Community-based Annotation of Multimedia Documents

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ABSTRACT

In this paper, we analyse the process of annotating multimedia documents inside a community as a way to enable knowledge sharing and reuse.

Keywords

Semantic annotation interfaces, multimedia enrichment, cooperative annotations, knowledge sharing.

1. INTRODUCTION

Nowadays a large and growing amount of information is stored in various multimedia formats, such as images, video, audio and it is therefore important to discover a way to manage this information. Previous research in personal image management [7, 8] and text annotation [3, 5, 6, 9] demonstrated how annotating images or documents could be a way to organise information and transform it into knowledge that can be retrieved easily later. Literature also details how manual annotation can be a labour intensive and tedious task [3]. Several tools already use metadata, free-text annotations and ontology-based annotations to enrich images and documents with added knowledge [3, 5, 6, 7, 8, 9], but a step further can be reached by providing methods to reuse the produced knowledge.

By sharing annotations inside a community of users can make the annotation task easier and facilitate the reuse of annotated knowledge, suggestions and recommendations could be provided on the basis of other users annotations. Previous research has investigated collaborative annotation systems for mobile phones [2] and for personal images collections [4]. The aim of our project is to offer users an interface for performing multimedia document enrichment in a shared environment, while using intelligent techniques to provide suggestions.

1.1 How is the annotation performed?

As previous research demonstrated there are various ways of annotating documents, especially images, when doing different tasks: (1) There are numerous business users for which precise image annotation is very important, for example patent agents, journalists, professional image researchers or simply users inside an organisation (E.G. for Knowledge Management). Typically users require not only an accurate description of the image

characteristics (i.e. shutter speed, date and so on) but also domain specific knowledge (patent number, location, product ID, etc.). In this scenario, the annotations should be performed in a standardised and constrained manner, typically using a strict ontology to ensure that the information is consistent and can be shared among the user's community. (2) In other cases, the strict standardisation and constraints are less relevant, for example users that simply want to annotate their own pictures for sharing with friends: in this case the social dimension is more important; there is no need of formal classification but more of a way to attach emotions and memories, to be able to retrieve them in the future. In these cases free-text annotation prove to be more interesting for the users [7].

Another important consideration is to identify and make explicit relations between annotated instances both within a single document and external resources. Relations can be cross-media, so they may interrelate, for example, text with part of an image: "engine1000" mentioned in the text could have a relation, for example, "has_part" with an instance "turbine" identified in a picture.

In our project we aim to conciliate these approaches providing an interface for adding ontology-based, free-text and relational annotations within multimedia documents. This conciliation of approaches allows a user to perform any desired annotation for any required task.

1.2 Sharing annotations in a community

The idea of sharing annotations inside a community is particularly powerful if thought in terms on Knowledge Management (KM). In a KM perspective, the knowledge must be shared to maintain the organisational memory through time [1].

We propose to use semantic annotation inside KM applications to ease the explicitation of the implicit knowledge. The process of annotating a document should start from a shared ontology that is agreed between the members of the organisation and will be used as a common vocabulary to annotate the documents in a consistent way. Moreover free-text annotations can be used to add personal comments or opinions on the document in general or on the annotations and relations can be identified between the found instances and commented. If the annotated documents are then shared inside this community also the attached annotations could be. This sharing facilitates the annotation task and makes other users aware of comments and opinion that may be particularly relevant and otherwise would get lost

2. Community Annotation in AKTiveMedia

AKTiveMedia is a user centric system for multimedia document annotation, developed at the University of Sheffield. AKTiveMedia allow users to annotate textual, image or multimedia documents in a collaborative way, sharing their experience with other members of the community. Language technologies and a web service architecture are adopted to provide a context specific suggestion mechanism: for example when the user is annotating a region of an image as a "part" of an engine, the system suggests all the possible parts present in the ontology or in other user annotations for that engine and the user can select the right one. The same happens for relations, again inferred from the ontology and the knowledge base and suggested to the user on the base of the concept selected: for example, when the part has been chosen, the user can select a "has_fault" relation and drag and drop the text in the document that describes the fault; when they are inserting a free-text for describing a fault, the system offers suggestions based on what other users previously input. Sharing in AKTiveMedia is possible due to the use of a two steps persistence model to save the annotations: 1) when the user annotates a document, the annotations are fist saved in a local repository, 2) then they are imported by an automated web service into a central repository. This operation is repeated at regular intervals (see Figure 1).
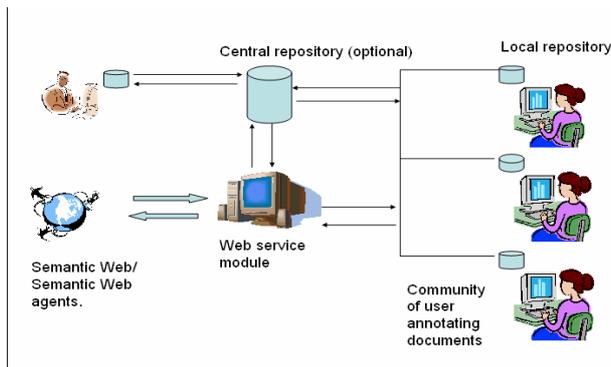

Figure 1 - AKTiveMedia two step persistent architecture

While the user is annotating a document, the system automatically performs an intelligent query on the central repository that contains the annotations knowledge base and extracts possible annotations and comments previously inserted by other members of the community and suggest them to the user. This mechanism can be used in two different ways in the annotation process: (1) to suggest a new annotation inside an image or a document; (2) to auto-complete the fields when the user is typing an annotation. Offering an auto-completion service enables the user to choose from alternatives already inserted by other users, thus preserving consistency while annotating. Suggesting new annotations and related documents is instead a way to make explicit connections and ideas that were not known to a user, taking advantage from the experience of the community. The produced knowledge is also used as a way to establish connections with and to navigate the information space: when the user annotates a part of an image as "sand-damage" upon a "turbine" the system uses those annotations to retrieve other related images and document. We believe this process could facilitate knowledge sharing inside a community but could also create privacy problems about the visibility of annotations and comments. These privacy issues are addressed by marking the annotations as public, private or restricted, thus presenting them only to users with the right to access them.

4. REFERENCES

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