

VPET - Virtual Production Editing Tools

Simon Spielmann

Animationsinstitut at Filmakademie
Baden-Württemberg
simon.spielmann@filmakademie.de

Volker Helzle

Animationsinstitut at Filmakademie
Baden-Württemberg
volker.helzle@filmakademie.de

Andreas Schuster

Animationsinstitut at Filmakademie
Baden-Württemberg
andreas.schuster@filmakademie.de

Jonas Trottnow

Animationsinstitut at Filmakademie
Baden-Württemberg
jonas.trottnow@filmakademie.de

Kai Götz

Animationsinstitut at Filmakademie
Baden-Württemberg
kai.götz@filmakademie.de

Patricia Rohr

Animationsinstitut at Filmakademie
Baden-Württemberg
patricia.rohr@filmakademie.de

ABSTRACT

The work on intuitive Virtual Production tools at Filmakademie Baden-Württemberg has focused on an open platform tied to existing film creation pipelines. The Virtual Production Editing Tools (VPET) started in a former project on Virtual Production funded by the European Union and are published and constantly updated on the open source software development platform Github. We introduce an intuitive workflow where Augmented Reality, inside-out tracking and real-time color keying can be applied on the fly to extend a real movie set with editable, virtual extensions in a collaborative setup.

CCS CONCEPTS

• **Applied computing** → *Arts and humanities*; • **Computer systems organization** → *Real-time operating systems*; • **Human-centered computing** → *Interactive systems and tools*;

KEYWORDS

virtual production, filmmaking, on-set editing, handheld, collaborative work, production pipeline, augmented reality, color keying

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1 INTRODUCTION

The Virtual Production Editing Tools (VPET)[VPE 2018b] were initially developed in the collaborative European research project Dreamspace[Dre 2018] till 2016. One objective of this project was to research and develop methods for designing Virtual Productions by modifying digital assets in a collaborative environment which allows for intuitive controls of creative parameters. It constituted an approach to democratize Virtual Production across a wide variety of potential applications, from previs to final production. Post 2016 the

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Filmakademie's research department continued the development as open-source project to meet the ongoing desire for generic Virtual Production pipelines within its own institution. The close link to the VFX and animation industry further motivated us to continue this development.

VPET can be used to layout digital set elements, edit light parameters, add virtual backgrounds and set extensions or create simple animations. Inside-out tracking is used to intuitively scout scenes and digitally augmented real locations. Optional joysticks improve the haptic feedback when performing edits to the scene. The client can be downloaded freely from Apple's App Store[VPE 2018a].

2 PREVIOUS WORK

Augmented Reality (AR) for filmmaking has been subject to ambitious research projects for over 10 years[Ichikari et al. 2006]. With the recent release of AR platforms for consumer applications those prototypes became much more applicable to a wider audience at affordable costs. In our recent publication [V. Helzle 2017] we demonstrated the potential of next level consumer devices within a virtual production environment at Filmakademie [Spielmann et al. 2016]. By utilizing robust inside-out tracking[ARK 2018], the Virtual Production Editing Tools can now be used to augment real scenes with virtual assets. The combination with haptic interface devices [Gam 2018] further increases usability and enables the user to interact with the scenery in a more natural way.

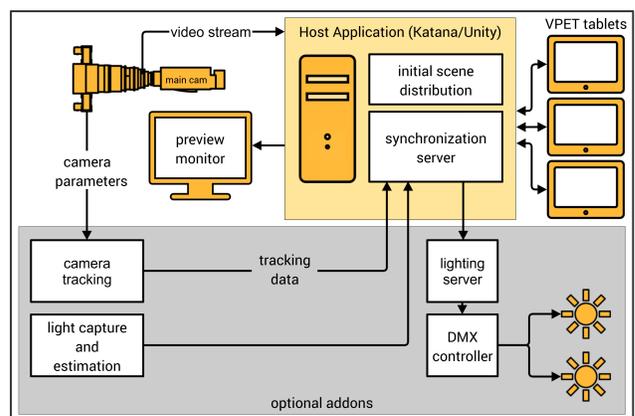


Figure 1: Schematic overview of the VPET components.

3 COMPONENT DESIGN

VPET consists of three core elements: client application, synchronisation server and distribution plugins (Figure 1). A key feature of the system is its easy adaption to any established film production pipeline by providing custom distribution plugins. The scene can be directly transferred from those plugins to the client (commonly tablets), while the synchronisation server propagates scene changes to all clients and the host. It might be necessary to provide reduced proxy geometry on the host in order to meet the rendering capabilities of the client hardware. This authoring can be performed in well established environments. Currently Unity and Katana are supported as host applications. Recent advances in Augmented Reality introduced by Apple ARKit were used to realize intuitive workflows in which AR techniques can be applied on the fly to extend a real set with virtual extensions.

4 ON DEVICE TECHNOLOGY

4.1 Set Extension

A precisely matching, virtual set extension was created to extend a real set for a running production at Filmakademie (figure 2). As a direct result, VPET enabled the Production Design department to visualize the final look in constant consultation with the Concept Art and Camera department. This will help the Director and the Director of Photography to clarify their visions and guarantees a smooth post production process.

To match the virtual set extension with the real set, VPET's functionality had to be extended. Before loading or streaming the virtual scene to the client, the user has to specify an anchor point, e.g. an object corner. This is then used to match the position of virtual elements in the real world. The virtual set elements will be loaded and seamlessly integrated into the client's visualisation. All virtual elements can now be edited using the full VPET toolbox.



Figure 2: Real set and its virtual extension.

4.2 Color Keying

On the clients, a realtime color keying can be used. Thereby the video provided by the device camera can not only be used to fill the background of the virtual scene, but also makes it possible to render the keyed version of the video in front of the virtual objects.

Additionally a matting object can be defined, on which the video feed can be projected. The matting object can be moved by the user

directly on the device, enabling him to precisely define where the real world video should be placed in the virtual environment.

4.3 Navigation

Several Input methods enable a user to navigate through the virtual scene. Probably the most intuitive one is using the inside-out tracking provided by the ARKit API. All physical movements of the mobile device are directly applied to the virtual scene, making the device a window into the virtual world.

Additionally, touch gestures can be used to translate the camera within the scene. Lastly joystick controllers can be attached to the mobile device to navigate through the scene, just like in a game.

5 FURTHER WORK

During test productions it became crucial to be able to scale the scene on each device individually. Some users may navigate through the scene in a miniature version using augmented reality, others want to match the scaling to the real set. Nevertheless all changes need to be synchronized across all devices. Along with individual scalings, different challenges arose. The speed of a navigation, using augmented reality, needs to match speeds of e.g. joystick inputs. Defining these speeds not only depends on an overall scaling factor, but also on the size of the virtual scene, and even the distance of the camera to objects in the viewport. A holistic approach for this is currently in development.

Currently the matching between virtual and real scene needs to be done by manually placing the origin in the virtual scene on the device. In the near future this will be simplified by placing a marker at the origin in the real set, which is automatically detected and tracked on the client.

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REFERENCES

- 2018. Apple ARKit. (Feb. 2018). Retrieved February 12, 2018 from <http://developer.apple.com/arkit>
- 2018. Game Vice. (Feb. 2018). Retrieved February 12, 2018 from <http://gamevice.com>
- 2018. Project Dreamspace, funded by the European Union (610005). (2018). Retrieved June 20, 2018 from <http://dreamspaceproject.eu>
- 2018a. VPET at Apple App Store. (2018). Retrieved June 20, 2018 from <https://itunes.apple.com/us/app/vpet/id1374394388>
- 2018b. VPET project page. (Feb. 2018). Retrieved February 12, 2018 from <http://vpet.research.animationsinstitut.de>
- R. Ichikari, K. Kawano, A. Kimura, F. Shibata, and H. Tamura. 2006. Mixed reality pre-visualization and camera-work authoring in filmmaking. In *2006 IEEE/ACM International Symposium on Mixed and Augmented Reality*. 239–240. DOI : <http://dx.doi.org/10.1109/ISMAR.2006.297823>
- Simon Spielmann, Andreas Schuster, Kai Goetz, and Volker Helzle. 2016. VPET: A Toolset for Collaborative Virtual Filmmaking. In *SIGGRAPH ASIA 2016 Technical Briefs (SA '16)*. ACM, New York, NY, USA, Article 29, 4 pages. DOI : <http://dx.doi.org/10.1145/3005358.3005370>
- S. Spielmann V. Helzle. 2017. Next Level Consumer Devices for Virtual Production.. In *CVMP 2017. Poster Presentation*.