

Augmented Reality for Virtual Set Extension

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ABSTRACT

We introduce an intuitive workflow where Augmented Reality can be applied on the fly to extend a real set with virtual extensions. The work on intuitive Virtual Production technology at Filmakademie Baden-Württemberg has focused on an open platform tied to existing film creation pipelines. The Virtual Production Editing Tools (VPET) are published and constantly updated on the open source software development platform Github as a result of a former project on Virtual Production funded by the European Union.

CCS CONCEPTS

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

KEYWORDS

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

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1 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 [VPE 2018b] 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.

2 REAL SET

The whole set was digitally designed beforehand by Filmakademie's Production Design and Set Building department. This data has been

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used to construct an precise matching virtual set extension (figure 2). As a direct result, VPET would make it possible for the Production Design department to visualize the final look in constant consultation with the Concept Art and Camera department. Furthermore the now matching virtual set could be used during the final shoot to create a better understanding of the virtual set extensions (figure 1). This will help the Director and the Director of Photography to clarify their visions and guarantees a smooth post production process.



Figure 1: Real set and its virtual extension.

3 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 (figure 3). After both scenes had been defined, 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.

Although the tracking capabilities of ARKit enabled devices are quite reliable, professional tracking systems like Ncam [NCA 2018] or Solid Track [Sol 2018] can deliver even more accurate and robust results. Also professional features like integrating virtual elements into the principal camera image feed (with correct lense effects) are important and can only be realized to some extent with a consumer tablet device. However, the diffusion and availability of mobile devices enable creatives to access a wide field of Augmented Reality visualisation techniques without the need of expensive and bulky professional equipment.

A prebuild version of the VPET client for iOS can be obtained for free from the Apple App Store [VPE 2018a].



Figure 2: Digital asset for set extension.

4 FUTURE WORK

Due to VPET's capability to support Katana [Kat 2018], it can be utilised for high quality look and light development. This can be achieved without the need of being an expert in using highly complex DCC applications. Subsequently, Katana will act as the scene host providing all necessary scene data. Notice that Katana is a reference implementation and that any DCC application could be easily adapted to act as a host. On the VPET client the user can now arrange the scene or edit light parameters in a more convenient way. Every edit is distributed back to the host system while a real-time capable renderer calculates high quality, production ready images. Within Filmakademie productions we are planning to evaluate physically correct renderers towards their suitability to provide true collaborative real-time feedback. For this purpose, we focus on the Redshift renderer [Red 2018] running on various setups: a Nvidia VCA [VCA 2018] or a local GPU cluster on a workstation. Complementary developments will target the integration of ARKit's light estimation capabilities as an additional tool for VPET. A tablet client would then be able to reconstruct the basic light direction and intensity on set, to further improve the integration of virtual elements



Figure 3: Interactive placement of anchor point.

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