Demo of FaceVR: Real-Time Facial Reenactment and Eye Gaze Control in Virtual Reality

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Figure 1: Our real-time gaze-aware facial reenactment approach controls photo-realistic stereo re-renderings of an actor.

ABSTRACT

We introduce *FaceVR*, a novel method for gaze-aware facial reenactment in the Virtual Reality (VR) context. The key component of FaceVR is a robust algorithm to perform real-time facial motion capture of an actor who is wearing a head-mounted display (HMD), as well as a new data-driven approach for eye tracking from monocular videos. In addition to these face reconstruction components, FaceVR incorporates photo-realistic re-rendering in real time, thus allowing artificial modifications of face and eye appearances. For instance, we can alter facial expressions, change gaze directions, or remove the VR goggles in realistic re-renderings. In a live setup with a source and a target actor, we apply these newly-introduced algorithmic components. We assume that the source actor is wearing a VR device, and we capture his facial expressions and eye movement in real-time. For the target video, we mimic a similar tracking process; however, we use the source input to drive the animations of the target video, thus enabling gaze-aware facial reenactment. To render the modified target video on a stereo display, we augment our capture and reconstruction process with stereo data. In the end, FaceVR produces compelling results for a variety of applications, such as gaze-aware facial reenactment, reenactment in virtual reality, removal of VR goggles, and re-targeting of somebody's gaze direction in a video conferencing call.

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SIGGRAPH '17 Emerging Technologies, Los Angeles, CA, USA
© 2017 Copyright held by the owner/author(s). 978-1-4503-5012-9/17/07…$15.00
DOI: http://dx.doi.org/10.1145/3084822.3084841

CCS CONCEPTS

•Computing methodologies →Image manipulation;

KEYWORDS

face capture, facial reenactment, expression transfer

ACM Reference format:
Justus Thies, Michael Zollhöfer, Marc Stamminger, Christian Theobalt, and Matthias Nießner. 2017. Demo of FaceVR: Real-Time Facial Reenactment and Eye Gaze Control in Virtual Reality. In *Proceedings of SIGGRAPH '17 Emerging Technologies, Los Angeles, CA, USA, July 30 - August 03, 2017,* 2 pages.
DOI: http://dx.doi.org/10.1145/3084822.3084841

1 INTRODUCTION

Modern head-mounted virtual reality displays, such as the Oculus Rift™ or the HTC Vive™, are able to provide very believable and highly immersive stereo renderings of virtual environments to a user. In particular, for teleconferencing scenarios, where two or more people at distant locations meet (virtually) face-to-face in a virtual meeting room, VR displays can provide a far more immersive and connected atmosphere than today's teleconferencing systems. These teleconferencing systems usually employ one or several video cameras at each end to film the participants, whose video(s) are then shown on one or several standard displays at the other end. Imagine one could take this to the next level, and two people in a VR teleconference would each see a photo-realistic 3D rendering of their actual conversational partner, not simply an avatar, but in their own HMD. In this VR teleconferencing setting, a (self-)facial reenactment approach could be used to remove the HMD virtually from the face of each participant by rendering the unoccluded view

Figure 2: FaceVR enables virtual removal of HMDs.

of the face on top of the VR display at the other end (see Fig. 2). Furthermore, existing reenactment approaches cannot transfer the appearance of eyes, including blinking and eye gaze - yet exact reproduction of the entire face expression, including the eye region, is crucial for conversations in VR.

In our work, we therefore propose *FaceVR*, a new real-time facial reenactment approach that can transfer facial expressions and realistic eye appearance between a source and a target actor video (see Fig. 1). Eye movements are tracked using an infrared camera inside the HMD in addition to outside-in cameras tracking the unoccluded face regions. It is also suited for self-reenactment with HMDs, thus enabling VR teleconferencing as described above.

2 USER EXPERIENCE

The demo is an illustration of our *FaceVR* approach (Thies et al. 2016), which is the basis for several applications such as gaze-aware facial reenactment, reenactment in virtual reality, removal of VR goggles, and re-targeting of somebody's gaze direction in a video conferencing call. In our booth, the visitors are able to experience real-time gaze-aware facial reenactment of stereo videos. We will track the user at real-time using an RGB-D sensor and transfer the facial expression as well as the eye motion to a stereo target video. To this end, we prepared a variety of stereo target videos that can be freely selected and reenacted. We show the live reenactment results on a large screen and in 3D using an Oculus Rift DK 2, which can be used by the audience. Seeing the reenactment results in 3D is a great experience and also fun to watch for everybody else standing around the booth. In addition, we plan to keep track of the best and funniest reenactment results, and share them with the world via a social media platform (i.e., Facebook).

REFERENCES

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