# Instant Video Browsing: A Tool for Fast Non-Sequential Hierarchical Video Browsing

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**Abstract.** We introduce an easy to use video browsing tool which assists users in getting a quick overview of videos as well as in finding segments of interest. It provides a parallel and a tree-based view for browsing the content of videos – or even video collections – in a hierarchical, non-sequential manner. The tool has a plug-in architecture and can be extended both by further presentation methods and by video analysis algorithms.

## 1 Introduction

Video browsing is an appealing approach to find out whether a video or some parts of it are of interest and where the most interesting segments are located within a video. Usually, video browsing solutions are based on content analysis of the underlying video. Almost all proposed solutions use shot segmentation as a first step and provide browsing mechanisms based on the shot structure. Content analysis – of a newly stored video file – takes quite a great amount of time, which a user often does not want to or cannot spend. In some scenarios, e.g. when only a quick overview of the content of a video is required, it is an overkill to perform a deep content analysis. If single shot videos are browsed (single shot is typical in many surveillance applications), shot detection does not help at all. For such scenarios it is much better to provide quick, yet powerful, interactive navigation means.

We propose a novel approach for instant video browsing that requires no content analysis at all. Our application can immediately and efficiently be used for scenarios where a quick inspection of a newly recorded video is required. While video retrieval tools typically perform much better and provide better content-based search functions, they first need to perform a deep content analysis step requiring a lot of processing time (often in dimensions of several hours). Users, who just quickly want to get an overview of a new video or to find some specific segments in it do usually not accept long delays before they can use the tool. From our experience [1] users in such situations rather employ common video players for interactive browsing although they provide only poor navigation features. The tool proposed in this paper has been designed to provide a real alternative to common video players for such situations.

## 2 Related Work

Several video browsing tools have been proposed in the recent years. While some of them try to improve navigation with extended seeker-bars (e.g. [2][3], others show content abstractions that can help users to more quickly locate desired segments [4][5]). Some other tools facilitate browsing by an index of extracted keyframes, typically at different levels of granularity (e.g. [6]), or by providing smart fast-forwarding features (e.g. [7]). A comprehensive review on video browsing applications can be found in [8].

## 3 Instant Video Browsing

Our tool divides every video into as many parts of equal length, as many video windows are opened on the screen. The number of windows ($n$) can be enhanced respectively reduced by the user with a single click. Two different views are available for browsing the content: a *parallel* and a *tree based view*. With both of them it is possible to traverse the content in a hierarchical way down, until the frame level is reached, and up again.

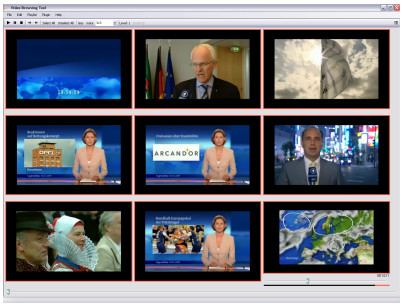

**Fig. 1.** Parallel View

An example of the parallel view is given in figure 1, where a news video is divided into nine equal parts. If one of the parts is selected by clicking the right mouse button, the user gets down into a deeper level with more details. That means that the selected part is divided into $n$ equal parts again. To get a coarser view again, it is possible to go back to a higher level. The parallel view only shows one level of the browsing hierarchy at a glance. In contrast the tree based view shows all levels simultaneously in a treelike structure, thus the context of the video windows is better preserved. Figure 2 shows an example[1] of the tree based view with a highlight video of a soccer match. Each row represents one level of the browsing hierarchy. The browsing history from the top to the

[1] The red lines between the horizontal window rows have been added to the screen shot for a better visualization of the tree-based browsing concept.

bottom level is preserved by coloring the selected video parts on each layer with a green border. This should help the user to quickly find an alternative browsing path. If a part is selected, a new row that shows only that part is added to the tree. Browsing through the content of a video this way can be compared with navigating through a tree structure. Having found the required scene the user may select the starting point of it as the new root. This enables to quickly locate a number of interesting scenes in a video.

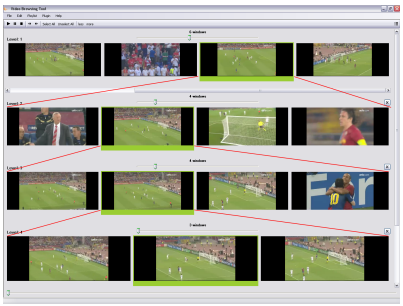

**Fig. 2.** Tree Based View

Beyond hierarchical browsing, the tool also offers parallelism. All shown parts or only selected ones can be played in parallel and the playback speed can be adjusted. The slider at the bottom of the container window can be used to scroll through selected videos in parallel. The users can get an impression of the whole video in a fraction of the overall duration. The audio playback is only enabled for one single selected video window (where the mouse points at). The ability to play the audio stream only of parts regarded to be interesting, helps the users in getting a better browsing experience.

The introduced views are not limited to single video files. They can be applied to small video collections as well. Opening a video archive adds an additional level to the browsing hierarchy, which means that on the first level all videos of the selected collection are shown, serving as starting point for hierarchical browsing of the whole video archive.

Another feature of our video browser is that segments of interest can be selected and stored in a playlist for later use. Moreover, selected segments can also be exported as a single file, which can be opened with a common video player. Thus, our browser is also a "poor men's" video cut tool.

Our video browsing tool offers a simple plug-in architecture. With new plug-ins it can be extended by further presentation views and also by video analysis and video processing algorithms. By combining different plug-ins it can be easily adjusted to the needs of the users and the peculiarities of different video domains.

Regarding the performance of the tool we can state that at least nine videos can be decoded and played in parallel with normal playback speed on a standard desktop computer (Pentium 4 2GHz, 1GB RAM).

## 4 Conclusion

The presented tool focuses on easy to use video browsing concepts for instant usage. While the parallel view can be used to get an overview of the content of a video by using parallel playback or parallel scrolling, the tree view provides mechanisms for quickly exploring different search paths within a video and thus it is better suited for searching for a particular scene. Both approaches refrain from content analysis and work for single-shot videos as well. They provide a flexible user interface for non-sequential hierarchical video browsing and are suggested particularly for situations, in which video analysis is not adequate (e.g. due to lack of rich semantics) or would take too much time.

In future we are going to perform a user study to compare our video browser with other video players to measure the retrieval performance for situations where a user wants to get a quick overview of a video or a video collection. Furthermore, we plan to integrate several video analysis plug-ins. Users will be able to decide whether they use the instant approach or a more sophisticated one, based on video analysis steps.

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