# Where Can I Add This Annotation?

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## ABSTRACT
Annotated interactive non-linear videos normally demand a two-stage authoring process. The structure of the video is defined in the first step, where video scenes are arranged in a scene graph. Additional information (annotations) are added to the scenes in a second step. Therefore a timeline-based editor has to be opened which enables the author to add images, videos, audio files, or text to a selected scene. User tests showed that users do not find the entry point to the annotation editor currently placed as a button on a scene in the scene-graph. This work proposes solutions for a better and more intuitive workflow in the tool to add annotations to scenes.

## Author Keywords
Authoring; Hypervideo; Annotation; Scene Graph

## ACM Classification Keywords
H.5.4 Information Interfaces and Presentation: Hypertext/Hypermedia

## INTRODUCTION
Annotated interactive non-linear videos consist of video scenes which are linked with each other in a scene graph. Each scene or the whole video can be extended with annotations (text, images, audio, or videos) which may add additional information to the video contents. These videos are for example very well suited for sports or physiotherapy training videos. They can furthermore be used for e-learning or tours through cities. The creation of this type of video comprises a series of steps in the authoring process. First, scenes need to be created and linked with each other in a scene graph. Then the annotations have to be linked either to single scenes (local annotation) or to the whole annotated interactive non-linear video (global annotation). Global annotations are shown during the whole playback while local annotations are faded in and out during single scenes. This affords a two-stage authoring process, whereby the navigational structure of the annotated interactive non-linear video is created first. In the second step, annotations are added.

Bulterman & Hardman describe and explain "four different authoring paradigms", which are (please refer to [1]) for further reading): structure-based, timeline-based, graph-based, and script-based. Neither of the paradigms can be applied to our workflow one by one. A switch from one editing paradigm (scene graph editor, graph-based paradigm) to another paradigm (annotation editor, timeline-based paradigm) is necessary. So far, no solution is proposed how to link those two paradigms.

The user group which is usually working with our authoring tool, called SIVA Producer, has limited to no experience in video editing, like physiotherapists, sports trainers, or teachers. First usability tests in our project with more than thirty users in more than five different settings showed, that the entry point for adding annotations to the scenes is not found by most of these users. This work tries to find solution on how to overcome these weaknesses. The main contributions of this work are: concepts for the creation of an entry-point to the annotation editor based on the user behavior in a previously conducted usability test and the evaluation of the concepts in a questionnaire.

## RELATED WORK
Annotated interactive non-linear videos can be seen as a subset of hypervideos (for an example definition see Chambel et al. [2]). These are often compared to interactive multimedia presentations. We analyzed authoring tools from both areas. They either use only videos which are linked with each other, or they treat each media element (image, video, text, audio, etc.) equally and do not have the two-stage authoring process and the same structures that we have. A detailed overview of related work can be found in [5].

## USER EVALUATION
Based on the knowledge that the button to add an annotation to a scene in the scene graph is rarely found, we conducted a user test combined with think-aloud protocols ([3]) and a screen capture software. Twenty test users (N = 20) were split into two groups of ten users each (NA = NB = 10). The users all worked with a computer often to very often and had average to very good knowledge about computers in general. None of them worked with video annotations before and had bad to very bad knowledge in this area accordingly. The users were chosen for that reason, because the SIVA Producer should be easy to use, especially for users with limited to no experience in video editing. The test users were aged between 20 and 60 (median 25 years). The test was used to find out where the problems of comprehension are in the existing version of the SIVA Producer, therefore this small

number of test users is enough ([6]). Both groups got a short explanation about the SIVA Producer. Then they opened a predefined project with a scene graph. Images were already loaded into the media repository but not added to the scenes. Group A had the task to first add a global annotation. After that, they were asked to add a local annotation to a specified scene. Group B was asked to add an annotation to a scene without adding a global annotation first. Both groups had to find the button with the pen positioned on a scene (see Figure 1).



**Figure 1. Button to add a local annotation to a scene.**

Group A eventually found the entries to open the editor for the global annotations in the menu or the toolbar and was able to add the annotation to the whole video. Based on the knowledge that annotations can be added this way, they tried adding the local annotation the same way. Nine out of ten users were not able to open the annotation editor for local annotations, because they did not find the button on the scene in the scene graph. Group B also started searching in the menu or the toolbar even without the knowledge of where to add a global annotation. In this group eight out of ten users did not find the button.

Taking a look at the search areas, two groups of users could be recognized: those who did understand the connection between scenes and local annotations, and those who did not. Some users tried more than one way of opening the editor. Thereby we counted each attempt. Nine users did not realize the connection between scenes and local annotations and wanted to open the editor via the menu. Six users searched for a button in the toolbar. Seven users recognized that a local annotation has to be added to a scene and tried a right-click on the scene and started searching in the appearing menu. Five users tried a double-click on the scene. Only three users were able to open the editor without help.

**TOWARDS A SOLUTION**

The user test showed us the areas where users are searching for the button to add a local annotation to a scene. If the editor should be startable from the menu, a second step where the scene is selected is needed. Based on the results of the user test described in the previous section, we created a questionnaire [4] which was carried out by 76 persons. They were aged between 16 and 65 and mainly between 20 and 35 years old. The questionnaire was finished and not clicked randomly by 58 persons (tested with statistical methods). The questionnaire contained four parts: a short introduction, ways to select a scene, possible button placements, and statistical data. Offered ways to select the scene where the annotation should be added were:

- Mark the scene with the mouse.
- Open a pop-up with a drop-down box to select a scene.
- Select scene in the annotation editor.

Except selecting the scene in the annotation editor, each of the ways to select the scene to be edited can be combined with each of the ways to place the button to open the annotation editor:

- Entry in the menu (see Figure 3).
- Button in the toolbar (see Figure 4).
- Entry in the right-click menu of a scene (see Figure 2).

Different questions including control questions were asked for each of the six solutions. Furthermore, pairs out of the three solutions for each problem were opposed and the preference for one solution was asked for each pair. As a result for the selection of the scene to which the annotation should be added, the pop-up with the drop-down box was not considered as useful. Marking a scene with the mouse or selecting the scene after opening the annotation editor was regarded useful. Regarding the placement of the button, the entry in the menu was not regarded useful. In contrast, using the a right-click menu of the scene was considered useful compared to each other placement of the button.
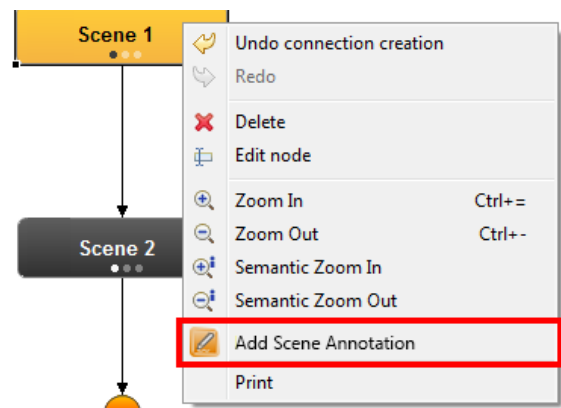


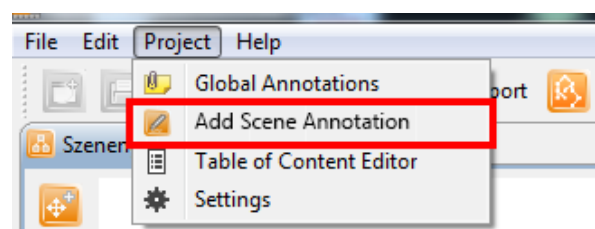**Figure 2. Adding annotations by an entry in the right-click menu.**



**Figure 3. Adding annotations via menu.**



**Figure 4. Adding annotations via a button in the toolbar.**

## CONCLUSION

Based on the two-stage authoring process of interactive non-linear videos, we faced the problem that authors were able to create a scene graph in the SIVA Producer, but did not find the entry point for opening the editor to add annotations to a single scene. In this work, we have proposed three methods of selecting a scene to which an annotation should be added as well as three placements of the button which opens the annotation editor. The most suitable solution according to the conducted questionnaire was an entry in the right-click menu of the scene to which the annotation should be added. Our future work includes the implementation of the proposed solution as well as further user tests to confirm the results of the questionnaire.

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