

Call for a Common Multimedia Ontology Framework Requirements

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1. Introduction

The need for a common multimedia ontology comes out from the research experience of our team, both in the framework of a Network of Excellence (MUSCLE- Multimedia Understanding through Semantics, Computation and Logic) and of a collaboration with the Russian Academy of Sciences (RAS).

Within the MUSCLE-NoE, we are working to show possible strategies for the interoperability of multimedia groups. ISTI is in fact leading the WP9 Working Group (Representation and Communication of Data and Meta-Data), particularly dedicated to enabling interaction and exchange of meta-data emanating from different MultiMedia modalities. This requires standardization of data and meta-data formats and thus we have been interested in analyzing requirements for multimedia elaborations and made a state of the art study of possible standard schemas and frameworks (see <http://si-lab.isti.cnr.it> and <http://muscle.isti.cnr.it> web sites for details).

In the end, we have to acknowledge the need to extend the available technology towards multimedia ontologies. To add more semantics in order to be able to handle applications that require annotation, retrieval, summarization of multimedia documents. Furthermore, the extension has to be done in line with Semantic Web technology, to provide for easiness of integration and interoperability with other existing applications and tools and widespread among different communities of users.

Additionally, as “Signals and Images” group we have years of experience within the field of image representation and understanding. We acknowledge the need to add semantic annotation to image representation as a value-added contribution to possible applications that require intelligent, non-naive retrieval and possibly “reasoning”. Within the collaboration with the Russian Academy of Sciences (RAS) we are in fact also considering the implementation of ontology for image understanding in line with the latest Semantic Web technology.

2. Requested items

Requirements of the “minimum set”

In the framework of the above mentioned activity within MUSCLE, we have collected information on metadata schemas and frameworks standards and we have considered MPEG-7 as the most mature and universally recognized most complete. Anyway, as it is nowadays widely recognized, we also must admit that MPEG-7, among its advantages related to its completeness to represent metadata of image, video and sound and its suitability to be used in connection with Semantic Web technology, it presents important limitations.

Thus, we are working towards possible approaches for extending it by adding semantics, in particular for annotation, (intelligent) retrieval and, possibly, reasoning.

To this aim we are looking on existing tools and, in particular, tools to define and manage ontologies, already developed ontologies, integration of existing ontologies, etc.

Identification of the characteristics to be represented

Starting from image understanding problems (e.g. segmentation, analysis, ...), we are working to the realisation of a thesaurus containing related concepts and algorithm.

It would important to represent features on how metadata could be extracted so that it could be used at a higher level for images and multimedia information

handling in general.

We have defined this meta-information as morpho-densitometric (shapes, how the object is made, ...) and spectral characteristics.

Another important feature would be to take trace of how a specific result has been obtained starting from a particular input.

Harmonisation approaches

- Within the Muscle NoE framework we prepared and distributed a questionnaire with the aim of collecting information and requirements from the partners (and possible users). This questionnaire was designed taking into account that the users were known and their fields of interest too.

- We are working at the definition of ontology for image understanding

- Research communities working on standards are developing upper ontologies in order to achieve interoperability among metadata, and integration of MM data.

An upper level ontology defines structures and concepts upon which single domain ontologies could be implemented. An upper ontology is defined through abstract concepts, which are generic enough to be exploited by a wide range of domains. And in fact they are especially suitable for MM data interoperability and integration.

Furthermore, an upper ontology should be defined in such a way to be extended from other ontologies. In fact, when an ontology is not sufficient to supply the requirements, the procedure should be to extend an existing ontology with other identifiers and definitions, and not to build a new one.

An upper ontology is necessary to permit the integration of multi-source MM information. In fact, it is essential for accurate mappings between metadata vocabularies and the construction of services, such as cross-domain searching, tracking, browsing, data mining and knowledge acquisition. By combining metadata from various initiatives (Dublin Core, MPEG-7, MPEG-21, CIDOC/CRM, ...), an upper ontology could also provide a basis for semantic interoperability and the development of services based on deductive inferencing.

The advantages of defining domain-independent upper ontologies can be identified in the overlaps, redundancies and incompatibilities between the semantics of terms used for example in both MPEG-7 and MPEG-21. Moreover, providing a common model having a single set of semantic definitions, would facilitate the efficiency and interoperability of MM systems based on the lower-level integrated standards.

Interesting projects focused to the development of upper ontologies are available in literature. From our side we are developing a specific approach whose preliminary results have been presented at EWIMT 2005.

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