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Semantics in Multi-facet Hypermedia Authoring

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Semantics in Multi-facet Hypermedia Authoring

ABSTRACT

The presentation generation area of hypermedia authoring contains different approaches to address the challenge of the presentation creation process. This paper presents the approach in which the author creates a presentation following the five stages process. These five stages reflect various facets in hypermedia authoring.

Semantics in Multi-facet Hypermedia Authoring

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ABSTRACT

Multimedia presentation creation is a complex process where the multiple phases would each benefit from human intervention. This paper presents a hypermedia generation model that lets the user influence all phases of this computer-assisted human-guided process. We present our five layered approach that is based on an example of an author who creates a hypermedia essay on an art style. This working example reflects various facets in hypermedia authoring. On the base of the example we introduce requirements for the underlying meta-data. Due to this meta-data the system can support the author in making a hypermedia presentation that conveys the semantic relations from the domain in a coherent way.

1   INTRODUCTION

For domains with a critical amount of media cross referencing, such as the disciplinary context of history of art, hypermedia allows to establish knowledge spaces. In both small (a single presentation) and large (a complex semantic network) knowledge spaces the community as a whole can develop and strengthen its own knowledge and practice. In other words, the information space provides perspectives on the domain, including basic assumptions, goals, terminology, and modes of discourse.

However, the authoring of hypermedia is a complex, resource demanding, and knowledge-intensive process [5]. Much of the current research on automatic hypermedia generation concentrates on the presentation creation process where the user is a final consumer of the presentation and influences the creation process only at the start of an otherwise fully-automated process [1], [3], [6], [7]. In our work we consider the user as an active creator or author of a presentation. We thus focus on providing extra support for helping the user find relevant media items and combine them meaningfully into a rich and coherent multimedia presentation. For that our approach uses explicit knowledge about the semantic relations of the presentation's topic domain, narrative structures, hypermedia presentation design and distinctions between media modalities. In this paper we discuss the phases of the presentation creation process in an example scenario. We introduce the requirements for the system facilitating the presentation creation process through these phases by discussing the two phases of the process in more detail – specification of the presentation structure and collection of material to be used in the presentation. The paper concludes with an outline of the future work.

2   SCENARIO

In order to understand the context of the process in which we consider the requirements for our meta-data framework, we present here the example scenario, taken from [2], where it is discussed in more detail. The user operates with our system called Samp*L*e (Semi-Automatic Multimedia Presentation generation Environment), which is connected to a large hypermedia database. The user creates a presentation (small knowledge space) using the material form the database (large knowledge space).

Our user is a student who has the assignment to build a presentation about the Dutch art movement 'De Stijl'. The goal is to convey the intended content of the presentation in an engaging way. For this the user has to perform a number of tasks. She has to choose the topic of the presentation and the genre at the first phase of the process. Then the intended content of the presentation has to be sketched out in the form of presentation structure at the second phase. During the third phase the user has to find the material she wants to use in her presentation. At the fourth phase the selected material should be organized into a coherent story. At the fifth phase the material should be structured into presentation scenes. The style of the presentation has to be settled with regard to the font type, colour scheme, animation effects and duration. In

addition suitable behaviours of switching between different presentation scenes through hyperlinks have to be defined. These five layers of the presentation creation process are discussed in more detail below.

2.1 Theme identification

Within the overall goal – creating a presentation about 'De Stijl' – the user has to specify the more concrete topic of her presentation. She decides that she is interested in the art movement as a whole. Among the proposed system genres she chooses *essay*, because the essay genre facilitates structures that allow an analytic composition dealing with the subject from the personal point of view. Thus, she specifies the topic of the presentation as 'Essay about 'De Stijl'', where 'De Stijl' – subject of interest – plays the role of the main character in the presentation. The system asks whether she wants to identify related characters for the presentation. The user knows that 'De Stijl' was influenced by Cubism. Thus, she chooses Cubism to play the role of related character in the presentation.

2.2 Specification of the presentation structure

Based on the choice made at the previous level the system selects, due to the expertise level of the user (user = student) the simplest presentation structure (prologue, elaboration, epilogue) for the essay genre and adapts this structure according to the choice of characters. The user decides to alter the proposed presentation structure. For that she extends it with new sections and changes the way of presenting information for some sections. For example, the system proposed for the prologue to give the overview of 'De Stijl' first and then to give the short definition of Cubism. The user did not agree with this way of introducing Cubism and decides that it should be represented more extensively in the form of the overview. In this way two movements will be introduced equally resulting in a better background for discussion about influences of one movement on another.

After the alteration of the whole presentation structure is completed the user proceeds with the next level.

2.3 Collection of the material

In this phase the material is retrieved and selected that has to fill the created presentation structure. The user specifies her preferences about media type of items to be retrieved. The description of every section serves as a query for the system. The system retrieves relevant media items for each section and presents this set of items to the user. The user chooses items she likes best to be used in the presentation.

2.4 Arrangement of the material

At this level the material inside each section of the presentation structure is ordered to create a coherent story. This ordering is done automatically by the system based on the rules that take into account the content of each media item, its narrative structure and media type. If the user is not satisfied with the arrangement she can adjust it to her preferences.

2.5 Presentation creation

Once theme, presentation structure and general arrangement of the material are specified, this final phase is concerned with the creation of the presentation with regard to scene specification and style selection. Our user has the possibility to choose between different types of presentation, such as slide-show, non-interactive or interactive presentation. The user decides that the most engaging presentation would be an interactive presentation, since it includes hyperlinks that allow to switch between different scenes and get more information from the presentation by following links. She realizes that in order to create interactive presentation she has to select more media items from the database. For that she goes back to the specification of presentation structure and adds new sections. In the introduction section, for example, she wants to add links to the biographies of 'De Stijl' movement main figures and principles of Cubism. Thus, she adds sections 'Biography of P. Mondriaan', 'Biography of T. van Doesberg', and 'Principles of Cubism'.

Below we discuss the second and the third phases of the process described above and derive the requirements for the underlying meta-data framework

3 SPECIFICATION OF PRESENTATION STRUCTURE

A common way of developing an *essay* is to start with introducing the main character in the prologue. Then the major activities of the main character are elaborated in the main section of the presentation. In the epilogue the main achievements of the main character are outlined and its influences on the future development are presented. This template structure is adapted according to the choice of characters in a way that the prologue part will contain the section in which the related character is introduced. The main part of the presentation will be extended with the section about influences of Cubism on 'De Stijl'. For the sake of clarity we discuss here only the alteration of the prologue part of the presentation. The prologue contains two sections

described as 'Overview of 'De Stijl'' and 'Definition of Cubism'. In order to perform changes to the proposed structure as discussed in the scenario, the user has to change the description of the second section to be 'Overview of Cubism'.

The description of the section represents content requirements. Thus, the description 'Overview of 'De Stijl'' denotes that this section gives the information about 'De Stijl' in the form of the narrative structure *overview*. The difference between *overview* and *definition* is that *definition* is just a short presentation of a subject whereas *overview* introduces a subject in more detail.

The process described above causes the need for the system to have certain knowledge. Domain knowledge is required to adjust the frame presentation structure of genres according to the chosen characters and also to derive relationships such as that Cubism started before and influenced 'De Stijl'. The relationships between these two art movements might be clear for the user but the system has to derive them to be able to introduce the relevant section in the presentation.

Changes in description of sections result in a different content selection behaviour of the system. In the next section we will outline how the established structure facilitates the ability of the system to guide the content collection process.

4   COLLECTION OF THE MATERIAL

In the previous section we mentioned that each section in the presentation structure is described in a way that makes it clear to the user what the section is about and what kind of information she will need to instantiate the established structure. The same information has to be understood by the system to make it possible to help the user with the retrieval of data for each section of the presentation structure.

To enable this all the concepts the user operates upon during the alteration of the presentation structure should be connected first to the domain ontology to let the system know about the intended content of the section, and second to the narrative structure ontology to deduce the preferred type of narrative the user wants to have for the certain content.

Further the retrieval process also takes into account the position of the certain section (whether the section is inside the prologue, elaboration or epilogue section), since this knowledge adds to the requirements about the narrative structures of items to be retrieved. For the prologue section,

for example, the retrieved media items should have more abridged structures than for the elaboration part.

Finally the system should have knowledge about the media type of each item in the database to retrieve items of media types specified by the user.

Having introduced these requirements we can now outline the framework for the meta-data structure. Every item in the database is annotated with:

- the concept(s) from the domain ontology to indicate the content of the item;
- the concept(s) from the narrative structure ontology to define the context in which the item can be used;
- the concept(s) from the media ontology to distinguish items by media type.

On the base of this framework for annotations semantic relationships between objects can be explained. All the annotations are written and stored using RDF [4] format. An example annotation of the textual item discussing principles of 'De Stijl' could look as presented below:

```
<rdf:Description about="d:item132">
    <c:principle name="P1"/>
    <c:art_movement name="De Stijl" />
    <s:structure>summary</s:structure>
    <m:media_type>
        <m:internal>text</m:internal>
        <m:external>text</m:external>
        <m:format>txt</m:format>
    </m:media_type>
</rdf:Description>
```

where 'c' stands for the namespace of the domain ontology, 's' for the narrative structure ontology, and 'm' for the media ontology.

The annotations for the image reflecting 'De Stijl' principles could contain:

```
<rdf:Description about="d:item122">
    <c:principle name="P1"/>
    <c:painting style="De Stijl"/>
    <s:structure>summary</s:structure>
    <m:media_type>
        <m:internal>image</m:internal>
        <m:external>drawing</m:external>
        <m:format>jpg</m:format>
    </m:media_type>
</rdf:Description>
```

The fact that the attribute name of the class *Principle* has the same value (*P1*) for both media items determines the semantic relationship between these items. In this way the system can retrieve textual items discussing certain aspects of the art movement and also image items that can be used as examples of those aspects.

5 CONCLUSIONS

In this paper we described the scenario for the system-supported process of manual presentation authoring. On the base of the scenario we explained the requirements for the system enabling this process, during which the user is supported with ontology-based and context-oriented information. We described the underlying framework of our approach and discussed the interrelationships between different types of meta-data.

For the material collection process a mechanism was established to facilitate the search in the large hypermedia database. The proposed approach for retrieval of the material has an advantage of reducing the set of retrieved items at each phase of the search. Thus, smaller and more relevant sets of retrieved objects are shown to the user.

Future work will concentrate on the realization of internal processes for the specified framework. The proposed meta-data requirements will be verified according to their completeness.

The possibility to enrich the system repository by storing successful presentations has to be integrated into the system. For that the way should be found to manage with new presentation structures in the relation with old ones.

Building the presentation at the last phase of the process includes combining various media items into scenes. By doing that new relations between items can be discovered (e.g. a subsection of the selected textual item describes a part of the image). The challenge of creating new annotations will be addressed. Annotations used by the system fall into complicated infrastructure a user cannot be faced with. Thus, a semi-automatic way of creating new annotations has to be found, where user intentions are understood by the system, and complete relation infrastructure is filled in without the user intervention.

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