# Multimedia Layout Adaptation Through Grammatical Specifications

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***Abstract***

*On-line multimedia presentations, such as news, need to be constantly updated. There are also increasing demands for accessing on-line multimedia documents from mobile devices such as PDAs. There is an urgent need for a sound but practical formalism that supports automatic adaptation to the change of media contents, display environments, and users intention. This paper presents a visual language approach to the layout adaptation of multimedia objects. The underlying theory of our approach is a context-sensitive graph grammar formalism enriched with facilities for spatial representation and specification. The paper focuses on the issues and techniques for size adaptation and style adaptation in response to the change of device requirements and users interactions.*

**Keywords**: Multimedia authoring, graph transformation, graph layout, visual languages, adaptive presentation

## 1. Introduction

With the rapid advance of the Internet and Web technology, an increasing number of graphs and media contents are delivered on the Web. The content and the presentation structure of an on-line multimedia presentation may also be frequently updated. At the client side, there are various kinds of viewing conditions, such as varying screen size, style preference, and different device capabilities. For example, consider a diagram representing an organizational structure on the Web that may be of considerable complexity occupying a large screen space, and thus may be unsuitable for small displays [16]. Thus, if the diagram is to be viewed on the screen of a mobile device, such as a PDA (Personal Digital Assistant), the original diagram layout may not be appropriate. Another example is a news Web site, which generally needs to be constantly updated with the incoming news items. Such a site may have to adapt itself frequently to the changing space and style requirements for different news categories. The ability of dynamically adapting its layout would be highly desirable.

With the current document markup languages such as XML, the layout of a Web page is relatively static and fixed [5]. When the user's requirement or the device capability is changed, the layout may become unsatisfied. The reason is that such markup languages do not provide any mechanism powerful enough for specifications to be adaptable to the changing context. A design mechanism capable of adapting multimedia presentations in response to the dynamic changes in information content and the user's interaction is therefore highly desirable.

To illustrate the concept of multimedia adaptation that we perceive, we use Ishizaki's schematic diagram of a process between content creation and information reception [13] as depicted in Figure 1. The design system should be able to adapt itself to the changing input from the information content and from individual users' intentions. As mobile devices provide an increasing proportion of on-line content accesses, we argue that a multimedia authoring system should support an additional type of context changes – i.e. adaptation to the change of device capabilities. In other words, the designer of a multimedia