

Semantic Video Patterns

Automatic Generation of Hollywood-like Movie Trailers

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For further information and scientific results please visit our website <http://www.tzi.de/svp>.

CONCEPT:

AUTOMATIC TRAILER GENERATION

The movie industry has long perfected advertising its movies. In order to inform and to attract the audience short previews are presented in cinema or TV – the “movie trailers”. A branch of Hollywood’s film industry has specialized in the production of trailers. The process of trailer creation has always been determined by manual editing of video and audio footage. It covers the selection of scenes and their arrangement, the composition of a music soundtrack or sound effects, and the generation of additional footage, like movie title animations.

The SVP project focused on the development of a trailer creation system which automatically generates typical Hollywood action movie trailers. In our assumption trailer creation – besides being a creative process which makes each trailer an artwork – follows certain rules which can be defined in algorithms.









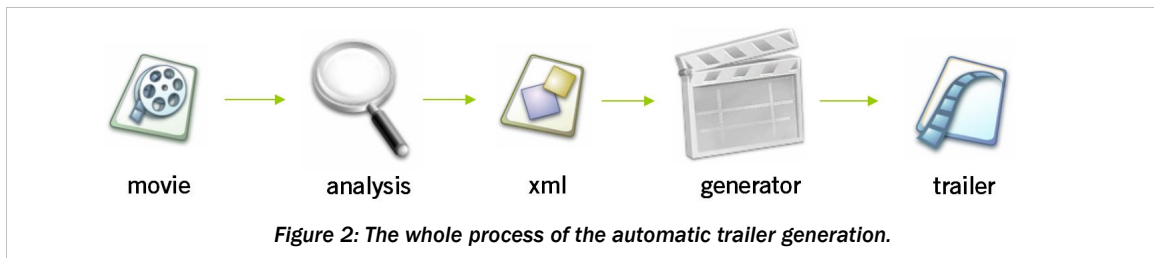
#	screenshot	trailer time	movie time	footage	description	keywords	actor 1	actor 2	actor 3
111		01:46.250	01:44:27	movie scene	Terminator walking through door with rifle in his hand	concentrate good interior introduction person walk		—	—
112		01:48.083	00:00:00	movie title	Showing title in short: T2	.	—	—	—
113		01:49.625	00:00:00	movie title	Title in long version: Terminator 2 - Judgment day	.	—	—	—
114		01:52.167	00:33:49	movie scene	Terminator with rifle and John sitting on a motorcycle	concentrate good person ranged weapon			—
115		01:54.542	01:42:14	movie scene	Building blowing up	destruction fire urban	—	—	—

Figure 1: An extract of the SVP trailer analysis database

* The document published earlier on the websites <http://www.eculturefactory.de> and <http://netzspannung.org/> was an uncorrected promotional description of the SVP project and should not be quoted.



TRAILER ANALYSIS: FINDING TRAILER PATTERNS

In order to analyze common trailer structures we created our own research data pool. Eleven action movie trailers (e.g. “Terminator 2” and “Charlie’s Angels”) were manually analyzed in detail for aspects such as shot duration, actor appearance, camera position or sound volume. All frame-precise data was stored in a database, as shown in figure 1. Based on the resulting pool of data sets we extracted typical trailer patterns by performing manual and automatic statistical analyzing methods.

OVERVIEW: TRAILER GENERATION SYSTEM

The automatic creation process of a trailer from a movie is realized in two phases: in the first phase, the “Analyzer” examines the source movie for a multitude of audio and video features. In the second phase, the “Generator” uses this knowledge in order to classify the movie footage, to calculate and render a trailer based on the patterns derived by our pattern analysis. The whole process, illustrated in figure 2, can be run fully automatically, generating a fully fledged movie trailer. In the following, the two software components “Analyzer” and “Generator” are described in more detail.

ANALYZER: KNOWLEDGE ABOUT A MOVIE

The analyzing operations of the system gather knowledge about features such as cuts, actor appearance, speech, text, sound events, and many more. Therefore, analyzing software was customized or self developed. The resulting feature data represents a large collection of knowledge about the source movie:

Image Features

- The system can find faces in the movie (see figure 3) and tries to distinguish the main actor.
- The image motion is calculated. High image motion indicates action.
- Overlay text is detected automatically. Start or end credits are not usable for a trailer.

Audio Features

- We trained our software to find explosions, gunshots and screams as well as other dramatic sound events, which are important elements of action trailers.
- The software can detect quotes within the movie that are registered in the international movie database IMDb. Well-known quotes (e.g. “Hasta la vista, baby!”) are preferred footage for trailers.
- We distinguish background music, since movie footage containing background music may disturb the final sound mix.

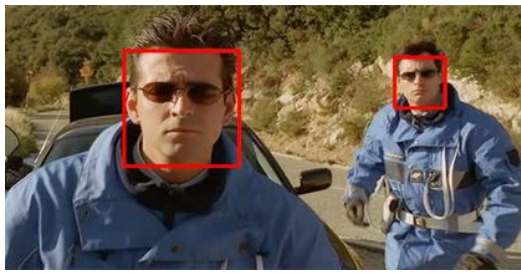


Figure 3: Results of the face detection ("The Transporter")

GENERATOR:

COMPOSING A TRAILER

Based on extracted movie information our generation software creates a complete movie trailer. A knowledge base is used as the "brain" of our application. It holds the structural information needed to create a trailer. When generating a trailer, the system dynamically calculates a trailer structure according to the stored facts and rules, and according to the available movie footage. This sequence is enhanced with all kinds of effects to create "real trailer feeling".

- **Categorizing Footage:** With our analysis data the system breaks down movie footage into small units and categorizes them (e.g. "fast action clip", "explosion clip", and more) based on extracted features.
- **Music and Sound Effects:** We use separate music and sound effect media to produce a unique trailer soundtrack during generation which may emphasize dramatic scenes or text animations.

- **3D Animations:** The system creates 3D text animations at runtime for titles or actors names (see figure 4).
- **Special Transitions:** White flashes, fades or hard cuts are used according to trailer semantics.
- **Playback Speed, Volume, Location:** The trailer generation software manages several footage properties for fine-tuned trailer results.

EVALUATION:

HOW GOOD ARE AUTOMATIC TRAILERS?

In order to evaluate the quality or attractiveness of our trailers, we asked 59 people to evaluate test trailers – professional trailers, random clip sequences and trailers produced by our software. The probands were asked to rate the same six aspects for each video.

Although the tests were performed by a not representative group of people, the first results indicate that our attempts of creating a trailer automatically appear to be generally successful. Our automatically generated trailers received high ratings for good composition and "cuts & effects", and lower ratings for "narrative aspects". Our automatic trailers can be seen as a clear improvement over random shot selection methods.

Sample trailers and further information about the SVP project can be found at <http://www.tzi.de/svp>.



(a)

(b)

(c)

Figure 4: Dynamically created 3D animations, (a) movie title, (b) punchline, (c) movie credits.