

# Real-time Facial Tracking in Virtual Reality

Jihun Yu\*    Jungwoon Park  
BinaryVR. Inc.



**Figure 1:** Our facial tracking system for Virtual Reality is presented. (left) The facial performance is captured for Oculus DK2 and applied to virtual avatars in High Fidelity, an open sourced social VR platform, (right) Our capturing camera attached on the HTC Vive.

## Abstract

Virtual reality (VR) emerges as the next social computing platform. For realizing immersive social interactions, projecting facial expressions onto the virtual avatar a crucial component. This is a challenge in VR as it requires capturing the facial motions behind the VR head mounted displays (HMDs). In this paper, we present a real-time facial expression tracking system in VR HMDs. The core of the system is a 3D camera attached to the HMDs, capturing motions on the lower half of the face, which enables users to track and retarget their facial animations in real-time onto CG avatars. The system is capable of capturing 20 facial expression parameters and transfer it onto the 3D character in real-time.

**Keywords:** virtual reality, facial capture

**Concepts:** • Computing methodologies ~ Animation; Motion Capture;

## 1 Related Work

Real-time Facial performance capture technology have been achieving significant progress in recent years. FaceShift [FaceShift] is one of the successful commercial products, which has been used in the movie/animation industries to animate CG characters. [Hao et al. 2015] built a real-time facial tracking system working on the Oculus Rift headset and demonstrated great potential to adapt the facial performance capture technology into VR HMDs.

\*e-mail:jihun.yu@binaryvr.com.

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The idea of facial performance capture using EMG sensors is proposed in the media such as Emteq [Emteq].

## 2 Facial Capture Technology

Our real-time facial tracking system for VR HMDs utilizes a 3D Time-of-Flight (ToF) camera to capture the depth map and 2D infrared (IR) image of the lower half of the face. Facial performance is captured at 45 fps and the system outputs 20 blendshape curves in real-time.



**Figure 2:** Our capturing ToF Camera attached on the oculus.

The system requires a one-time calibration step when users wear the HMD for the first time. During the calibration, the system scans the face for a second and builds the personalized facial tracking model. Once the calibration step is completed, the system captures the real-time facial performance based on the depth map and the sparse 2D facial landmarks tracked on the 2D IR image. In order to complete the full facial capture for VR HMDs in the future, we will add the eye regions (eye and eyebrow) tracking feature by embedding high-framerate optical cameras inside the HMDs.

## References

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