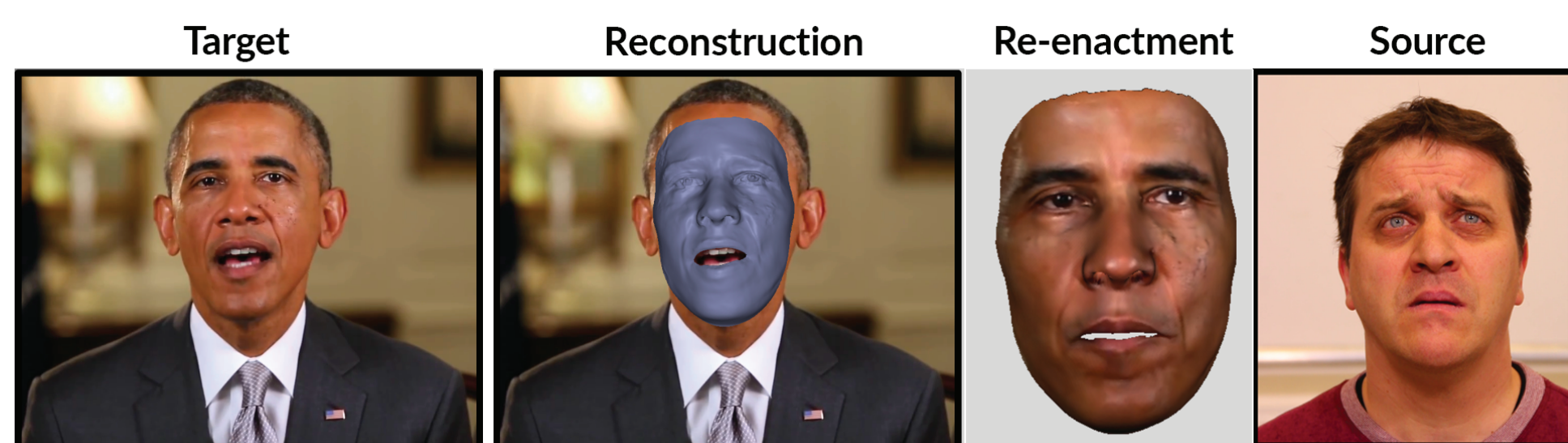


Problem

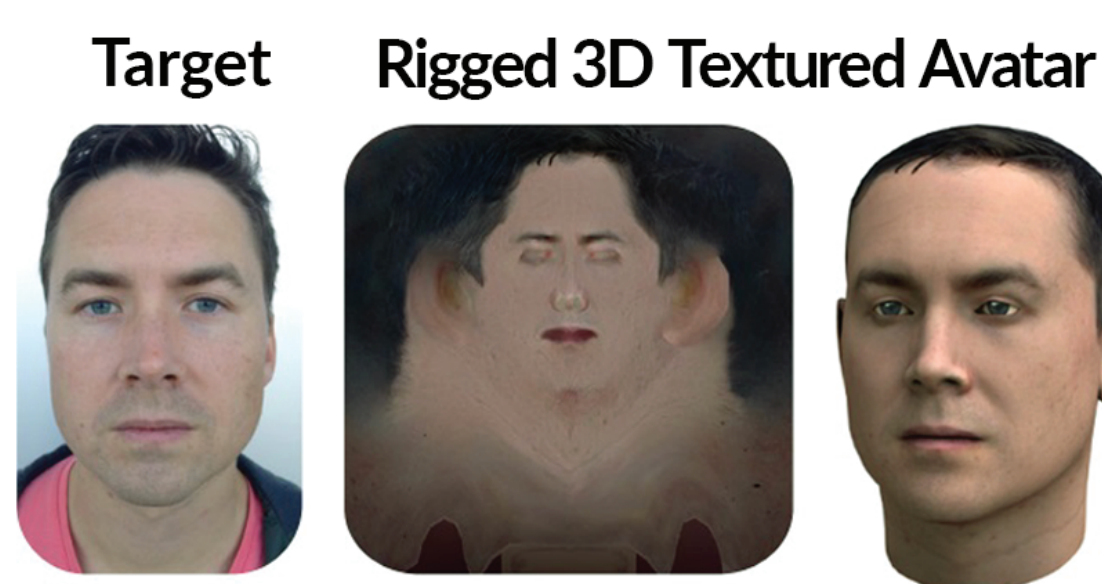
- Casually create photo-realistic avatar
- Interactively animate target avatars
- Allow real-time re-enactment of new views

Previous Related Work

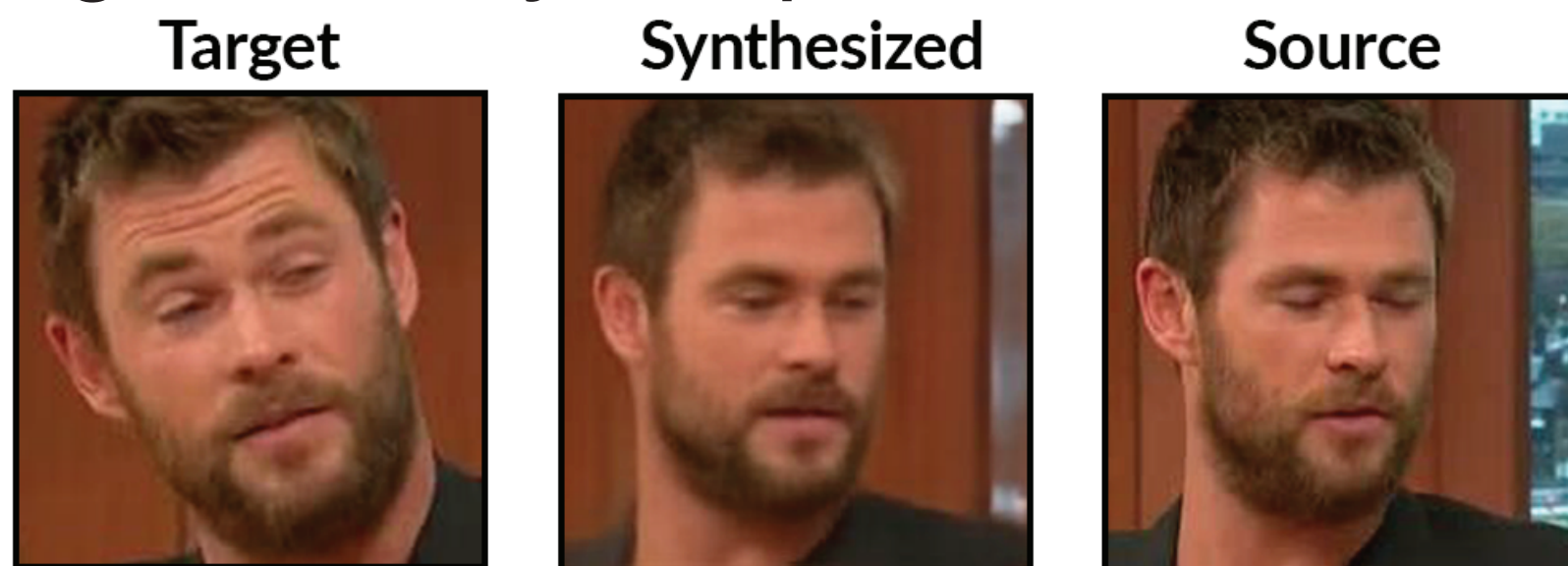
- Focus on re-enacting frontal pose [1]



- Lack of realism and lengthy capture process [2]



- Target identity not preserved [3]



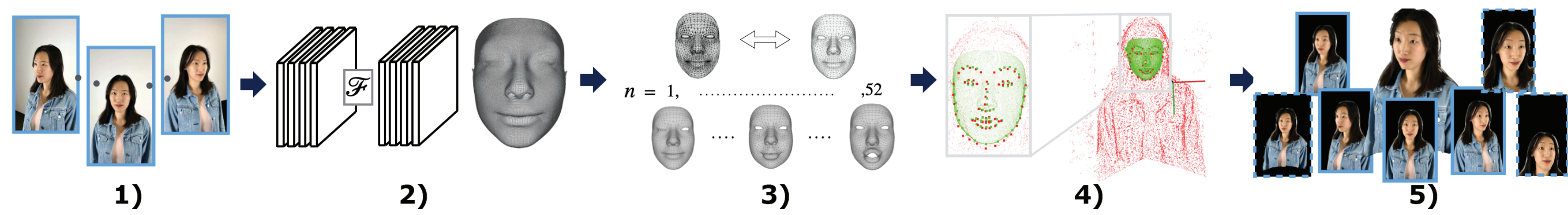
Solution

- Preserve the target identity: align a rigged mesh (morphed blendshapes) to the target's Multi-View Reconstruction
- Transfer expressions: use the blendshape coefficient generated by tracking source with ARKit to create an expression
- Use the blendshape expression as proxy for Image-based Rendering

References

- [1] Garrido, Pablo, Michael Zollhöfer, Dan Casas, Levi Valgaerts, Kiran Varanasi, Patrick Pérez, and Christian Theobalt. 2016. Reconstruction of personalized 3D face rigs from monocular video.
- [2] Michael Zollhöfer, Justus Thies, Pablo Garrido, Derek Bradley, Thabo Beeler, Patrick Pérez, Marc Stamminger, Matthias Nießner, and Christian Theobalt. 2018. State of the Art on Monocular 3D Face Reconstruction, Tracking, and Applications.
- [3] Egor Zakharov, Aliaksandra Shysheya, Egor Burkov, and Victor Lempitsky. 2019. Few-Shot Adversarial Learning of Realistic Neural Talking Head Models.
- [4] Chris Buehler, Michael Bosse, Leonard Mcmillan, Steven Gortler, and Michael Cohen. 2001. Unstructured lumigraph rendering.
- [5] <https://colmap.github.io/>
- [6] Yao Feng, Fan Wu, Xiaohu Shao, Yanfeng Wang, and Xi Zhou. 2018. Joint 3D Face Reconstruction and Dense Alignment with Position Map Regression Network.
- [7] Robert W. Sumner and Jovan Popović. 2004. Deformation Transfer for Triangle Meshes.

Pipeline



1. Casual Capture

A walk-around video of the target neutral expression is fed into a SfM reconstruction pipeline [5]

2. Target face mesh

Multi-View extension of [6], which generates a face mesh of fixed topology from a given view

3. Blendshapes Creation

Non-rigid transformation between the face mesh and a neutral blendshape expression. Transfer this transformation to other expression blendshapes with deformation transfer [7]

4. Face Mesh Alignment

Compute a similarity transformation between the landmarks of the face mesh and the SfM mesh. This transformation is the model matrix for the blendshape templates

5. Free-Viewpoint Re-enactment

Obtain the blendshape coefficient of the source with ARKit face tracking API. Use the coefficients to create a blendshape expression which is used as proxy for unstructured lumigraph rendering

Results

