"High-Fidelity 3D Digital Human Head Creation from RGB-D Selfies" Supplementary Material

In this supplementary document, we present additional materials to complement the paper. Most importantly, we present the skin PBR material template in UE4 for rendering our results.

1 UE4 SKIN PBR MATERIAL FOR RENDERING

We use a skin PBR material template (shown in Fig. S1) simplified from the official skin PBR material template of digital human "Mike" provided by the engine (shown in Fig. S2). The differences of the rendering results with the two materials are shown in Figs. S3 and S4. Note that when use UE4 Mike's skin material, we replace the albedo map, the normal map, and the roughness map with our synthesized maps. For the full head rendering as shown in Fig. S3, there are almost no differences with the two materials. The differences between the two materials are only visible when the camera is very close to the skin, as shown in Fig. S4. There are more micro-specular details of the skin when rendered with the UE4 Mike's skin material, which is due to the micro-normal and micro-roughness used in Mike's skin material. The rendering results in our paper are rendered with our simplified material, while the close views in our supplementary video are rendered with these micro-normal and micro-roughness maps (i.e., UE4 Mike's skin material with our synthesized albedo/normal/roughness maps).

2 MORE UE4 RENDERING RESULTS

We show more rendering results with our simplified skin material in Figs. S5 - S11.

3 VALIDATION OF FRAME SELECTION PROCEDURE

Fig. S12 shows an example of the results with our frame selection procedure. Our algorithm can automatically reject low-quality frames where motion blur or facial movement exists.

4 COMPARISON WITH GANFIT AND AVATARME

We provide more comparison of rendered results with GANFIT and Avatarme in Figs. S13 - S15.

5 HAIRSTYLE CLASSIFICATION LABELS

The 30 hairstyles used in our system are shown in Fig. S16.
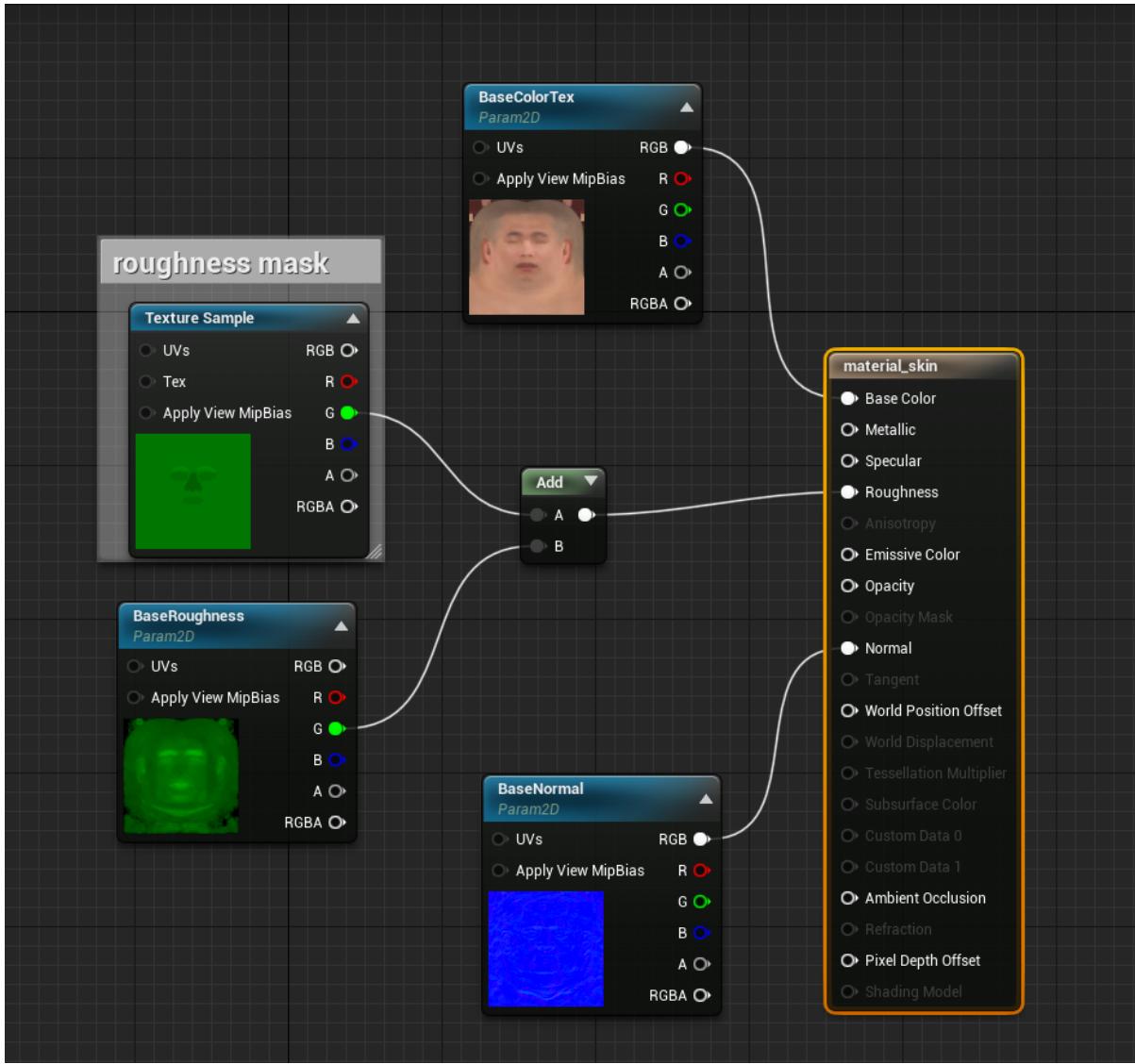
Fig. S1. The simplified UE4 skin PBR material used in our rendering. Although there are four texture maps shown in the material composition, only albedo map (node BaseColorTex) and normal map (node BaseNormal) is needed to render a new face. The BaseRoughness map are computed from the gradient magnitude of the normal map, while the roughness mask is a constant mask to provide roughness differences over facial regions.
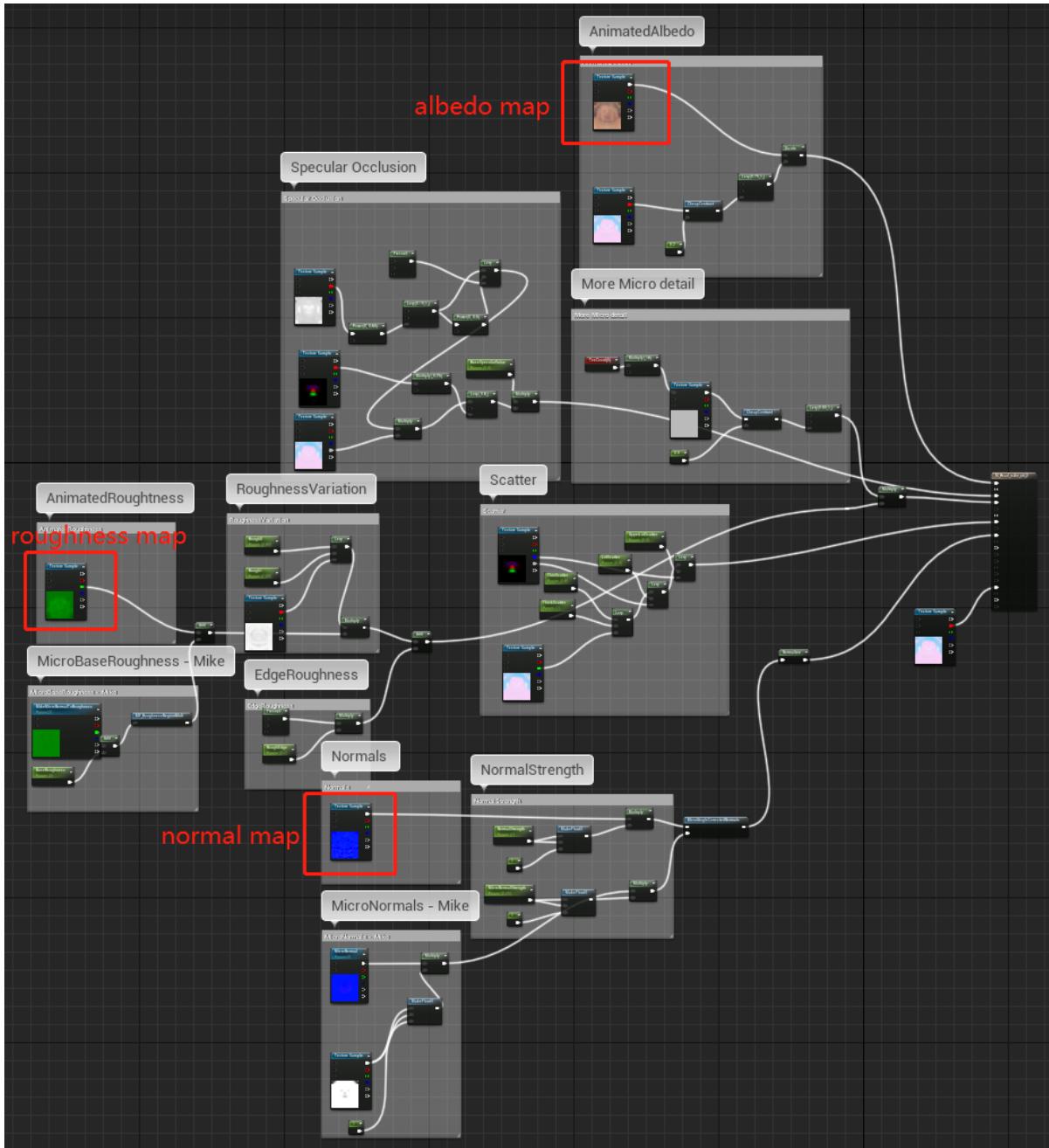
Fig. S2. The official UE4 skin PBR material of "Mike" (https://docs.unrealengine.com/en-US/Resources/Showcases/ DigitalHumans/index.html). To render a new character, we can plug in the albedo map, normal map, and roughness map (which is computed from normal map) as highlighted in red squares in the figure.

Fig. S3. Comparison of two different rendering skin materials. Left: our results rendered with official UE4 skin PBR material of "Mike". Right: rendered with our simplified UE4 skin PBR material. There are almost no differences between the two full head renderings.

Fig. S4. Comparison of two different rendering skin materials. Left: our results rendered with official UE4 skin PBR material of "Mike". Right: rendered with our simplified UE4 skin PBR material. Note that the differences are only visible when the view is very close to the face. There are more micro-specular details of the skin in the left rendering, which is due to the micro-normal and micro-roughness used in Mike's skin material.
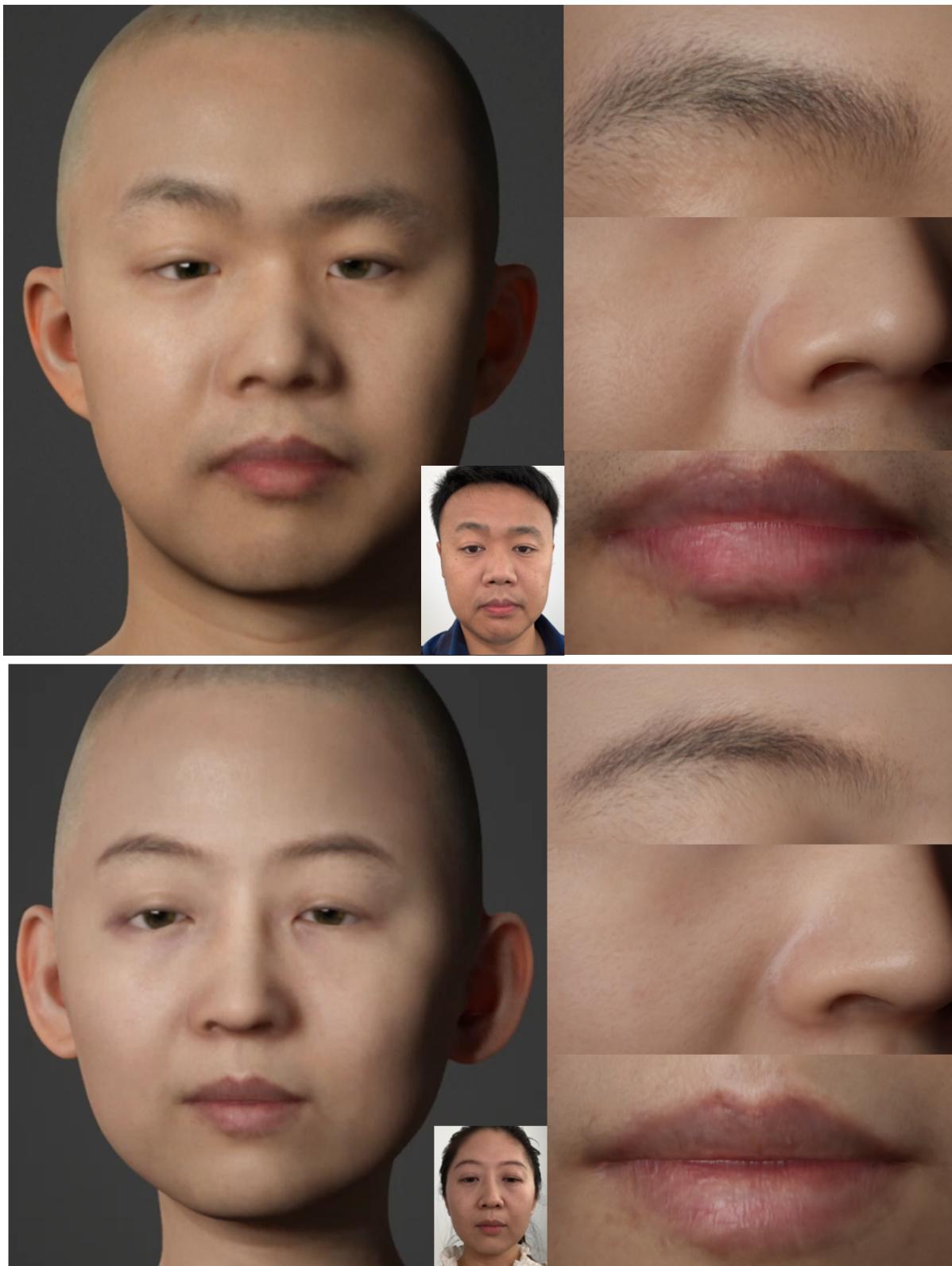
Fig. S5. Rendering of our results with our simplified skin material.
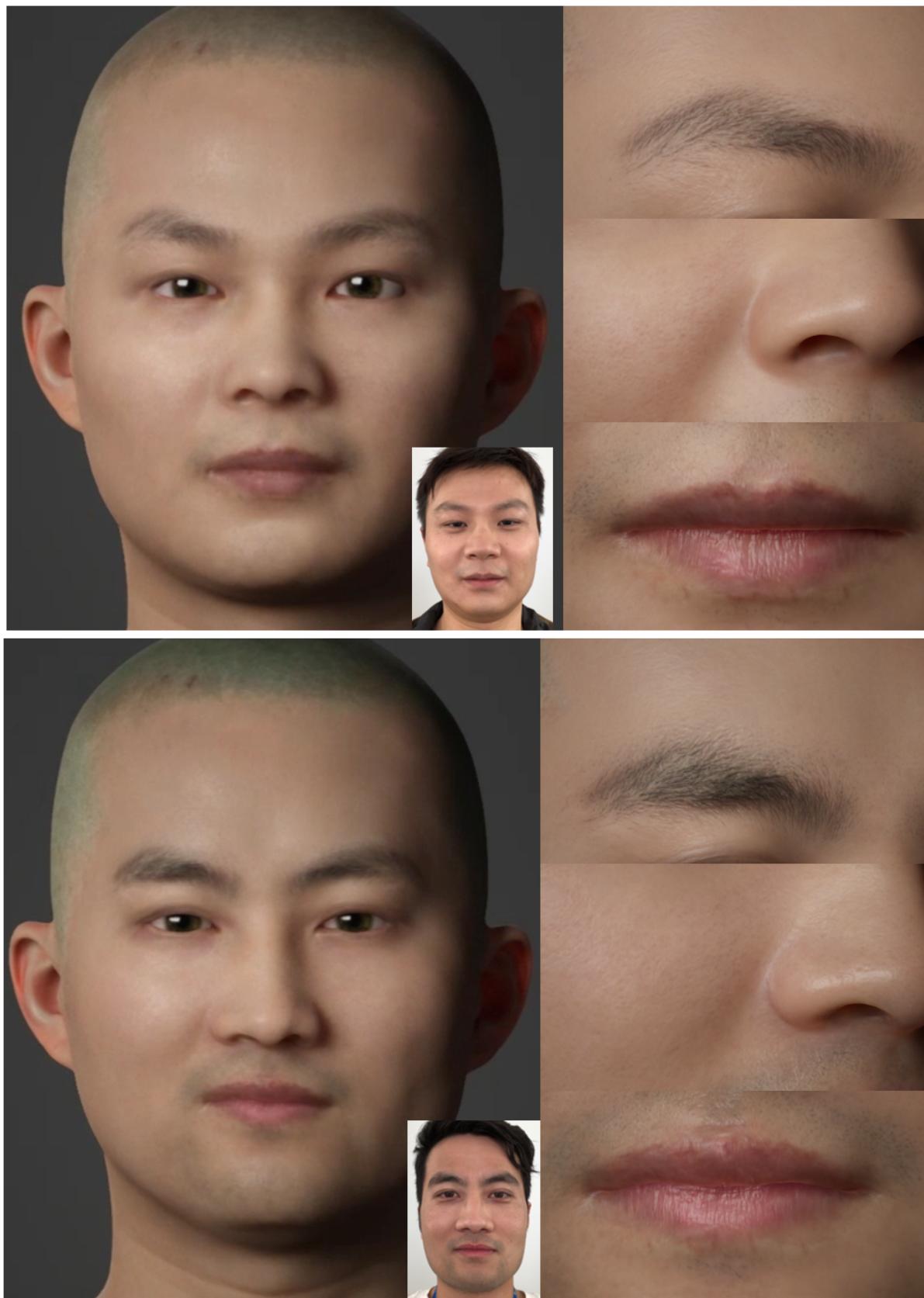
Fig. S6. Rendering of our results with our simplified skin material.
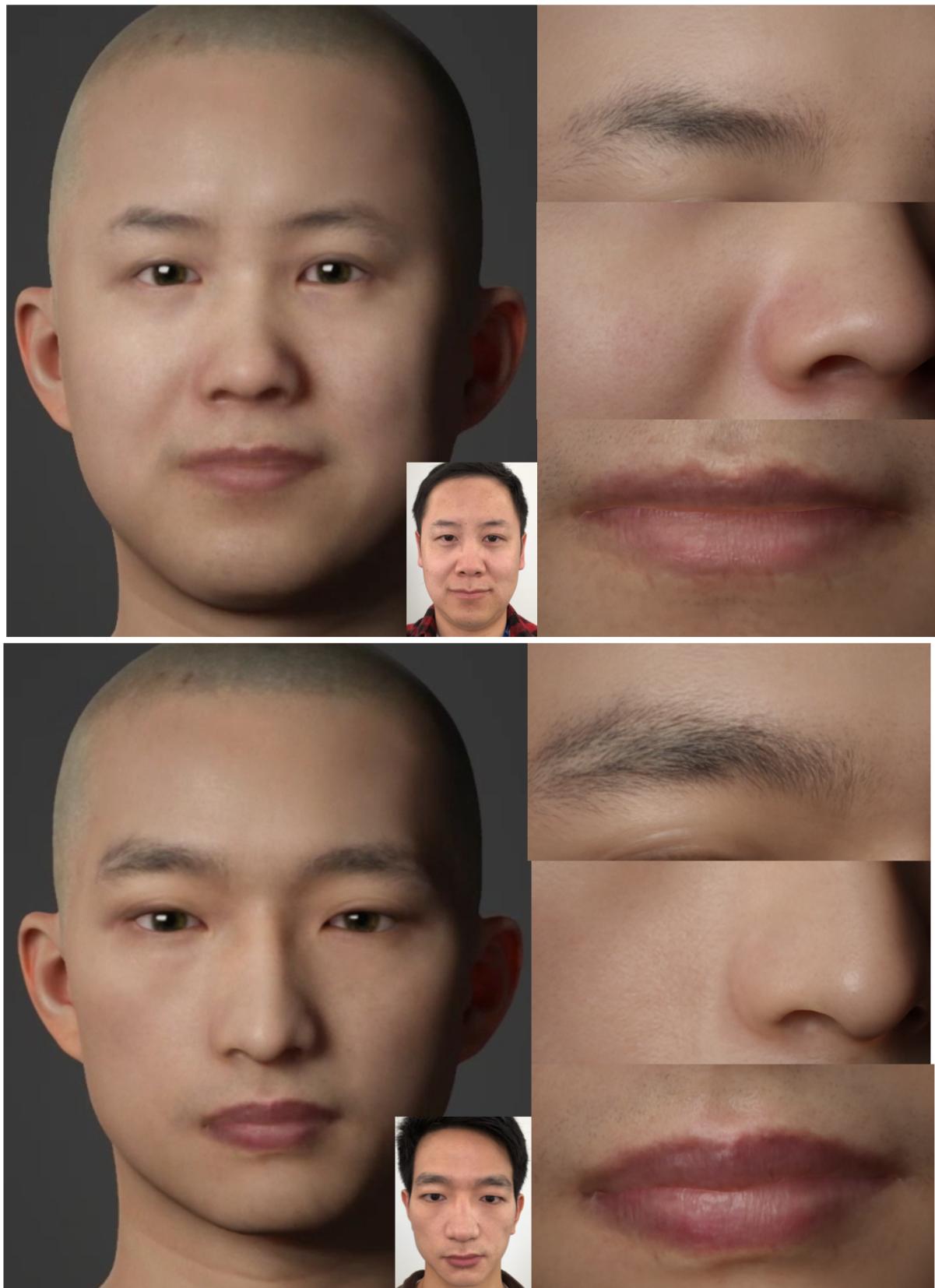
Fig. S7. Rendering of our results with our simplified skin material.
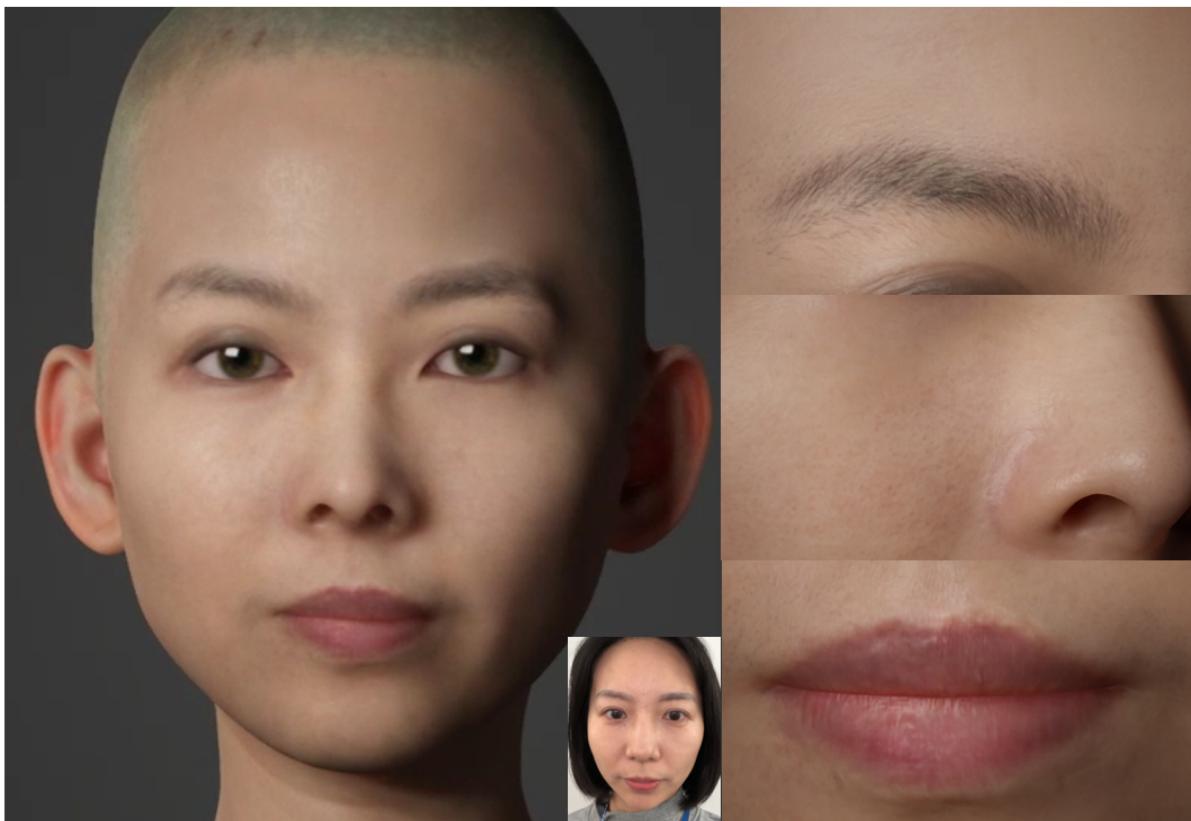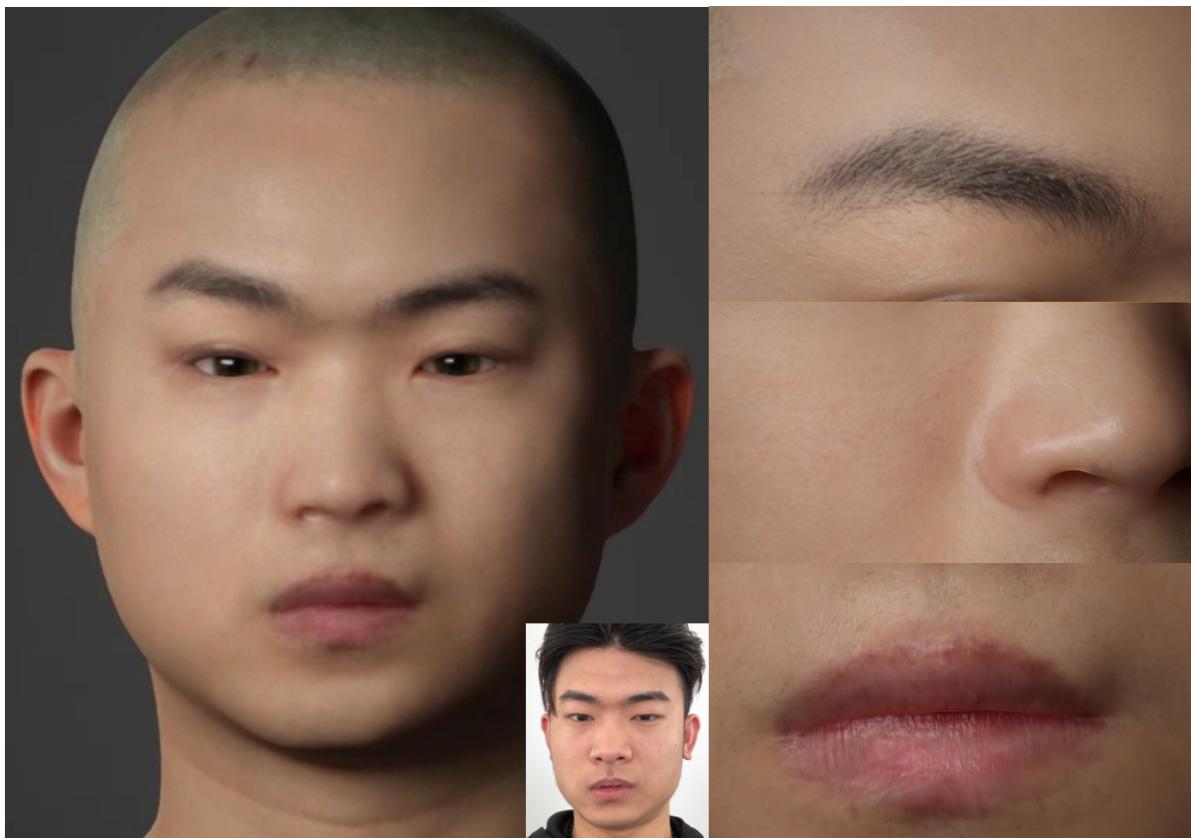
Fig. S8. Rendering of our results with our simplified skin material.
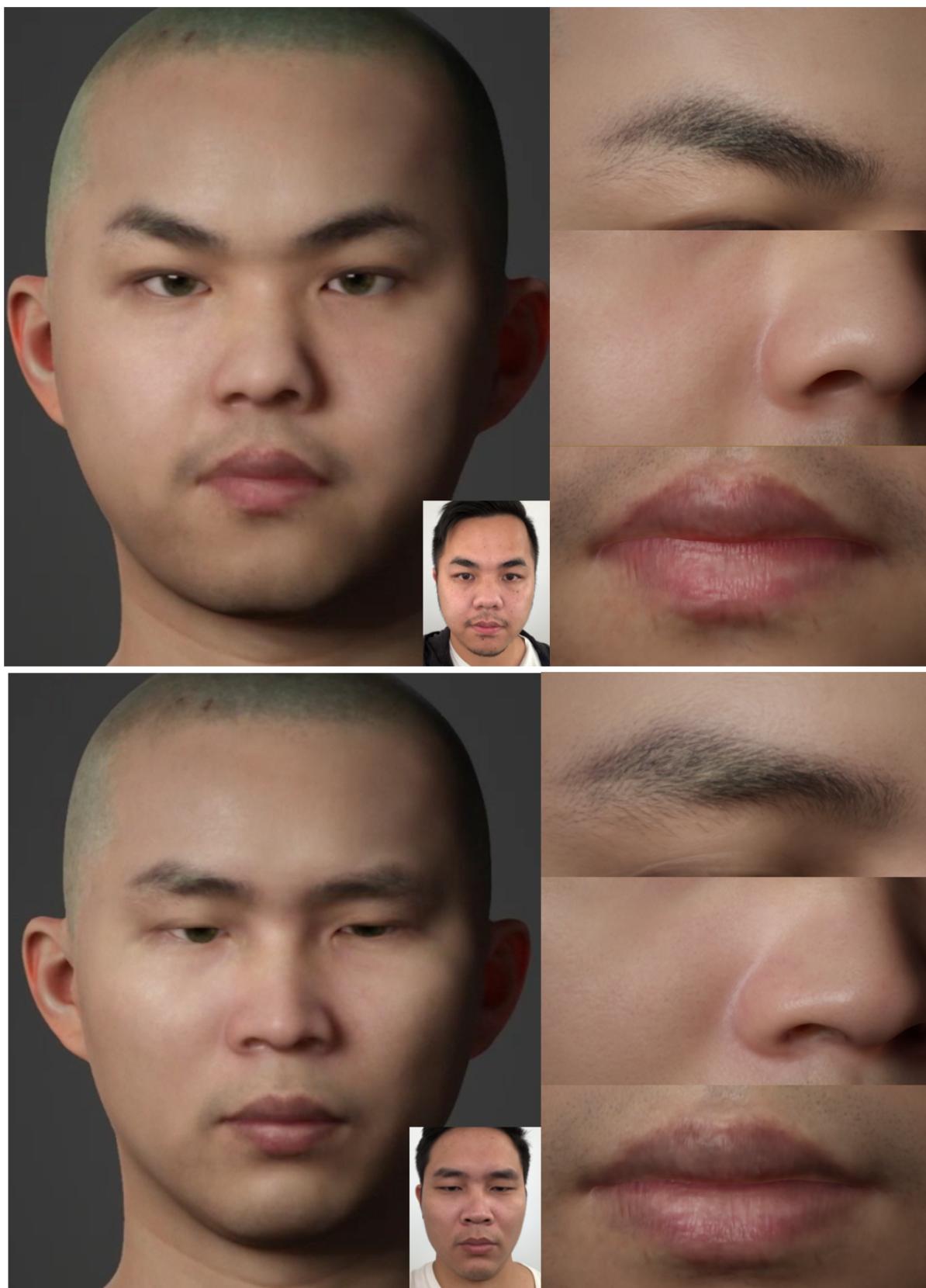
Fig. S9. Rendering of our results with our simplified skin material.
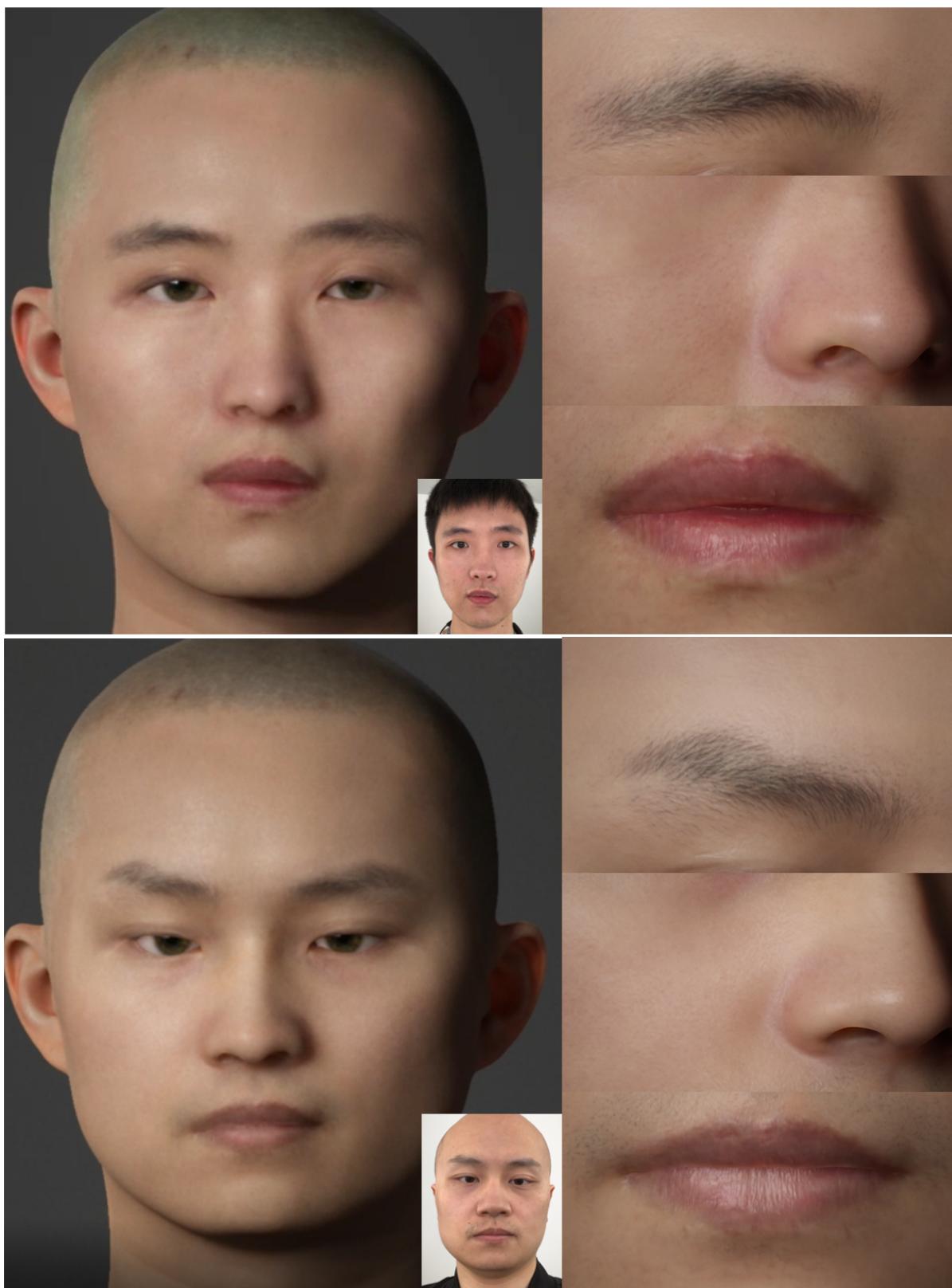
Fig. S10. Rendering of our results with our simplified skin material.
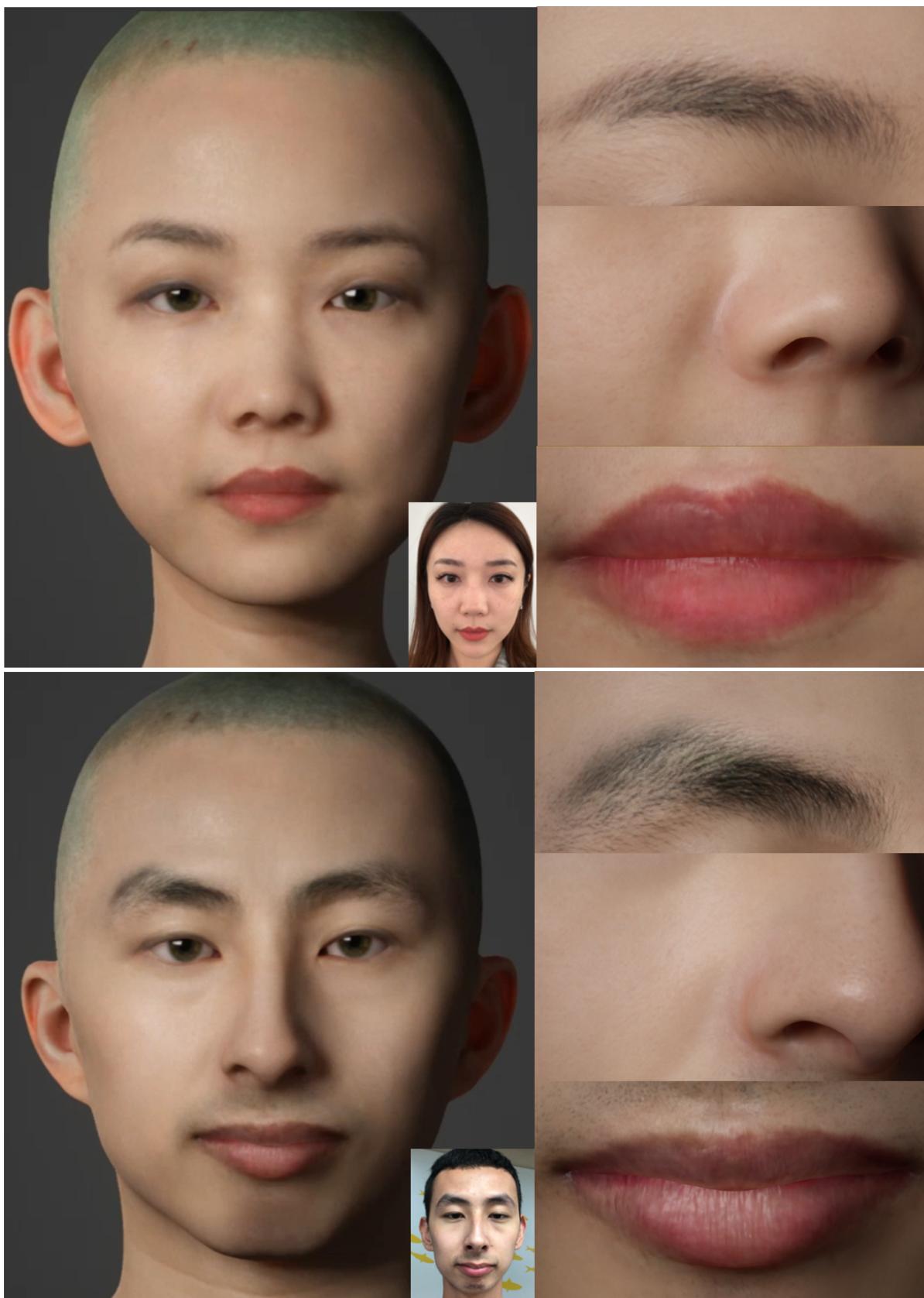
Fig. S11. Rendering of our results with our simplified skin material.

Fig. S12. Our frame selection procedure can automatically reject low-quality frames where motion blur or facial movement exists. First row: examples of rejected low-quality frames. Second row: the select frames of our algorithm.
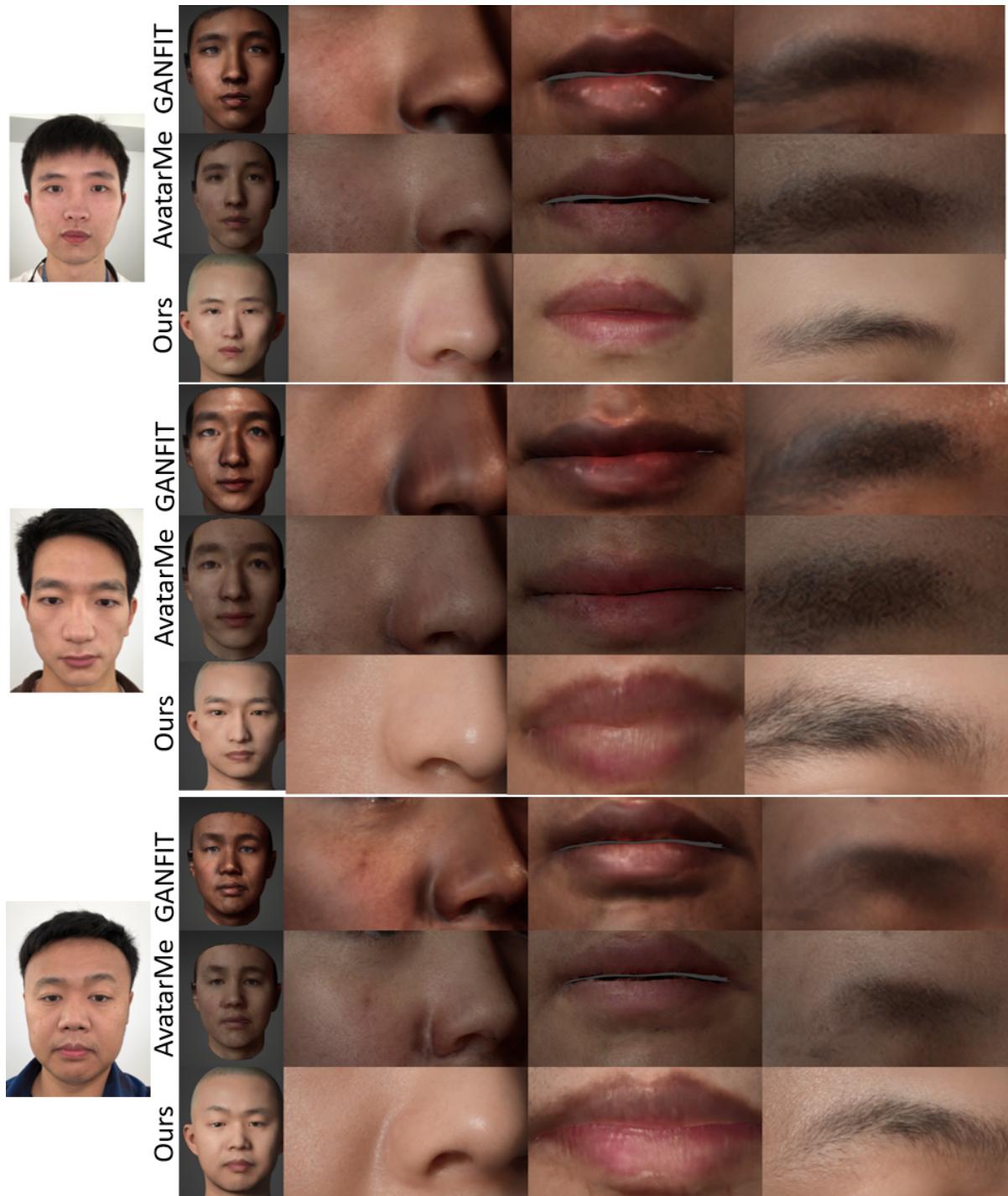
Fig. S13. Comparison of rendered results to GANFIT and Avatarme.
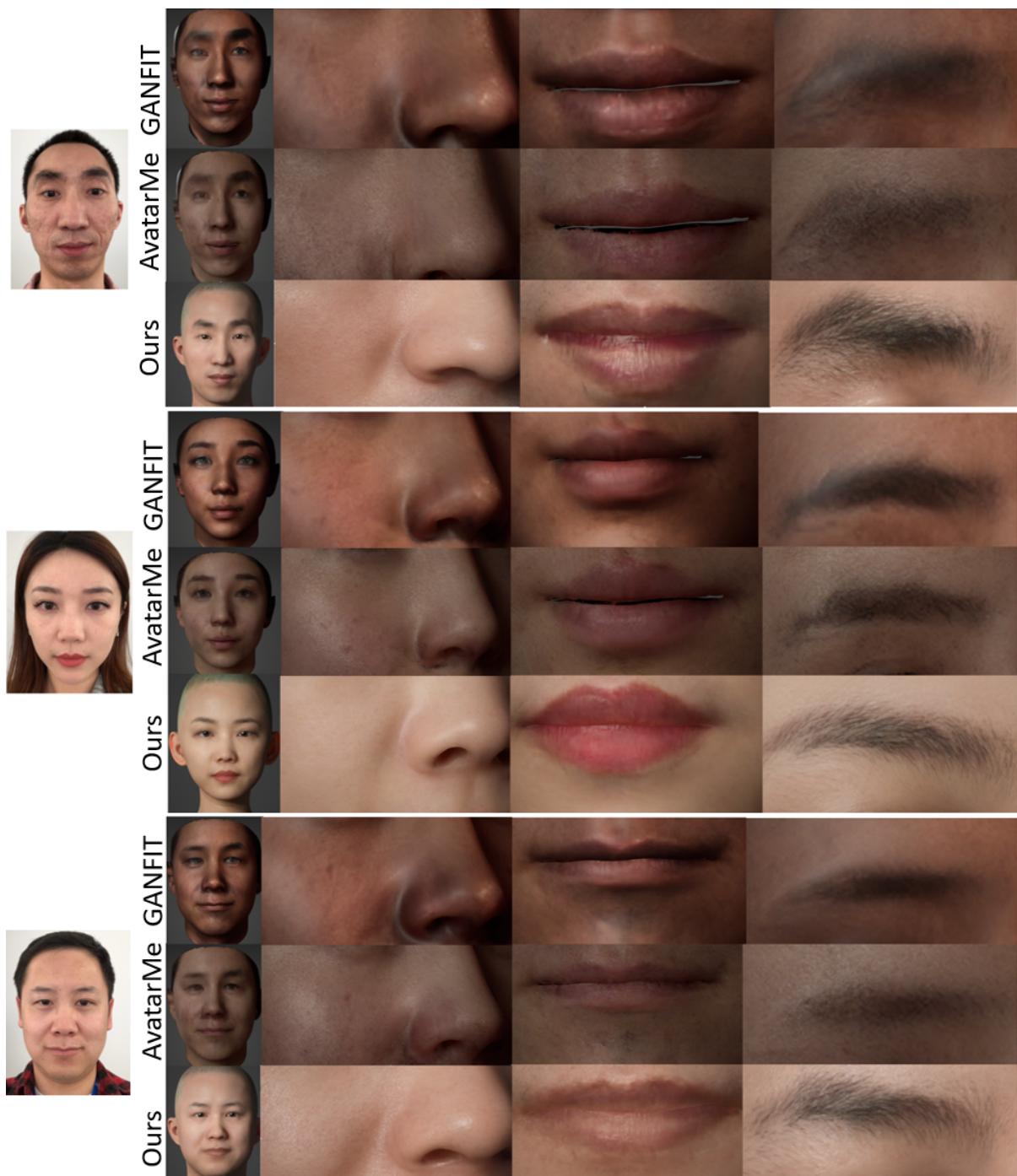
Fig. S14. Comparison of rendered results to GANFIT and Avatarme.
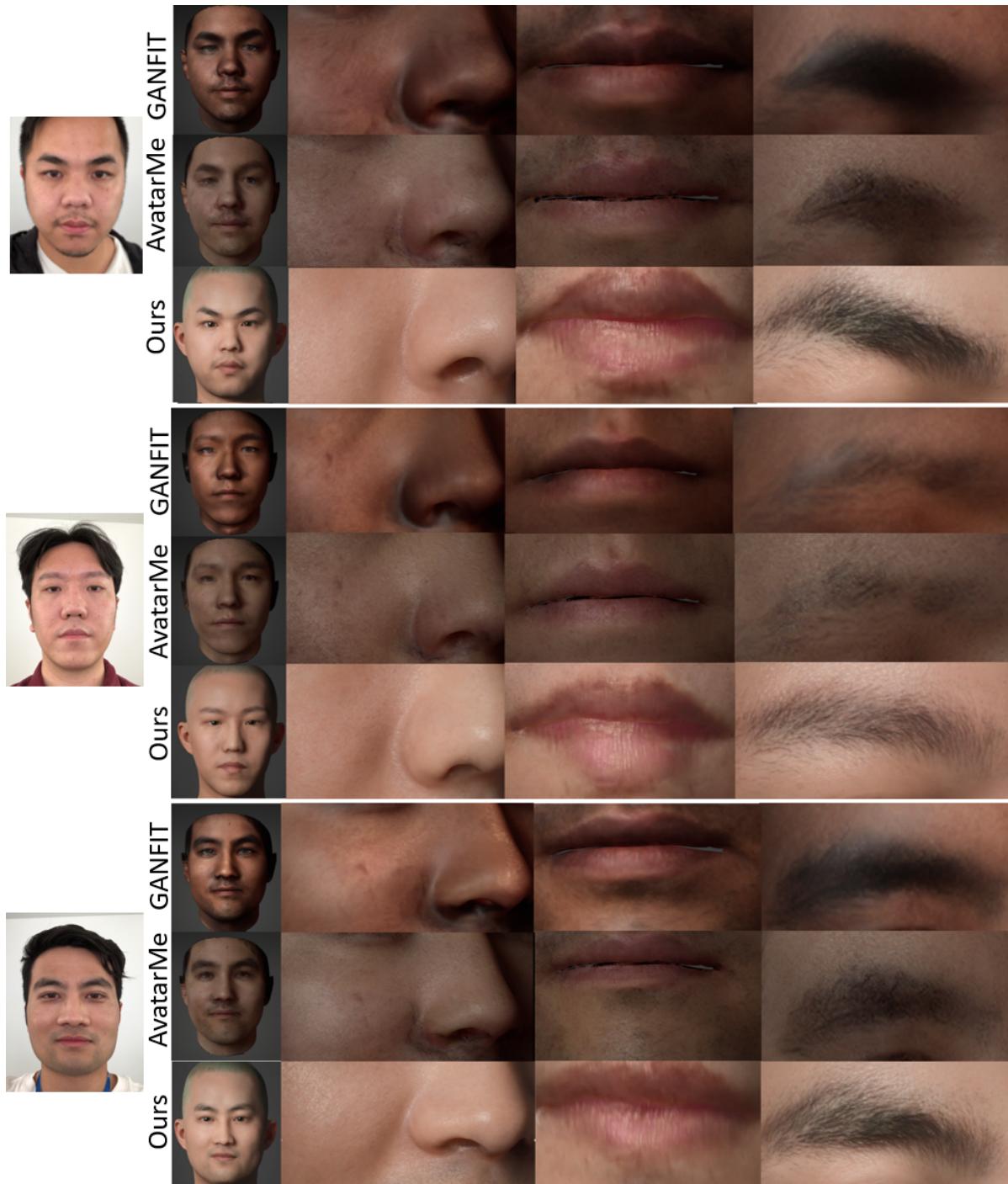
Fig. S15. Comparison of rendered results to GANFIT and Avatarme.

Fig. S16. The 30 hairstyles used in our system.