

Immersive Previz: VR Authoring for Film Previsualisation

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ABSTRACT

Creatives in animated and real movie productions have been exploring new modalities to visually design filmic sequences before realizing them in studios, through techniques like hand-drawn storyboards, physical mockups or more recently virtual 3D environments. A central issue in using virtual 3D environments is the complexity of content creation tools for non technical film creatives. To overcome this issue, we present *One Man Movie*, a VR authoring system which enables the crafting of filmic sequences with no prior knowledge in 3D animation. The system is designed to reflect the traditional creative process in film pre-production through stages like (i) scene layout (ii) animation of characters, (iii) placement and control of cameras and (iv) montage of the filmic sequence, while enabling a fully novel and seamless back-and-forth between all stages of the process thanks to real-time engines. This research tool has been designed and evaluated with students and experts from film schools, and should therefore raise a significant interest among Siggraph participants.

CCS CONCEPTS

- Human-centered computing → Virtual reality; User interface programming;
- Applied computing → Media arts;

KEYWORDS

Virtual Reality, Immersive, Previsualisation, Motion Capture

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1 MOVIE PROTOTYPING THROUGH VR

With the advent of realistic real-time rendering techniques, the film and animation industries have been exploring the use of 3D virtual environments to prototype animated and real movies, a technique termed *previsualisation* (or *previz*). Previs consists in creating a rough 3D mockup of the scene, laying out the elements, staging the characters, placing the cameras, and creating an early edit of the

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sequence. Previsualisation provides a mean to creatively explore multiple framing or editing choices, and to confirm or confront initial design ideas from early stages. Most large budget movies nowadays rely on previz technologies as a way to reduce the costs by early anticipation of issues in the 3D environment. Previsualisations are currently outsourced to dedicated companies composed of 3D artists, using traditional modelling/animation tools that are complex to apprehend for creatives in a film crew (editor, cameraman, director of photography). In such a context, we propose to fill a gap by designing an accessible and dedicated content creation tool using VR to author 3D contents for previsualisation. We extend approaches such as the Directors Lens [Lino et al. 2011] to not only manipulate cameras, but also manipulate scene layouts, control 3D character poses and animation, place cameras and perform editing of the sequence, placing the creativity back in the hands of directors and cinematographers.



Figure 1: Our previsualisation tool using an HTC Vive to perform scene layout, staging of characters, acting, camera placement and editing in a virtual 3D environment.

To the best of our knowledge this represents the first VR tool dedicated to film previsualisation. It has received a very strong interest from students in film schools and experts alike. The Unity company displayed our *One Man Movie* tool during the last Unite event in Austin, Texas. Thorough user experiments that involved students from film schools as well as novice users, have demonstrated the strengths of this approach, namely (i) the capacity to be used by novices (ii) the significant reduction of manipulations thanks to a better spatialization in 3D, and (iii) the capacity to seamlessly navigate between staging, acting, shooting and editing modes.

2 DEMONSTRATION AND AUDIENCE

We propose the SIGGRAPH audience to experiment this novel movie prototyping technology using an HTC Vive (see Figure 1) and additional trackers on hands, waist and feet. Participants will

be immersed in a 3D animated reconstruction of a scene from 1985's movie *Back to the Future*. Users will be able to modify the scene layout, add additional characters to play their roles, and take Roberts Zemeckis' place behind the camera to produce their own version of this sequence (see companion video). Participants will be given full freedom to produce their own animated sequence and will receive a link to download their own edit after their participation¹. The approach we propose is of particular interest to filmmakers, technical directors, film students, directors of photography and animators.

3 SYSTEM OVERVIEW

Following the process of movie making, we developed the tool around four main components namely the staging, the acting, the cinematography and the editing. Unlike traditional software used in the cinema industry which are meant to be used separately and in succession – making modifications in early stages especially heavy – our system takes full advantage of realtime rendering to propose a more flexible pipeline. This specific design scheme consists in allowing seamless back and forth between the different stages. Combined with the use of a VR device, this all-in-one process removes the boundaries between stages in a seamless way with the idea of not constraining the creative process and enabling the any-time redesign of earlier choices.



Figure 2: Acting can be performed through novel body parts manipulators grabbing the head, hands, shoulders, waist and feet. Characters poses can be created and edited in seconds to quickly prototype a scene layout and atmosphere.

3.1 Staging

The staging component allows users to craft a scene layout by placing objects and characters within a given environment. Classical selection, manipulation, navigation and application control techniques from the literature [Bowman et al. 2004] ensure a quick assimilation of the system. Additionally, we devised new character pose control metaphors that allow the manipulation of the main body parts of a character (*i.e.* feet, hands, hips, shoulders and head) through VR. We relied on inverse kinematics to compute and propagate manipulations through the articulated chains representing the skeleton, in a natural and intuitive way (see Figure 2).

3.2 Acting

An acting component then allows the user to virtually play a character in the scene. The acting is performed through live motion capture relying on additional HTC Vive trackers (for the feet and hip, see companion video). Once again, inverse kinematics techniques are used to ensure a consistent animation of body parts with

¹There is no original material used from the movie that would infringe any copyright from Universal Pictures.

a low number of trackers. Animation tracks are recorded for an actor, and can be instantly replayed in VR, and exploited to perform acting on a second character, incrementally building a whole sequence.

3.3 Cinematography and editing

To perform the cinematography, different interactions are proposed. Virtual cameras can be grabbed like any object in the scene, adjusting the position, framing and focal length with a real-time viewfinder. Motions can be crafted alike either by recording handheld camera motions, or creating camera rails that automatically frame targets like characters, using the Unity Cinemachine features².

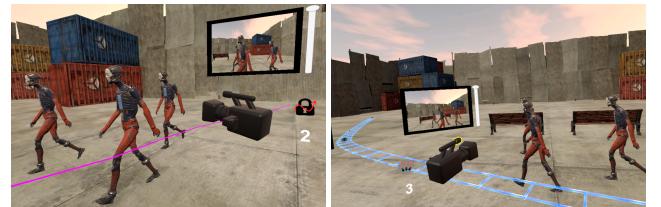


Figure 3: Example of features proposed to assist users in shooting a sequence. (Left) Trajectory recording tool. (Right) Rail crafting tool.

Finally, to complete our VR previzualization tool we propose a new editing method dedicated to VR. Standard editing tools are based on the 3-point editing principle which rely on complex user interfaces, unsuited for VR interactions. Our editing interface follows the concept of multicamera editing with additional interaction constraints specific to VR. In addition, the user can seamlessly change the camera angle, change the scene layout or character animations directly while viewing the results through the editing interface, navigating between stages that are traditionally separated between different tools.

4 RESULTS AND PERSPECTIVES

Experiments with film schools have shown the benefits of the tool in rapidly prototyping filmic sequences for novice and professional users. Participants were able to achieve staging and framing performances with just few minutes of training and the feedback was extremely positive. The Unity company (on which the tools is built) showed a video of this tool at the last Unite event in Austin³, and received a wide interest. Future work focuses on integrating smart components to rearrange staging, lighting and cameras while interacting.

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²<http://www.cinemachineimagery.com/>

³<https://www.youtube.com/watch?v=jH4LY-SS6oM> at 42m53s