Ca3OH1

Contact Aware in 3D Object-Human Interaction

Thesis Proposal

Keywords: 3D human reconstruction, human-object interaction, contact aware geometric constraints, pose optimization,

HCY WRT ZBH

01

Contact Area

Contact in Gaussian Model

- We can easily identify areas where there's no interaction
- Occlude means lower opacity α
- Stable pos relationship between human and object

⇒Contact Interaction Score $$c = w_\alpha \cdot Norm(\alpha^h) + w_d \cdot d_C(p^h, p^o)^h$$

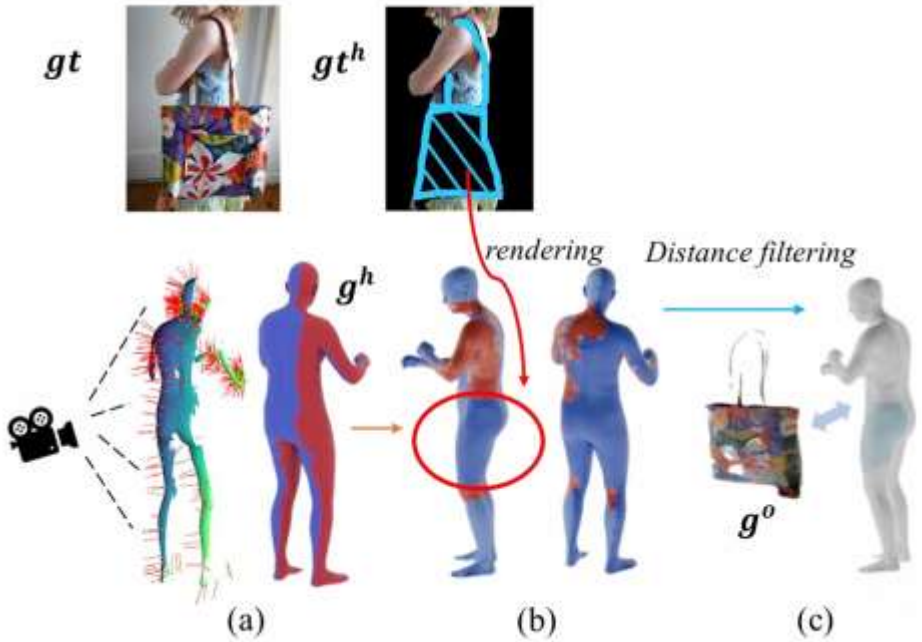
where Norm means the normalization of the vector to a range between 0 and 1,

and d_C means the Chamfer distance.

(a) Opacity initialization using human normals.

(b) The distribution of human body point cloud opacity scores is visualized to identify the blue region as a potential inter action area.

(c) Based on the approximate distance between the human body and the object, the optimized contact region is further identified, shown in light blue.

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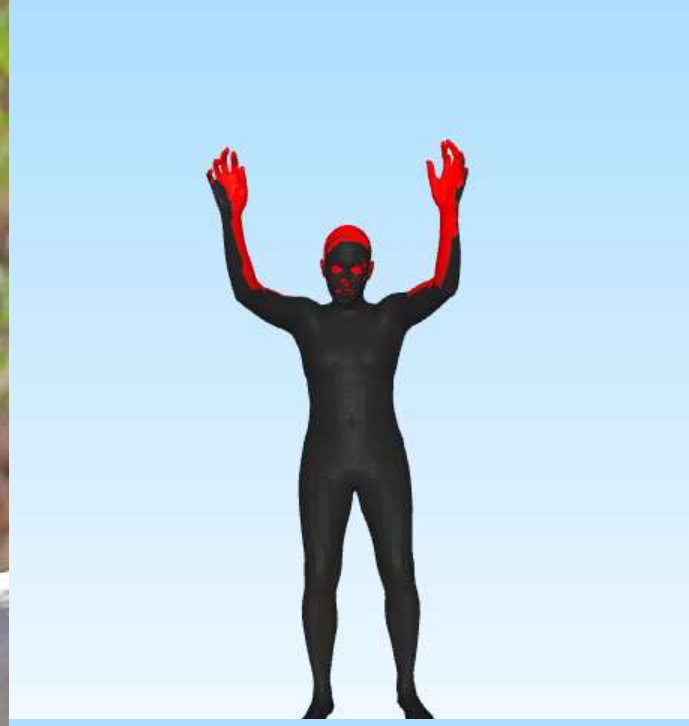


02

Only ‘Sandwich’ ?


vevo

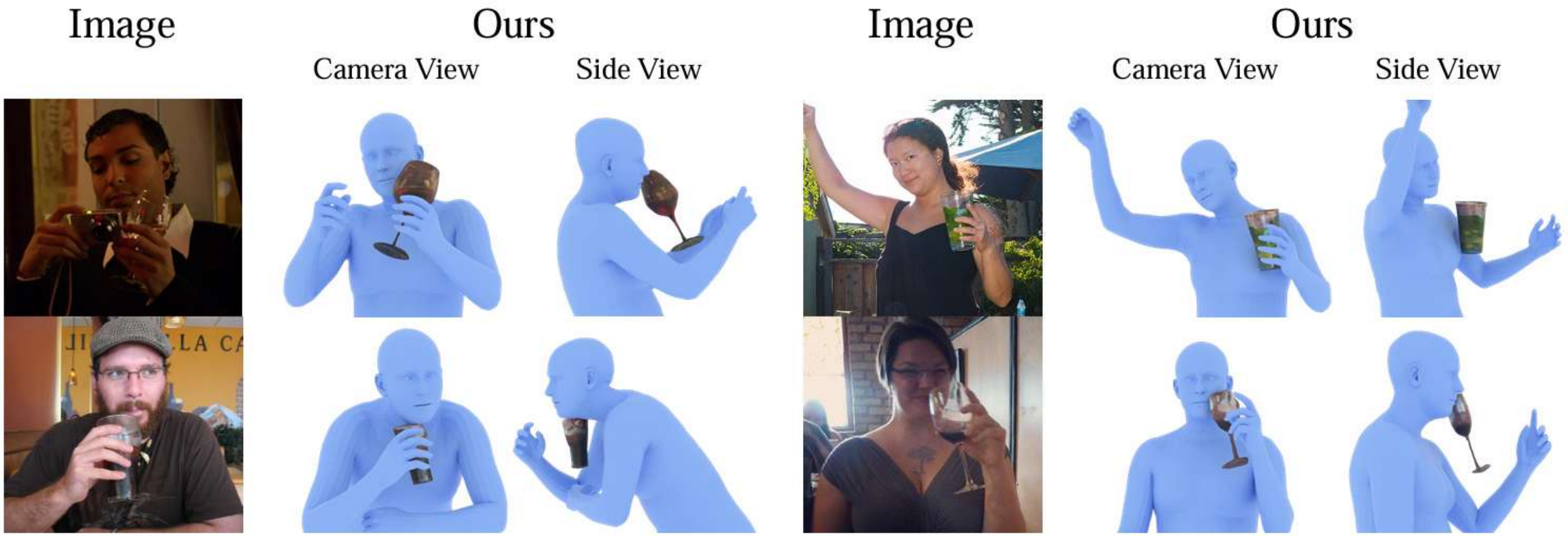


Figure 21. Failure cases of HOI-Gaussian.

C.2. Failure Cases

Fig. 21 shows some failure cases of our HOI-Gaussian optimizer. In these cases, human body parts occlude each other severely, and the object happens to be located between the occluded areas, which becomes challenging to determine which body part the object should contact with.

Sandwich

人体在优化过程中没有改变

sheep
- box_annotation.json
- calibration.json
- extrinsic.json
- h_mesh.obj
- image.jpg
- normals_smplx.npy
- obj_annot1.obj
- obj_pcd_h_align.obj
- object_mask.png
- person_mask.png
- smplx_parameters.json

Dataset Structure:

```
- motorcycle
  - HICO_train2015_00013672
    - smplx_parameters.json # SMPL-X paramet
    - h_mesh.obj # Human mesh
    - object_mesh.obj # Object mesh
    - image.jpg # Image
    - person_mask.png # Person mask save as
    - object_mask.png # Object mask save as
    - depth.png # Depth generated by ZoeDept
    - box_annotation.json # Bounding box ann
```

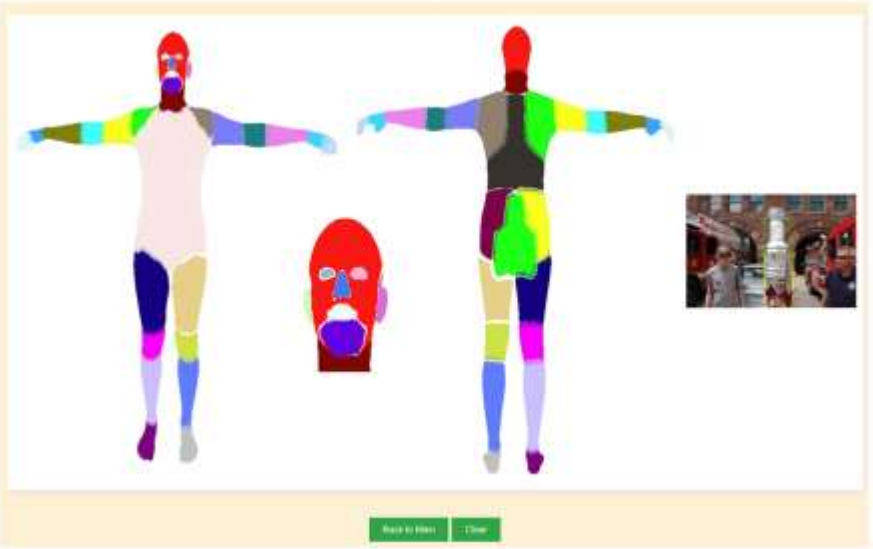
Expectation:

High:

- Adding mesh(.obj) & additional Loss to VLM model to fix the problem in human reconstruction before HOI reconstruction.
- Hopefully, this will solve the ‘Sandwich’ problem at the same time.

Low:

- Train a model to figure out the exact contact area. (‘Sandwich’ Only)
    1. (HxWxRGB -> the id of contact area)
    2. (HxWxRGB -> every vertex-10457)



THANKS