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Chapter V

A Framework for Supporting Reuse in Hypermedia

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This chapter presents a conceptual framework which supports reuse in hypermedia applications. Reuse is important in hypermedia, and especially hypervideo, as it is rich in content but often costly to capture, store and annotate. The framework's use is illustrated through three different example hypervideo applications which exhibit several forms of reuse. This chapter goes beyond the notion of reuse of parts of hypermedia applications and considers the reuse of classes of structure of hypermedia applications, and the issues relating to such reuse. Future systems can be developed which utilise this approach to modeling video content as illustrated in Bryan-Kinns (1998; 2000). The key contribution of this chapter is the illustration of a novel approach to modeling video, rather than how this could be implemented as discussed in other chapters.

PROBLEMS WITH REUSE IN HYPERMEDIA DEVELOPMENT

Hypermedia applications are often inconsistently structured and have poorly defined semantics (Catlin et al., 1991). This may be intentional (e.g. artistic endeavours) or may be the result of the typically *ad-hoc* nature of hypermedia application development. The results of such inconsistencies and ambiguities are often user disorientation (Catlin et al., 1991), reduced reuse between applications (Bryan-Kinns, 1998) and increased authoring effort (Jordan et al,. 1989).

This chapter concentrates on the conceptual problems of supporting reuse within and between hypermedia applications. Reuse is important, especially with multimedia data types such as video as it is rich in content and widely used, but is expensive to capture, store, analyse and retrieve (Duda et al., 1994). There are two main reasons for the current poor support for reuse, either:

a) Hypermedia development environments impose one form of structure upon developed hypermedia applications. This restricts reuse to within particular applications; parts of the application cannot be shared between applications.

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b) Hypermedia development environments provide generally applicable structures. This allows reuse between applications, but does not capture the semantic and structural regularities of classes of hypermedia applications resulting in irregularly structured applications which can make querying and reuse difficult.

Several approaches have addressed this problem by supporting the description of the structural and semantic regularities of hypermedia applications, e.g., HDM (Garzotto et al., 1993), HyperStorM (Bapat et al., 1996) and VCMF (Bryan-Kinns, 1998, 2000). Once these regularities have been defined for a class of applications (typically by a *schema*), individual applications are developed. A schema usually contains node types related to each other by link types. These define the semantic and structural regularities of applications respectively. Node types define the kinds of nodes (*units* of information), their attributes and possible values in applications. Link types define the kinds of links that can exist in applications, and constrain which nodes can be linked.

Unlike unstructured approaches, using a schema-based approach means that applications will have consistent structures and semantics (Marshal et al., 1991) which should reduce user disorientation (Catlin et al., 1991), especially when the structure matches the user's expectations. Moreover, the approach can be used to reduce authoring effort by automatically generating values for nodes and creating certain kinds of links (Garzotto et al., 1993). Such approaches have been further developed by VCMF (Bryan-Kinns, 1998, 2000), which uses the notion of schemas to support reuse of hypermedia information (video in the case of VCMF).

This chapter presents a framework which supports reuse in hypermedia through the use of schema-based modeling. In order to reduce the complexity of this presentation a constrained form of hypermedia is considered: *hypervideo* (Geißler, 1995; Sawhney, 1996). Hypervideo is essentially a hypermedia in which nodes can only be video data rather than multimedia data. As such it exhibits the essence of hypermedia (complex, dynamic media related to each other in some way) without the presentation complexities of multimedia data. Further work needs to consider how multimedia data can be presented in different contexts; this chapter considers the support for reusing multimedia data, not how it is presented in its new context.

A FRAMEWORK TO SUPPORT REUSE

Notions of Reuse

This chapter presents a framework for modeling hypervideo which support reuse. Two general questions with respect to reuse arise:

First, what is reuse? Reuse in this chapter is considered to be the use, either by copying or reference, of something in a different context (Garzotto et al., 1996; Bryan-Kinns, 1998). The new context may be within the same application where an application is one particular use of one or more schemas.

Second, the different kinds of hypermedia-related reuse that are possible need to be considered. This chapter considers reuse of objects and schemas, as they are typically the most useful parts of hypermedia to reuse. A taxonomy of object reuse derived from work by Garzotto et al. (1996) is presented in Table 1. The contents of the table relate to the examples of reuse investigated in this chapter. Especially important in the table is the reuse of objects from one model in a model of a different schema, used for a different application.

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