A Synthetic Moviemaker for Spatial Representation

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1. Summary
This project introduces a new type of digital animation tool for architects. It synthetically constructs a stylized cinematic representation of a given geometric model of a building. The novel approach is a complete automation of the process of camera work as well as montage. The tool automatically places multiple cameras, move them, and edit the clips together by looking at a given architectural space as condition populated with mobile human inhabitants and taking advantage of cinematic conventions a trained film-maker would deploy. A prototype implementation demonstrates an application of this tool to a small house designed by Le Corbusier.

2. Background
Computer graphics animation tools recently have become available to architects at relatively low cost and without extraordinary technical requirements. However, most contemporary productions of architectural walk-through animation do not reach the level of sophistication where architects’ essential spatial ideas and sense of place are truly conveyed through moving images. This presents a sharp contrast to recent special effect films that Hollywood film-makers produce. One of the reasons for this shortcoming is architects’ lack of training and understanding of cinematic language, which is necessary to translate an architectural form into a cinematic form. Trained film-makers would know camera work conventions such as pan, dolly, and subjective camera. They also know ways of assembling a sequence through such typical methods as rhythmic montage, shot-reverse-shot or an uninterrupted long shot. And a typical process of their production describes a space in reference to its inhabitants and events taking place inside it. This language, largely built for narrative films with characters in space, controls parameters such as camera movement, sound effect as well as montage, and has been developed by various film-makers throughout the past century. Constructivist film theories from Arnheim through Eisenstein made its framework.

3. New animation tool
This paper introduces a new type of digital tool that augment current animation software by algorithmically implementing those basic cinematic methods specifically useful for spatial representations. It focuses on camera placement, camera movement and montage of short clips.

With a geometric model of an architectural space provided, the software works in two phases: individual clip generation and montage. An architect first specifies a major circulation path of a space. Based on these analyses, at any point in the spatial design can be revised as a response. The software then analyzes each clip and checks if a part of the clip includes a view of any object of interest. Also, it tests if the view is obstructed such that a camera accidentally goes outside of the wall and no longer views the interior space concerned. Based on these analyses, at any point in the timeline, the clips are prioritized, and accordingly, the timeline of a stylized template is filled by parts of these clips and assembled into a final sequence of montage.

4. Test application
Prototype software has been built, and its application has been tested on a small unexecuted housing project by Le Corbusier (Citrohan House, 1929). It demonstrates that this tool can create a quick, automated generation of a credible cinematic spatial representation in a format very familiar to general audience who are used to the conventions of commercial films and television dramas. Also the demonstration shows that a different selection of objects of interest and montage method produces a different sequence and conveys a dramatically different sense of space. This digital tool is originally intended to help a quick and credible presentation of a designed environment. However, an architect may well use it in the context of a design in progress. The tool can provide a quick visual feed back of movement in the space, and the spatial design can be revised as a response.