

The EFR (Electronic Film Review) Approach to Using Video in Education

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Abstract: An EFR (Electronic Film Review) system includes an authoring tool and a specialized DVD player. The authoring tool allows an instructional designer to segment a video asset, such as a feature film on DVD, hierarchically and then annotate individual segments (also called clips) of video. The resulting description is called an EFR and is represented as an XML document. An instructor can then create various video-clip playlists from the EFR. A playlist controls the playback of a video asset, specifying which clips are seen in what order and allowing the user to pause, replay a clip, and view the annotations on a clip. The exact nature of the annotations will depend on the learning environment and the subject matter. Certain restrictions apply to what types of information can be included in the EFR when the video asset is a commercial feature film.

The Electronic Film Review (EFR) approach to using video in education is an example of annotation authoring. In annotation authoring, a video asset, such as a recorded television program or a feature film, is segmented and annotated by the instructional designer using a software tool. The annotated video asset is then viewed by the student, who has access to the annotations during video playback. See Gale et al (also presented at this conference, June 2004) for details on annotation authoring and evidence of its effectiveness in education. This paper will focus on three aspects of the EFR approach to annotation authoring that distinguish it from some other approaches to annotation authoring: (1) the type of video asset that is typically treated for educational use; (2) the difference between a video asset description (VAD) on the one hand and a video clip playlist (VCP) on the other; and (3) the flexibility to mix and match three components: the authoring component, the playlist builder, and the playlist-aware video player.

In conjunction with these three aspects of the EFR approach (type of video asset, VAD/VCP distinction, and flexibility), certain legal issues will be raised. However, this paper should not be construed as constituting a formal legal opinion. The opinions expressed are personal opinions of the author and neither represent the author's institution nor should be used as the basis for business decisions. Legal counsel should be obtained by anyone concerned about the legal aspects of the EFR approach.

The EFR approach is not just a theoretical possibility. It has been used at the author's university to develop EFRs for several films being used for language learning. For a report on a particular application of the EFR approach to teaching French to Americans, see Melby (2002). It is hoped that the EFR will be used more widely in the future.

Three Types of Video Asset

One way to categorize video assets used in education is according to what rights one has for their use. Three points along a spectrum of possibilities are: fully-owned original footage, footage licensed for incorporation into a derivative work, and retail footage that is widely distributed through normal commercial channels. We will not consider here an instructional package containing a few seconds of video footage included under what is known as

"Fair Use". Instead, we limit the discussion to instructional packages based on most or all of a substantial video asset, such as a two-hour feature film. Each type of video asset can be stored on various types of media, such as fixed magnetic disk and optical disc, using various methods of compression.

Fully-owned original footage has typically been created expressly for a particular project. The film crew, professional or amateur, usually retains no rights to the footage. The instructional design team has full copyright on the footage and has complete freedom to edit the footage and incorporate it into an instructional package in any desired manner.

Licensed footage belongs to a third party, but the instructional design team and the copyright holder have concluded some kind of legal agreement granting certain rights to the design team. That way, the footage can be incorporated into an instructional package that is distributed as a derivative work. Without the license, this would be considered to infringe copyright. See www.movielearn.com for an example of using licensed footage for English language training.

Retail footage also belongs to a third party; however, no custom contract has been signed by the rights owner and the instructional design team. Instead, the instructional designer has only done whatever is necessary to show the footage, typically a feature film or documentary, in the classroom. In the United States, classroom use requires no particular arrangements. For example, a DVD can be purchased at a retail outlet and shown in the classroom, so long as the content of the film is relevant to the subject matter of the course being taught. In Canada and some other countries, a group contract is negotiated between the rights owner and a school system to allow films to be shown in the classroom. In most countries, the purchase of a DVD or other video asset at a retail outlet does not bring with it the right to make a public presentation of the video material outside the home or classroom.

The EFR approach is focused on the third type of video asset: retail footage. In particular, this approach is intended for the case where a feature film is used in conjunction with some course of study, but it is not feasible to obtain a derivative works license from the rights holder of the film. This imposes certain restrictions on how the video asset can be used in an educational setting. The EFR approach is intended to increase the effectiveness of using retail footage, especially feature films on DVD, in education, without requiring a license to distribute a derivative work.

Video Asset Descriptions vs. Video Clip Playlists

In annotation authoring, a video asset is always described using some kind of metadata. This metadata, called a Video Asset Description (VAD), includes information that divides the asset into segments such as scenes and sub-scenes. This segmentation does not involve actually moving pieces of video around. Instead, there are two methods of defining a segment within a video asset: (1) a pair of timecodes defining beginning and ending points, and (2) a timecode plus a duration. For example, suppose a film contains a twenty-second segment, also called a clip, in which a rocket ignites, takes off, and disappears into the sky. If this segment is ten minutes into the film, it could be described either by a timecode pair ("10minutes00seconds" to "10minutes20seconds") or by a timecode "10minutes00seconds" plus a duration indicator "20seconds". A video asset description for a two-hour film might possibly include several hundred segments averaging twenty seconds in length. Yet the video asset description contains no video at all, only pointers into the actual video asset. A video asset description contains annotations that are specific to a particular clip. A sparsely annotated video asset description might include a dozen annotations, while a heavily annotated video asset description might contain over a thousand annotations, most clips being favored with several annotations of various kinds. Annotations can be anywhere from a simple piece of plain text to a fancy HTML page with embedded graphics and sound. The nature of an annotation depends on the learning environment and the subject matter.

In some variations of annotation authoring, the video player uses the video asset description directly. In a direct-access approach, the only way to play video is for the user to point at a segment defined by the description. After the segment is played, either the player pauses, waiting for the user to indicate which segment to play next, or the player goes on to the next segments in the description until the user requests some other action.

In contrast, the EFR approach does not allow video to be played directly from the video asset description. Instead, video is only played under the control of a Video Clip Playlist (VCP), which is a sequence of playback commands. There is, of course, the limiting case where the user requests that a single clip in the description be played and a minimal playlist is created that instructs the player to play that one clip. However, distinguishing between the video asset description and the video clip playlist allows much more sophisticated playback than just playing one clip at a time. For example, a video clip playlist could consist of a sequence of commands to play clips in an order that does not correspond to the order of the clips in the video asset but in an order that does support a particular instructional objective. In addition, a video clip playlist could be used to define a version of a video asset, such as a Nova documentary, that has been shortened to fit into the time constraints of one lecture period, by playing certain clips from the description and leaving out others. Another reason to use a video clip playlist could be to avoid offensive material by not including clips containing graphic violence or other content deemed by the instructor to be potentially offensive to students. In all these cases, a video clip playlist accomplishes what is sometimes called Customized Video Playback. A video clip playlist can specify not only which clips are played in what order but also whether the audio is muted and the video blanked or overlaid with a text message for each clip.

Customized Video Playback can be implemented in the direct-access approach to annotation authoring by limiting the video asset description to include only selected segments, with certain parts of the video asset not described at all. In this case, the video asset description can be thought of as a type of playlist, but the EFR approach is much more powerful in that many playlists can be defined based on the same video asset description. Another advantage of the EFR approach is that a playlist can define a sequence of clips selected from anywhere in the video asset, while the direct-access approach either plays one clip at a time or plays sequentially through the video asset. In the EFR approach, every part of the video asset is described sequentially in the video asset description. Nothing is left out. However, a playlist specifies which clips (from one to hundreds) are played in what order and with what attributes, such as muting of the audio portion.

There is another reason that the EFR approach is preferable to a partial video asset description, besides the ability to build many playlists from the same video asset description. There is a lawsuit in the 10th District Court (Denver, Colorado, USA) that is unresolved as of this writing and that bears on the legality of customized video playback. There is also US legislation (The Family Movie Act) that bears on the legality of Customized Video Playback. The Hollywood plaintiffs in the Denver case claim that distributing a video clip playlist, which provides the same customized viewing experience to everyone who purchases and runs the same playlist, is a violation of copyright in that it is equivalent to distributing a derivative work. It is far from clear how that lawsuit will finally be resolved, but it may be safer to distribute a complete video asset description that exhaustively segments the video asset and lets the user build their own playlists than to distribute a partial video asset description. Therefore, in the EFR approach, the video asset description (the EFR) is always exhaustive, leaving out no frame of the video asset and leaving the segment definitions in the original linear order. Then, the user can use the EFR to easily build many different playlists, each of which customizes the playback in some way. These legal concerns only apply to the third type of video asset: retail footage. An EFR cannot, of course, include the text of the transcript of a film without permission from the copyright holder of the film, but it might include annotations that are segment-specific glossaries of terms in alphabetical order.

Flexibility

As mentioned in the introduction, an EFR system consists of three main components: the authoring component, the playlist builder, and the playlist-aware video player. The first two components are software applications. The third component, the player, can be implemented as a software application on a general-purpose microcomputer or as a consumer-electronics device. Starting with a video asset, such as a feature film on DVD, we will review the functions of the three components in an EFR system.

The authoring component is used by the instructional design team to create a description of the video asset. In the EFR approach this description is, naturally, called an EFR. Each EFR is created with a particular educational purpose in mind, such as using a film as a tool for language training, but an EFR by itself does nothing. It is just a static description, more or less detailed, of a video asset. An EFR consists of a global review of the content of the

video asset and segment-by-segment critical commentary that is composed by an instructional designer based on the educational purpose of the EFR. An EFR is an XML application that is convertible to and from a subset of the MPEG-7 standard. MPEG-7 is a very powerful and extremely complex ISO standard (Manjunath et al, 2002; MPEG-7 Overview, 2003); therefore, an official subset of MPEG-7 is being defined within the context of MPEG, which is a working group of ISO. See www.iso.org for more information about ISO. This subset will eventually be published in ISO standard 15928 Part 9, as the Core Description Profile of MPEG-7, and the author is one of the editors of this forthcoming standard. The EFR format uses a further subset of the Core Description Profile (CDP). Anyone can create an EFR and then choose to either give it away or sell it, since the EFR has its own copyright, separate from the copyright on the video asset that it describes. An EFR is a review and critical commentary for a specific purpose and thus may be protected according to the principle of Free Speech in the United States, and possibly elsewhere.

The playlist builder is the second component in an EFR system. Playlists can, of course, be created without an EFR, but complex playlists would be too time-consuming and tedious to build without an EFR as a reference. A playlist, in contrast with an EFR, actually does something. It is sequence of commands that control the playback of the video asset. There is currently no standard format for a video clip playlist (VCP), but the author has submitted a proposal to the DVD Association (www.dvda.org) that a formal working group be established for this purpose. Although we do not know exactly what a standard playlist will look like, it will likely be an XML application, like an EFR. In the EFR approach, as previously explained, the main difference between a video asset description (an EFR) and a video clip playlist (a VCP) is that an EFR is just an exhaustive description of an entire linear video asset from start to finish. In contrast, a playlist is a sequence of commands to a video player, telling which clips to play in what order and when to mute the audio, when to blank the video or overlay it with a text message, and when to pause playback. An EFR may take hundreds of hours to author, but an instructor can use an EFR to create a simple playlist in a few minutes. It is unclear whether a playlist can be distributed outside the home or classroom for which it was built. In the interim, until this complex legal issue is resolved, it may be best to avoid distributing playlists. Instead, an EFR could be distributed, so that each instructor can easily build their own playlists.

The video player is the third component of an EFR system. If the EFR system in question is based on DVDs, then, obviously, a DVD player is needed; however, a typical DVD player is not sufficient. Instead, a playlist-aware player is needed. A playlist-aware DVD player can play DVDs from start to finish, like any other DVD player, but it can also play DVDs under the control of a selected playlist. As previously indicated, playlists can be created for many reasons, such as shortening the playback of a video asset to fit into the time constraints of a lecture or avoiding offensive content in a film. A playlist can also be used in a film studies course to play a sequence of clips that show the development of a character in a film or that illustrate a camera technique. The player does not know about an EFR directly, only indirectly through the playlists that are built from it.

The three components of an EFR system fit together as follows:

- The authoring component is used to create an EFR that describes the video asset in question.

(An EFR is the link between the authoring and playlist building.)

- The playlist builder facilitates the building of playlists, using the descriptions in an EFR.

(Playlists are the link between playlist building and customized playback.)

- The player permits Customized Video Playback (CVP) by allowing itself to be controlled by a designated playlist.

Thus, the EFR and the playlists tie together the three components of an EFR system.

If multiple EFR components were to conform both to the MPEG-7 standard upon which the EFR format is based and to the forthcoming DVD Association playlist format standard, then theoretically, any of those standards-based components could be used interchangeably with another component of the same category. Thus, an instructional designer could choose which authoring system to use to create an EFR. Then an instructor could choose which

playlist builder to use to build a playlist and which player to use to run that playlist. In practice, a playlist builder may be integrated into a player, but, clearly, the use of standards provides for considerable flexibility in combining interoperable components.

Operation

An DVD-based EFR system operates as follows. Once someone decides to treat a particular film that is available on DVD, the first step is to create an EFR for the film. Then, the instructor, who need not be the person who created the EFR creates a playlist for a particular classroom lesson or for a homework assignment. Many different playlists can be created from the same EFR. Once a playlist exists, it can be used by instructors or students. The DVD is inserted into the drive of a playlist-aware DVD player and the playlist for playlists for that DVD appear. Once a playlist is activated, the user can play the clips and access the annotations associated with a current clip.

See the EFR website (www.efr.byu.edu) for more information about the EFR project.

References

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