

**Fachbereich Mathematik und Informatik  
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# SWeMPs: A Semantic Web-enabled Multimedia Presentation System

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# Abstract

*We propose a framework for an Intelligent Multimedia Presentation System which is tightly integrated to the distributed knowledge of the Semantic Web. This knowledge integration is the basis for the development of more flexible and intelligent information services. An implementation of this framework acts as a proof of concept.*

The Web contains a lot of information but computers can't do very much with it. We have access to and a need for a lot of information (thanks to pervasive information devices such as mobile phones, PDAs, smart devices, TV, radio...) but we don't have time to find and make associations between information every time we want to. Given the need for quick, intuitive access to information, multimedia presentation is an effective form of communication - different media act as a better means to communicate dependant on the context, and synchronization (organisation of media in space and in time) can express non-verbally relationships between the content (e.g. linear presentation to represent a timeline of events).

Appropriately delivering content in the form of synchronized multimedia is a complex task which needs to meet the requirements of the user, device, and actual context. This proves to be too complex to be fulfilled by manually authoring for all possibilities. This has lead to efforts in developing systems for (semi-)automatic multimedia generation.

Knowledge representation techniques developed in earlier AI work are being applied to the World Wide Web. Through standards such as RDF and OWL, the so-called "Semantic Web" offers the potential of a large scale distributed knowledge repository built upon the existing Web infrastructure. This makes powerful amounts of knowledge available to Web-based applications as the basis for a new paradigm of Web-oriented services which are intelligent, dynamic, flexible and user-centred.

Such services could find the information we need and present it to us in an effective manner. The current situation of Web content discovery and delivery displays significant disorder and inflexibility: natural language is problematically ambiguous and Web content is only adaptive to a limited extent. Using the Semantic Web, intelligent Web clients will be able to deliver the correct information every time by unambiguously understanding the meaning of queries and reasoning on them (through the knowledge available to them on the Web) to come to an answer. Likewise, Web resources will be described with metadata that supports their selection, adaptation and presentation to the needs of the client. Such a paradigm shift in Web-based systems (from content to knowledge-centred) requires a similar paradigm shift in system models, architectures, implementations and operations. This is equally the case for multimedia presentation systems.

We propose a framework for a new type of multimedia presentation system in which the multimedia generation process is tightly integrated with the distributed knowledge of the Semantic Web. Unlike previous work in which knowledge is narrowly defined and used by the system, this approach is built with the scale and dynamics of the Web in mind. We name this framework SWeMPs - a Semantic Web-enabled Multimedia Presentation System.

The key results of our research are the conceptual model for a multimedia presentation system and the generic rule base which interacts with that model (through querying, reasoning and deriving new knowledge) to realise individual multimedia generation tasks. These form the basis for an implementation of a multimedia presentation system which is fundamentally different from existing multimedia presentation systems in that it operates at the logical or conceptual level rather than the data or syntactic level. This reflects the reality that what users seek is information (knowledge about concepts) and effective communication of that information (respecting the relationships between concepts). It leverages the potential of the Semantic Web as a distributed, large scale, accessible repository of knowledge about the world of the user just as systems today use the Web as a repository of content. The implementation of this proposal serves as a 'proof of concept' and as a basis for the evaluation of the new approach through use cases.

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# Dedication

I wish to dedicate this dissertation to the memory of Maria Julia Gramajo de Lemus.

Her love and endurance in the face of life's tribulations set an example to us all. The contribution of this doctoral research pales into insignificance in comparison to her achievements in life, and remind us always of what is truly important. She will remain in our hearts and thoughts always.

*Even when I walk through the dark valley of death, I will not be afraid, for you are close beside me. Your rod and your staff protect and comfort me.*

*You prepare a feast for me in the presence of my enemies. You welcome me as a guest, anointing my head with oil. My cup overflows with blessings.*

*Surely your goodness and unfailing love will pursue me all the days of my life, and I will live in the house of the LORD forever.*

Psalm 23:4-6





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