management Functionality
 - Could become Interoperable
 - Could be organized as Components of a Service-oriented Architecture with a manageable effort
- These components should:
- Provide a minimum and expandable Semantic Multimedia Functionality
 - Be Integratable on top of the OSIRIS Platform

Relevant Tasks

- ❑ **WP3 - Task 3.6:** Video Annotation with Pictorially Enriched Ontologies (VAPEON)
- ❑ **WP3 - Task 3.7:** Multimedia Interfaces for Mobile Applications (MIMA)
- ❑ **WP3 - Task 3.8:** Description, Matching, and Retrieval By Content of 3D Objects
- ❑ **WP3 - Task 3.9:** Automatic, Context-of-Capture Based, Categorization, Structure Detection and Segmentation of News Telecasts
- ❑ **WP3 - Task 3.10:** Content and Context Aware Multimedia Content Retrieval, Delivery and Presentation (CoCoMA)
- ❑ **WP3 - Task 3.11:** Natural Language and Speech Interfaces to Knowledge Repositories
- ❑ **WP5 - Task 5.4:** Interoperability of e-Learning applications with digital libraries
- ❑ **WP5 - Task 5.5:** Ontology-driven Interoperability

Towards an Audiovisual DL Architecture



Common Components and Task Interrelationships

- Common Denomination: The functionality needed to support semantic content descriptions of multimedia based on content standards (MPEG-7) and rich domain ontologies (based on OWL)
 - Provided by GraphOnto
- The Core Functionality of the GraphOnto Component was developed in T5.4
 - Interactive Graphical OWL Ontology Editor & Viewer
- The Expanded Functionality of the GraphOnto Component was developed in Tasks 3.6 and 3.10
 - Definition and editing of both Upper (standard-based) and Domain OWL ontologies and their use in Multimedia Information System Components
 - In the multimedia domain, an Upper Ontology, which captures the MPEG-7 MDS, is utilized and OWL (imported and/or interactively created) domain ontologies extend the upper ontology with domain knowledge
 - The Metadata may be stored in MPEG-7 format, in files or in an underlying MPEG-7 Repository

Common Components and Task Interrelationships

- Most of the GraphOnto functionality may be offered in a Service-Oriented fashion:
 - Retrieval of ontology information to support ontology browsing
 - Ontology validation
 - Ontology-based metadata definition (this requires the existence of ontology information retrieval services)
 - Definition of ontology mappings (this requires the existence of ontology information retrieval services)
 - Translation of Ontology-based Queries, using different ontologies for which mappings exist
 - MPEG-7 Repository access (including search and filtering services) and population

Common Components and Task Interrelationships

- In task 3.6 (VAPEON) GraphOnto is used to create Pictorially Enriched ontologies
 - It interoperates with the structural software and the automatic extraction software
- The following integration activities may be carried out:
 - Integration of the GraphOnto component with the Annotator developed by UNIFI-MICC
 - Integration of the GraphOnto Component with the VideoBrowse Component
 - Utilization of the MPEG-7 Repository for the storage and retrieval of:
 - MPEG-7 compliant multimedia content descriptions using the UNIFI-MICC annotator
 - MPEG-7 compliant segments and summaries defined using VideoBrowse
 - Development and integration of audiovisual feature extraction services (in conjunction with Task 3.10)
 - Development and integration of CBR Services (in conjunction with Task 3.10)

Common Components and Task Interrelationships

- In task 3.10 (CoCoMA) GraphOnto is used for the creation, storage, and management of the semantic video metadata
 - The metadata (MPEG-7 using ontologies) are described as XML schema and XML data and are managed by an XML database
- The following integration activities may be carried out:
 - Integration of the (low level feature-based) Content-Based Retrieval (CBR) functionality provided by the VizIR framework with the Semantic-Based Retrieval (SBR) capabilities provided by the MPEG-7 Repository
 - Possible integration with T3.6
 - Integration, in the UNIMI authoring tool (MPAT), of the ontology-based object annotation capabilities provided by GraphOnto
 - Access, from the MPAT, to the MPEG-7 Repository to store and retrieve metadata descriptions of the multimedia objects participating in the presentations authored using the MPAT
 - Development of a connector that allows the MM4U framework to utilize:
 - The querying capabilities of the MPEG-7 Repository
 - The user preference descriptions (standard MPEG-7 or semantic-based) stored in the MPEG-7 Repository
 - Development and integration of audiovisual feature extraction services (in conjunction with Task 3.6)
 - Development and integration of CBR Services (in conjunction with Task 3.6)
 - Semantic Adaptation support, utilizing ontologies (in conjunction T3.7)

Common Components and Task Interrelationships

- In task 3.11 (Natural Language and Speech Interfaces to Knowledge Repositories) GraphOnto is used:
 - As a basis for creating ontologies
 - As the storage management of the metadata
 - For the support of semantic MPEG-7 descriptions

The natural language interface software can tightly integrate on top of it to provide natural language based access to semantic metadata repositories including semantic multimedia metadata access

- In task 3.9 (Automatic, Context-of-Capture Based, Categorization, Structure Detection and Segmentation of News Telecasts) GraphOnto is used to provide management for ontologies that are used as part of automatic multimodal extraction software
 - Cross-fertilization with T3.6

Common Components and Task Interrelationships

- In task 5.4 (Interoperability of e-Learning applications with digital libraries) GraphOnto provides:
 - Management of 3D ontologies and 3D metadata which are stored in the XML database
 - Possible Integration with T3.8: semantic and non-semantic 3D indexing integrating mechanisms to automatically extract semantic information for a 3D object, or for a 3D scene
 - Content Based Retrieval of 3D objects UNIFI-MICC
 - Support for 3D MPEG-7 Descriptors from UNIMORE
 - Instructional ontologies
 - Learner profiles
 - Learning designs
- In task 5.5 (Ontology-driven Interoperability) GraphOnto is used to manage mappings among ontologies in the cultural domain

Conclusions

- The above tasks already interoperate to some degree towards providing the functionalities needed in semantic multimedia architectures
- In the future the focus of the Tasks should be towards providing:
 - Service oriented interfaces to the outside world
 - Compatibility to the OSIRIS platform
 - Enhancement of the interoperability across their subcomponents