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Chapter 13

EMMO:
Tradeable Units of Knowledge-Enriched Multimedia Content

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ABSTRACT

Current semantic approaches to multimedia content modeling treat the content's media, the semantic description of the content, and the functionality performed on the content, such as rendering, as separate entities, usually kept on separate servers in separate files or databases and typically under the control of different authorities. This separation of content from its description and functionality hinders the exchange and sharing of content in collaborative multimedia application scenarios. In this chapter, we propose Enhanced Multimedia MetaObjects (Emmos) as a new content modeling formalism that combines multimedia content with its description and functionality. Emmos can be serialized and exchanged in their entirety — covering media, description, and functionality — and are versionable, thereby establishing a suitable foundation for collaborative multimedia applications. We outline a distributed infrastructure for Emmo management and illustrate the benefits and usefulness of Emmos and this infrastructure by means of two practical applications.

INTRODUCTION

Today's multimedia content formats such as HTML (Raggett et al., 1999), SMIL (Ayars et al., 2001), or SVG (Ferraiolo et al., 2003) primarily encode the presentation of content but not the information content conveys. But this *presentation-oriented* modeling only permits the hard-wired presentation of multimedia content exactly in the way specified; for advanced operations like retrieval and reuse, automatic composition, recommendation, and adaptation of content according to user interests, information needs, and technical infrastructure, valuable information about the semantics of content is lacking.

In parallel to research on the Semantic Web (Berners-Lee et al., 2001; Fensel, 2001), one can therefore observe a shift in paradigm towards a *semantic* modeling of multimedia content. The basic media of which multimedia content consists are supplemented with metadata describing these media and their semantic interrelationships. These media and descriptions are processed by stylesheets, search engines, or user agents providing advanced functionality on the content that can exceed mere hard-wired playback.

Current semantic multimedia modeling approaches, however, largely treat the content's basic media, the semantic description, and the functionality offered on the content as separate entities: the basic media of which multimedia content consists are typically stored on web or media servers; the semantic descriptions of these media are usually stored in databases or in dedicated files on web servers using formats like RDF (Lassila & Swick, 1999) or Topic Maps (ISO/IEC JTC 1/SC 34/WG 3, 2000); the functionality on the content is normally realized as servlets or stylesheets running in application servers or as dedicated software running at the clients such as user agents.

This inherent separation of media, semantic description, and functionality in semantic multimedia content modeling, however, hinders the realization of multimedia content sharing as well as collaborative applications which are gaining more and more importance, such as the sharing of MP3 music files (Gnutella, n.d.) or learning materials (Nejdl et al., 2002) or the collaborative authoring and annotation of multimedia patient records (Grimson et al., 2001). The problem is that exchanging content today in such applications simply means exchanging single media files. An analogous exchange of semantically modeled multimedia content would have to include content descriptions and associated functionality, which are only coupled loosely to the media and usually exist on different kinds of servers potentially under control of different authorities, and which are thus not easily moveable.

In this chapter, we give an illustrated introduction to Enhanced Multimedia MetaObjects (Emmo), a semantic multimedia content modeling approach developed with collaborative and content sharing applications in mind. Essentially, an Emmo constitutes a self-contained piece of multimedia content that merges three of the content's aspects into a single object: the *media aspect*, that is, the media which make up the multimedia content, the *semantic aspect* which describes the content, and the *functional aspect* by which an Emmo can offer meaningful operations on the content and its description that can be invoked and shared by applications. Emmos in their entirety — including media, content description, and functionality — can be *serialized* into bundles and are *versionable*: essential characteristics that enable their exchangeability in content sharing applications as well as the distributed construction and modification of Emmos in collaborative scenarios.