User interface of a new generation of authoring environment of multimedia documents

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Multimedia documents compose in time and space different kinds of objects (audio, text, ...). Some of these objects, like video, have intrinsic durations. Furthermore, they can be temporally organized by the author to define the *temporal scenario* of the document. Due to this temporal dimension, authoring a multimedia presentation is known to be a non-trivial task. Numerous works [Buc93, Song96, Jou97a] tend to prove that using temporal constraints, like the Allen operators [All89] (before, equal, during, ...) to specify the temporal scenario of a document is a good way to achieve the "easy-to-use" goal. However even by using temporal constraints, specifying a temporal scenario is still a complex task, if no visual interface helps the author to understand the set of solutions of his specification and the interdependencies between the objects due to explicit and induced constraints (i.e. A equal C and C before D implies A before D).

We discuss in this paper the main requirements for the design of such an interface and we present our proposition experimented in our constraint-based authoring environment called Madeus [Jou97a]. A more detailed presentation of these aspects could be found in [Jou97b].

Visual interface requirements

1. *Links between the set of constraints and a specific solution* : to understand why a solution is possible and while another is not.

2. *Links between two steps of the editing process* : building a document is an incremental process. At each step the author adds/removes objects or relations. The visual interface must help him to understand the modifications introduced by his actions. Moreover, the differences between the two views (before and after the author actions) must be clearly shown. Another aspect of this issue is how the interface can help the author to reach his final goal

3. *Access to the whole set of solutions* : Due to the incremental nature of the editing process, the author needs to cover the space of solutions to decide his next refinment actions. Moreover, by covering the space of solutions, the author can detect situations that he has not expected.

4. *Identification of the executed solution among the set of possible ones.*

A first attempt of temporal constraints visualization in Madeus

We only give an answer to the issues 1 and 3, since, in a first step, we have only considered the visualization part of the problem. So we suppose in the sequel that the scenario is edited via a textual editor. Our visual interface aims at providing the author with a way to clearly understand the global behavior of his set of constraints.

* Providing the user with a view of a temporal placement of objects that is consistent with the set of constraints. In this view, each constraint is graphically represented (see Fig. 1): springs represent flexibility introduced by constraints such as before or during ; horizontal lines represent fixed delay and vertical lines link simultaneous instants. Moreover, this view is synchronized with the textual specification.

* Allowing direct manipulation of objects (resizing or moving along the temporal axis) with real-time adjustments of the related objects. Only consistent manipulations are allowed (i.e. manipulations that can lead to another consistent solution).

* Anticipating the allowed modifications. Each time an object is selected to be moved (no overload of the view), a red interval appears under the object (see figure Fig. 1) which shows its possible positions. In addition, objects firmly attached to the selected object (they will follow the moving object) are set in green.

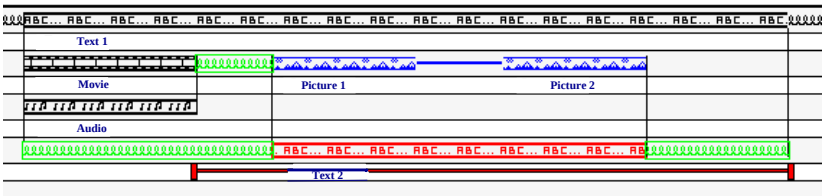

Fig. 1 : Madeus view associated to the scenario of figure 2.

Text 1 Start Movie	Movie Before Picture 1
Audio Equal Movie	Text 2 Start Picture 1
Text 1 Start Audio	Text 2 Finish Picture 2
Text 2 During Text 1	Picture 1 Before(15) Picture 2

Fig. 2: An example of temporal scenario

To implement this proposition, we have developed an *ad hoc* algorithm to handle the dynamic behavior of the scenario, which has good real-time performances. The problems addressed in this paper is only a part of a big problem: the design of a visual interface which takes into account each aspect of a multimedia document: hierarchical decomposition, spatial organization, hyperlinks, ... Moreover, a big issue is to make this view not only a visualization support but an editing one as well.

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