User Interface Management System Embedded in a Multimedia Document Editor Framework*

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Abstract. This paper describes Duma: a Data-based User interface man-
agement system for Multimedia Application, which is embedded in a mul-
timedia document editor framework (MMDEF). MMDEF is the core of
a multimedia document editor, which can adapt to externally defined
media types and operations, and enables the user to work on docu-
ments composed of multimedia objects, including objects of newly de-
efined types, through a coherent user interface. Duma introduces an ex-
tensible data model called interactor that abstracts the user interac-
tion between application semantics and user interface components. Also,
Duma's data-based UIMS architecture embodies an interactive UI design
environment in which interfaces to the interactor model are given.

1 Introduction

Remarkable advances in CPU performance and system software enable recent
desktop computers to process and present non-textual objects with relatively
inexpensive cost. Accordingly, in the field of document processing, a number of
DTP systems have started incorporating capabilities to let non-professional users
author multimedia documents that combine not only text objects but multiple
kinds of non-textual media objects. An example of such systems is Microsoft's
Word which is equipped with the 'plug-in' capability that allows externally-
defined media objects and their subeditors to be hooked up to its main editor.
Meanwhile, most of these DTP systems treat foreign media objects as special
textual objects that inherit features of text in terms of presentation and editing.
Therefore, in editing a multimedia document, users have to explicitly go back
and forth between the main editor for textual media and other medium-specific
editors as shown in Fig. 1(A). We observe that this type of user interfaces (UI's)
will become unacceptable for users when the number of foreign media explodes,
since users will have to take care of the differences of all media incorporated in
documents.

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Fig. 1. Editing Environment for Multimedia Documents

To deal with this problem, we have been designing and implementing a multimedia document editor called Ensemble. Ensemble, whose appearance is shown in Fig. 2, is built on our research framework called MMDEF (MultiMedia Document Editor Framework). MMDEF is the core of a tightly integrated multimedia document editor that adapts to different media. Ensemble uses a novel architecture to utilize common services unlike a system like Quill [3] which is a collection of subeditors. The user of Ensemble may have the illusion that s/he is in a subeditor when editing a MODULA program. For the integrated multimedia document editor on MMDEF, all of the available media are adapted. In other words, the differences among media are taken care of by MMDEF instead of by users as shown in Fig. 1(B).

Fig. 2. A Screen Dump of Ensemble based on MMDEF

We claim that MMDEF plays the role of a user interface management system (UIMS). In addition, MMDEF should offer software repository of UI's that can be shared among adapted media at runtime. The repository might store diverse models of user interaction that can be reused rapidly by newly adapted media.

In this paper, we describe the design and the implementation of Duma [7]: an embedded data-based UIMS in MMDEF, that provides users, UI designers, and AP designers with coherent UI's. Duma’s achievement is characterized by the