A virtual cinematography system that learns from examples.

Master 2 Internship Proposal

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Description : Developers of interactive 3D applications, such as computer games, are expending increasing levels of effort on the challenge of creating more and more realistic experiences in virtual environments. In recent years, there has been a clear move in games towards a more cinematographic experience, by recreating and reusing the narrative devices of conventional movies (importance of cut-scenes, continuity editing in the shots).

As a result, there is a pressing requirement to automate cinematography, and develop camera control techniques that can be utilized within the context of complex, dynamic and interactive environments. Such camera control algorithms should be capable of computing optimal viewpoints and performing appropriate editing (or montage) when switching between viewpoints. While an important amount of work is devoted to optimal camera placement, there has been little effort, in the research community, on providing expressive computational models for automated editing.

In this Master internship, we propose to learn from real examples of carefully chosen movie scenes, to drive the automated editing in virtual worlds and 3-D animation. Real movie scenes will be augmented with an annotation scheme consisting of (1) a detailed description of screen composition (positions and orientations of all actors and objects), (2) an
identification of important camera techniques including lens choice (wide angle, long lens), depth of field, camera heights and angles (low angles, high angles) and (3) a narrative summary of the action taking place in the scene. **Those real examples will be used to train statistical models that can predict the cutting points between shots as a function of time, screen composition and action.**

In a second part of the internship, the learned models will be put to test by attempting to rank all the possible edits of a given set of shots (rushes or takes) of an animated scene. Given a sequence of actions to be portrayed in the edited movie, the models should be able to provide a quantitative evaluation of how well any candidate sequence of shots conveys the action, how closely it follows the established rules of continuity editing and how well it fits the learned editing styles. Based on this evaluation criterium, an algorithm for computing optimal or near-optimal solutions will be designed and tested for proposing a “rough cut” of the movie, using all available shots from the animated scenes.

The main difficulties consist in:

1. Identifying and extracting a set of meaningful parameters from real movies
2. Building an expressive editing model that learns from this set of parameters
3. Evaluating the quality of the model in its application to interactive virtual environments

The successful candidate must have a background in statistical machine learning, including Markov models and maximum entropy methods, and very good computer graphics programming skills (C++, OGRE3D). An interest in cinematography and film editing techniques is a plus. The internship is expected to lead to a PhD thesis on the same topic.

The work will take place within the LEAR research team (INRIA Grenoble), in close collaboration with the BUNRAKU team at INRIA Rennes, who will be providing test material in the shape of annotated 3-D animation scenes and shots.

This research is expected to shed light on the theory of film editing, and to be directly applicable to automatic cinematic replay in video games, machinima and automated video editing of home movies.

Bibliography


