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UNCONSTRAINED REALTIME FACIAL PERFORMANCE CAPTURE

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facial performance capture on highly occluded subject

ABSTRACT

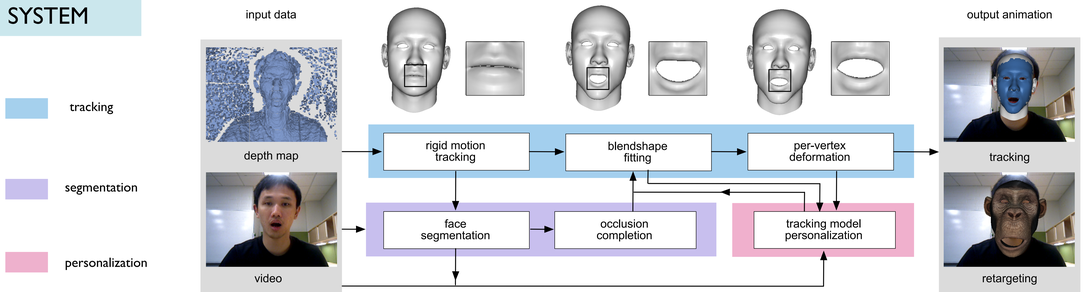
We introduce a realtime facial tracking system specifically designed for performance capture in unconstrained settings using a consumer-level RGB-D sensor. Our framework provides uninterrupted 3D facial tracking, even in the presence of extreme occlusions such as those caused by hair, hand-to-face gestures, and wearable accessories. Anyone's face can be instantly tracked and the users can be switched without an extra calibration step. During tracking, we explicitly segment face regions from any occluding parts by detecting outliers in the shape and appearance input using an exponentially smoothed and user-adaptive tracking model as prior. Our face segmentation combines depth and RGB input data and is also robust against illumination changes. To enable continuous and reliable facial feature tracking in the color channels, we synthesize plausible face textures in the occluded regions. Our tracking model is personalized on-the-fly by progressively refining the user's identity, expressions, and texture with reliable samples and temporal filtering. We demonstrate robust and high-fidelity facial tracking on a wide range of subjects with highly incomplete and largely occluded data. Our system works in everyday environments and is fully unobtrusive to the user, impacting consumer AR applications and surveillance.

CAPTURE SETTING

facial tracking

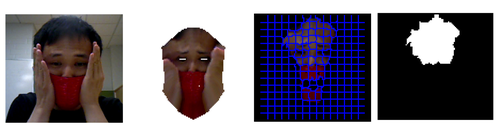
facial retargeting

SYSTEM



FACE SEGMENTATION

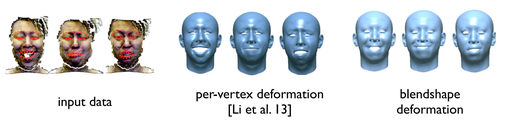
input data | no depth segmentation | without penetration test | with penetration test



input data | input data (UV) | superpixels | segmentation

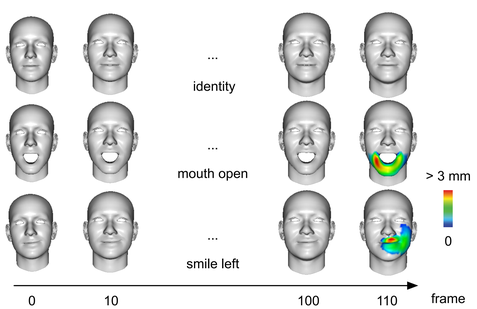
input data | without occlusion completion | with occlusion completion

TRACKING

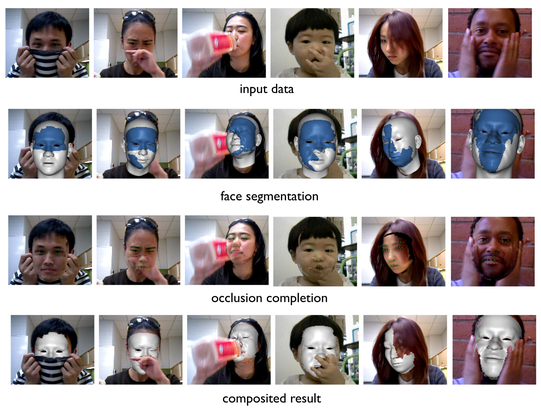


input data | per-vertex deformation [Li et al. 13] | blendshape deformation

PERSONALIZATION

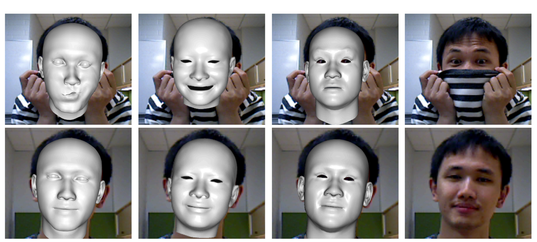


RESULTS



input data | face segmentation | occlusion completion | composited result

COMPARISON



[Faceshift 14] | [Cao et al. 14] | our method | input data

[Li et al. 13] H. Li, J. Yu, Y. Ye, and C. Bregler. Realtime facial animation with on-the-fly correctives. ACM Trans. Graph., 32(4):42:1–42:10, 2013.

[Cao et al. 14] C. Cao, Q. Hou, and K. Zhou. Displaced dynamic expression regression for real-time facial tracking and animation. ACM Trans. Graph., 33(4):43:1–43:10, 2014.

[Faceshift 14] www.faceshift.com