APPROACH TO MANAGE SEMANTIC INFORMATIONS FROM UGC

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Abstract: The purpose of this work is to face the issue of classification variety and non-homogeneity, especially in Web 2.0, for User Generated Content coming from popular digital platforms. The solution offered to this problem is an approach based on an ontology that can represent information, typically associated with UGCs, integrated with a unique mapping technique amongst ontology contents and UGCs contents coming from other platforms. Regarding standard information and information shared by many of these objects, existing relations are exploited through mapping, when possible; otherwise new ones are created when it is deemed necessary. Such an ontology can represent, as embedded information, folksonomies and all non-standard information. That kind of information, despite being unclassifiable by means of standard schemas like the UGC ones, can be mapped. Rather than representing all properties of digital content, we were concerned with having an ontology that could associate semantic value to every tag, standard and not.

1 INTRODUCTION

This work deals with the issue of usability of different content types: bibliographical, digital text, customised, as well as content types that, stemming from different digital platforms, offer different means of representing information. Software platforms that handle great quantities of multimedia content, especially User Generated Content, are steadily increasing nowadays. The prominent features of such platforms are their ease of use, the possibility for users to create and manage their own spaces (personal channels or pages), the implementation of efficient content research and localization methods, and the definition of access and usage types. Objects with these features appeal to more and more users, requiring an ever-growing number of applications. The main drawback of such platforms lies in their poor interoperability, which does not allow for a complete usability of contents. Thus contents cannot be shared with other platforms, in particular aggregation or multi-source ones. These problems drove us to using a semantic representation of data and resources. We started with the idea of a Knowledge-base, based on an ontology able to provide contents originated in UGC sources like Flickr, Youtube and Wikipedia, along with what was entered by users of the system itself. The knowledge-base had to be able to receive and manage contents, assigning them an unambiguous meaning. We then followed an approach based on choosing an ontology already in existence, able to represent the semantics of known multimedia content. As a starting point, we chose the most used standards to represent metadata in this domain: Adobe XMP, DUBLIN CORE, EXIF, IPTC and other types of standardised metadata. Typical tags for UGCs were analysed next, and a rule was defined to reconcile the tags with metadata of the chosen ontology as well as to import the other tags as embedded in specialised metadata (e.g., folksonomies in Flickr).

This document is organised as follows: section 2 deals with the state of the art for multimedia content ontologies; section 3 offers a review of the state of the art for User Generated Contents tags, while section 4 hosts observations on issues concerning mapping and the description of the proposed approach. Lastly, conclusions are listed in section 5.

2 MULTIMEDIA ONTOLOGIES

When multimedia content ontologies (Schreiber, Dubbeldam, Wielemaker and Wielinga, 2001) are described, the ones with a working range including

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many application fields, (such as Content Visualization, Content Indexing, Learning, Reasoning and Sharing) are considered. The solution is in the usage of semi-automated building techniques with the purpose of simplification of previous steps. Many attempts at building multimedia ontologies can be referenced.

In (Jaimes and Smith, 2003), ontologies were built manually. Textual information provided in videos was manually extracted and assigned to concepts, properties, or relations within the ontology.

New methods for semantics knowledge extraction from annotated images are presented by Benitez and Chang (2003). Perceptive knowledge is built by organising the images in clusters based on their visual and textual features. Semantic knowledge is extracted removing all semantic ambiguity, using WordNet and image clusters.

In Strintzis, Bloehdom, Handschuh, Staab, Simou, Tzouvatras, Petridis, Kompatsiaris and Avrithis (2004), a Visual Descriptors Ontology and a Multimedia Structure Ontology, respectively based on MPEG-7 Visual Descriptors and MPEG-7 MDS, are used together with a domain ontology so as to support content annotation.

In Bertini, Cucchiara, Del Bimbo and Torniai (2005), ontologies enhanced with images were introduced to automatically annotate videos. Clip highlights were considered as examples of ontology concepts and were directly related to corresponding concepts, grouped into subclasses based on their perceptive similarity. BOEMIE (Bootsrapping Ontology Evolution con Multimedia Information Extraction) uses a synergistic approach that ties multimedia extraction to ontology evolution, by operating automatically a continuous extraction of semantics information from multimedia contents. This action aims to create and enhance ontologies. On the other hand it aims to spread the ontology to improve on the resilience of the extraction system. MOM (Multimedia Ontology Manager), as seen in Bertini, Del Bimbo, Torniai, Cucchiara and Grana (2006), is a complex system, developed according to the principles and concepts of ontologies, enhanced through images.It supports dynamic creation and update of multimedia ontologies; and offers functionalities to automatically perform annotations and create extended textual comments. It also allows for complex queries on video databases. Based on the same ontology, there is also OntoMedia: a multimedia ontology based on an information system. Its main purpose is managing big multimedia collections using semantic metadata integration techniques. The annotations on multimedia documents were generally developed according to two different routes. Both approaches were focused on low-level descriptors. Our ontology (for which a brief description will be provided in the following sections) is conceived as a tool able to exploit pre-made schemas in order to represent content belonging to various types and coming from different sources. Such schemas are typical of standards and were used as means to model the domain.

3 UGC

The most powerful applications and the most common platforms usually have these features: easy and fast content search by keywords, link usage for easy navigation in contents, content editing by users themselves either iteratively (Wikipedia) or cumulatively (blogs and forums), content classification through “tags”, possibility to direct users to offers (any kind) through “collaborative filtering”-type algorithms, real time notices through RSS for content change or editing. The usage of all those new technologies encouraged the success of such systems for socialising, where a remarkable exchange of information of many types (text, video, audio) and from different sources takes place. Users create communities, sharing comments, opinions and above all their own knowledge and experience.

The term 'UGC' nothing but points out how the Web is evolving more and more towards being a product by its very users, labelled with the new name of 'prosumer' (producers and consumers). Every publicly accessible content type, with an added share customised by the user, is part of the UGC universe. We considered two kinds of such content, for which we analysed and compared metadata, that is contents from Youtube and Flickr. The differences can be immediately noticed. In the first case, there is mapping possibility, directly or not, through schemas and standard properties; in the second, the usage of a new cataloguing method, typical of the platform and coming from a new school of thought, with no compliance with any standard.

An example of this can be the atom id tag, that “*specifies a URN that uniquely and permanently identifies a feed or video entry.”*

The Dublin Core Standard element dc.identifier is *“An unambiguous reference to the resource within a given context.”*

Given the semantics in common between the objects we can thus perform a direct mapping between this Atom tag and the dc.identifier element from Dublin Core.

Table 1: Disambiguation: direct mapping

Mapped Tag	atom:id
Semantic description	Specifies a URN that uniquely and permanently identifies a feed or video entry.
Standard Metadata	dc.identifier
Identifier	An unambiguous reference to the resource within a given context.

The problem with User Generated Content, coming from the various platforms considered, is that they display marked differences in classification of associated information. We considered also Flickr and Youtube, which, despite handling customizable multimedia content customized by users, consider a different way to represent information. In Youtube's case, it is often possible to create relation via a direct mapping in general, and indirect mapping in some special cases. Regarding Flickr, instead, we faced a "customisation" of the information, exploiting Folksonomies to catalogue all information without a standard. Some information is natively represented, other is included in metadata. The latter can be mapped in an ontology that, starting from the usage of standards, provides for receiving and cataloguing information in existing tags or tags for which a new relation was created.

4 PROPOSED APPROACH

The purpose of this work was to offer a different approach for the usability issue of User Generated Content coming from the most popular digital platforms. In order to solve this problem we propose, as a solution, an approach articulated in few easy steps: 1) Selection of an ontology able to represent information typically associated with such contents, among what is already available. 2) Improving this ontology with a number of mapping rules that allow for representing information coming from sources like UGCs not complying to standards. This technique can exploit different relations when possible, or creating new ones whenever necessary. This is especially true for information proper and common to many contents. 3) Integrating other pieces of information of this ontology in fields that can store non-mappable information with the above mentioned technique. In such fields typical tags for the platforms, as well as tags defined by users (folksonomies) can be stored. With this approach, we can store all non-standard and unclassifiable information inside the ontology, by pre-made schemas. Rather than representing all properties of digital content, we were concerned with having an ontology that could associate semantic value to all non standard, mappable tags as well as storing also information found in non-mappable tags.

The ontology does not need to be able to represent everything, but to use what is already available for representing known and classified information such as author, URL, etc. It also must use that mapping amongst infrastructures and information provided by the platform.

For every information for which no schemas or tags are present, i.e. for everything non-standard, like user comments and other new default information, folksonomies are used.

Below is a peculiar example of Web content acquisition for content related to an image stored in the Flickr platform, and of related metadata management. For example, Flickr provides a tool, flickr.photos.getExif, that allows for reading the metadata set associated to a given content. Entering the last number of the address into the tool, a list of tags that include that information, is returned. In order to enter such data in the ontology, it is necessary to create various instances to represent content, format, the schema-Exif describing it, instances for each data type associated to each tag and related values. As you can see, not all retrieved data were created inside our ontology, so an Atom feed needed to be associated to the content, so that it can collect unknown metadata in bulk. These metadata are partly complying with the Exif standard (and mapped with the typical rules of the standard as such) and partly belong to Folksonomies. The above mentioned mapping rules were applied, and part of the data were inserted, while the rest was inserted in the FlickrFolksonomies class. As for the mapping, it was necessary to manually enter what was not provided for by the scheme of the ontology. We inserted the information related to all properties and created the link amongst them and between them and the various metadata so that they could be represented univocally and no information could be lost. In our example the first thing to be created was, with the aid of the tool, the MultimediaContent class; the name 'CastellodiArco' was then associated to it, exploiting the 'instance browser. It could be noticed that, for the properties previously created, the hasMetadataLocation and doesExpress fields

appear already compiled. On the other hand, we had to define the elements to insert in the hasMetadataDescription field and the ExifSchema, ExifSchemaCastellodiArco, UnknownMetadata and UnknownmetadataCastellodiArco instances.

The latter belongs to the class devoted to the representat ion of unknown metadata belonging to a standard.

At this stage, the ExifSchemaCastellodiArco instance could be filled out with all the fields returned by the Flickr tool. In this way an univocal correspondence between information and metadata related to it was created. The entire Exif schema must be checked in order to know which tags of the picture are present or not. We entered the missing data manually.

Once the values were ready to be entered into the tags, we created a different data-type instance for each data. Afterwards a Date_1-type instance was created for the tiff:dateTim*e* tag. Since the data type belongs to the Exif schema, it requires some additional attributes for temporal information (exif:subSecTimeDigitized,exif:subSecTimeOriginal exif:subSecTime); thanks to the existing relations, the fields related to such attributes were displayed as well.

5 CONCLUSIONS

In this work, we suggested a new approach to solve the problem of actual availability of UGC. This approach is especially suited for all those instances when a multimedia content is considered for which associated information do not comply with standard in categorizing metadata. Special attention has to be paid to widespread standards like Adobe XMP, DUBLIN CORE, EXIF, IPTC.

In fact, in those cases, a synergistic integration of an ontology based on the standard with the usage of a clearly set mapping technique allows for representing a great number of contents and metadata. This mapping technique was especially useful to sort out a vast and complex knowledge field such as multimedia content. Dealing with mapping arose the necessity of using shared standards rather than proprietary ones, now very widespread. The proposed approach may be used as support for a software platform that allows different actors to develop added-value services. Such services could be based on multimedia content insertion into a semantic organisation context. It is clear that such an approach should rely on a powerful tool which could map all the information concerning entered contents in relation to the form decided as representation standard within itself.

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