

One Man Movie: A VR Authoring Tool for Film Previsualisation

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ABSTRACT

Creatives in animation and film productions have forever been exploring the use of new means to visually design filmic sequences before realizing them in studios through hand-drawn storyboards, physical mockups or more recently virtual 3D environments. A central issue in using virtual 3D environments to rehearse a sequence is the complexity of content creation tools. To overcome this limitation, we present *One Man Movie*, a VR authoring system which enables the crafting of filmic sequences with no prior knowledge in 3D animation. The proposed system is designed to reflect the traditional creative process through (i) the staging of a scene, (ii) the animation of characters, (iii) the placement and control of cameras and (iv) the montage of the filmic sequence. As a benefit, the proposed approach enables a novel and seamless back-and-forth between all stages of the process.

CCS CONCEPTS

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

KEYWORDS

ACM proceedings, L^AT_EX, text tagging

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1 MOVIE PROTOTYPING THROUGH VR

Film and animation industries have forever been exploring means to prototype movies before shooting them. 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 *previs*). Previsualisation generally 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 sequence. As an addition to the storyboard, the previsualisation stage provides a means to creatively explore multiple framing or editing choices, and to confirm or confront initial design ideas from early stages with layout, shooting and editing constraints. Most large budget movies nowadays rely on previsualisation technologies as a way to reduce the costs by early anticipation of issues in the 3D environment. Previsualisations of movies or animated sequences are currently crafted by dedicated companies composed of 3D artists, using traditional modelling/animation tools such as Maya, 3DS or Motion Builder since most creatives in a film crew (editor, cameraman, director of photography) who may not master these technologies. While a few tools such as FrameForge3D, MovieStorm or ShotPro[1–3] and research prototypes have been proposed to ease the creative process [5], most tools remain technically complex to master, outsourcing the control of the contents, and hampering the creativity of film crews.

In such a context, we propose to fill a gap by designing an accessible and dedicated content creation tool using VR so that part of the creative power can be placed back in the hands of film creatives. We propose to build on VR technologies to author 3D contents for previsualisation. We extend approaches such as the Directors Lens [5] to not only manipulate cameras, but also manipulate scene layouts, control 3D character poses and animation, place cameras and perform editing of the sequence.

Through user experiments that involved students from film schools as well as novice users, we have demonstrated the strengths of this approach, namely (i) the capacity to be used easily by novices as well as students in film schools and 3D animation schools, (ii) the reduction of viewpoint manipulations thanks to a better spatialization in 3D, and (iii) the capacity to seamlessly navigate between staging, acting, shooting and editing modes. To the best of our knowledge this represents the first VR tool dedicated to film previsualisation and received a very strong interest from students in film schools and experts.

2 THE ONE MAN MOVIE DEMONSTRATION

We propose to the SIGGRAPH audience to discover this novel type of movie prototyping tool through different setups using an HTC Vive (see Figure 1). In a first demo, 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 and

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pose additional characters, and take Roberts Zemeckis' place behind the camera to produce their own version of the movie. In addition, we propose a second environment based on the universe introduced in the short film *Adam*, produced by Unity3D. Participants will be given full freedom to produce their own animated sequence.



Figure 1: Experiments will take place in different virtual environments. Users wearing an HTC Vive (left) can be immersed in an animated reconstruction of *Back to the Future* (middle) or in another futuristic environment (right).

3 SYSTEM OVERVIEW

Following the process of movie making, we developed the tool around four main components, each dedicated to a specific task, 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 successively – 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 re-design of early choices.

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 [4] 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 techniques that encode joint limits on the character and propagate manipulations through the articulated chains representing the skeleton in a natural way.

3.2 Acting

Following the staging, we devised an acting component that allows to animate characters. The acting can be performed through motion capture relying on additional trackers (for the feet and hip) or using our pose manipulators to animate body parts separately. Figure 3 illustrates the acting stage through motion capture.

3.3 Cinematography

Moving on to the next stage of the movie production pipeline, we propose a set of features (*cf* Figure 4) to assist the user in



Figure 2: We propose a novel interacting metaphor to craft character poses with Inverse Kinematics to ensure the naturalness of the pose. Starting from an initial pose (Left), the user can create new poses through a small set of operations.

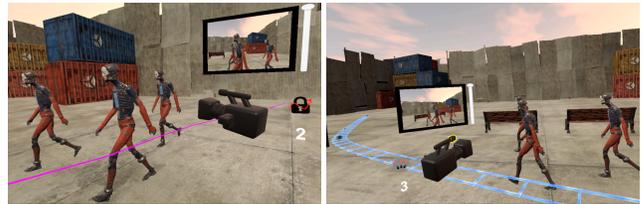


Figure 3: Acting can be performed through (a) motion capture or (b) body parts manipulators

performing the cinematography (placing and moving the camera). Virtual cameras can be grabbed like any object in the scene and the user can interactively adjust the focal length. The resulting shot can be previewed in realtime. To create camera motions, the user has the possibility of either creating camera rails or recording tracked camera motions.

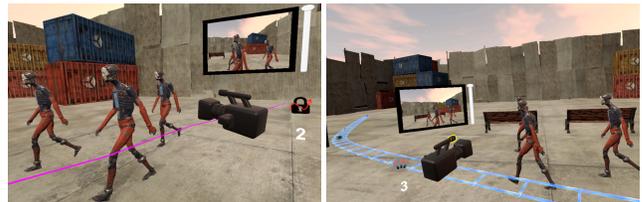


Figure 4: Example of features proposed to assist users in shooting a sequence. (Left) Trajectory recording tool. (Right) Rail crafting tool.

3.4 Editing

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 was crafted following the concept of multicamera editing with additional interaction constraints, specific to VR. The user can interactively change the camera angle, change the scene layout or character animations directly while viewing the results through the editing interface, seamlessly navigating between stages that are traditionally split in different tools.

4 RESULTS AND PERSPECTIVES

The system was tested on several scenarios involving different categories of participants with different level of expertise in 3D animation and movie making in general. Results have shown the benefits of the tool in rapidly prototyping filmic sequences for novice and professional users. Participants were able to achieve optimal performances with just few minutes of training and the results were overwhelming and extremely positive. All expert users were willing to use future versions of the systems and integrate the tool in their projects.

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