A Semantic Model for the Authorisation of Context-Aware Content Adaptation

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ABSTRACT
This paper considers the authorisation of context-aware content adaptation in a generic multimedia scenario based on a semantic model. The Context Aware Ontology (CAO) models the Universal Environment Descriptor (UED) tool contained in the MPEG-21 DIA standard, and its context representation feeds an Adaptation Authorisation based on the RRDoOnto (Represent Rights Data) ontology, which grants that Intellectual Property rights will be respected along the Value Chain while supporting the MPEG-21 license model. The integration of both is described, providing a joint model that allows the adaptation to be controlled by Content Creators and Content Distributors.

Keywords
MPEG-21, Digital Item Adaptation, Rights Expression Language, Context Aware Ontology, RRDoOnto

1. INTRODUCTION
Content adaptation is an essential element in Universal Multimedia Access scenarios to enable users to access any type of content anywhere and anytime. Context information is required to decide how and when to adapt content, so as to meet users’ expectations and satisfy usage environment constraints. However, content is often considered an artistic work and therefore subject to the Intellectual Property (IP) environment legislation. If an adaptation is performed without the consent of the rights holder, copyright laws are infringed. Both Content Creators and Content Distributors have to express digitally their authorisation in the framework of a Digital Rights Management (DRM) system.

The MPEG-21 standard (ISO/IEC 21000) proposes a framework for multimedia applications where a generic Digital Item (DI) is the unit of content. Digital Item Adaptation (DIA, part 7 of MPEG-21) identifies and represents context to assist operations to adapt the DI. Rights Expression Language (REL, part 5 of MPEG-21) defines XML Schemata to specify licenses authorising users to execute specified rights over the DI. A joint use of REL and DIA can be found in [2], but their focus was on syntactic integration rather than covering a complete DRM scenario.

2. A VIRTUAL COLLABORATION SYSTEM
The semantic bridge between MPEG-21 REL and DIA presented here is given in the context of the project VISNET-

3. SEMANTIC REPRESENTATIONS
The expressiveness in the MPEG-21 DIA is given by a set of XML schemata. Whilst providing a structured representation of the context, they are not sufficiently rich to describe more complex real world situations and relations and are not the most suitable to enable computer reasoning. Thus, the CAO ontology describes semantically the UED tools. Additionally it includes the description of a media profile derived from the MPEG-7 Multimedia Description Schemes (MDSs). The main classes in CAO ontology are based on these standards, but not literally translated. The domain knowledge, here conceived, can be used to model domain rules and heuristics that help to improve the quality and effectiveness of adaptation decision [3].

The RRDoOnto ontology is an OWL ontology aimed at repre-

1VISNET II Network of Excellence, IST-2005.2.41.5
senting the Intellectual Property Value Chain [4]. RRDonto is a part of the Interoperable DRM Platform, a proposal of the Digital Media Project to make DHM systems to become truly interoperable and to extend its benefits to all involved parts. The RRDonto has applicability in any information system and is based in the idea that IP rights do exist and they are transferred along a provenance chain which starts in the Content Creator and finishes in the End User. The RRDonto, coded as an OWL DL ontology, represents the elements and the roles involved in this Value Chain, and their relations. The IPEntity class represents anything subject to the Intellectual Property laws, over some Actions can be performed by users playing certain Roles. Through the use of Permits, users can authorise the execution of these actions; this Permit class the binding point to the CAO.

4. THE ADAPTATION AUTHORISATION

Content Creators retain moral rights enabling them to veto changes over their works (distortion, mutilation etc.). In addition, Content Distributors, who presumably perform the adaptation, hold the distribution rights over the work and may be interested in modifying the features of the distributed content. Both the original author and the distribution rights holder are in conditions of issuing licenses over content.

This licensing procedure has been done through paper contracts or by issuing MPEG-21 REL licenses including one of the defined rights -mx:adapt, mx:modify, mx:governedAdapt-but the AA proposed here can manage instances of the Permit class of the RRDonto ontology, and context information expressed semantically with the CAO ontology descriptors. Thus, a matching of concepts can be done between these ontologies and DIA. The MPEG-21 User is an abstract agent (person or machine) who executes functions over digital items (“Media” in the CAO Ontology, “IPentities” in RRDonto) and matches the RRDonto incarnation of one or more roles definition of User. Context state (terminal, network etc.) represents positive facts that can be combined in a Permit as deontic statements: Requirements or

5. CONCLUSIONS

Content adaptation can be based on more expressive descriptors defined on the CAO ontology, and its authorisation is a mere inference which takes into account complex permits conditioned by these descriptors. The presented model represents a novelty and enthusiastic application on how to formulate an adaptation based on authorisation, although this potential flexibility has still to be put into practice in the framework of a Virtual Collaboration project.

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7. REFERENCES


