Fight ill-posedness with ill-posedness: Single-shot variational depth super-resolution from shading Supplementary material

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1. Additional real-world experiments

We ran our algorithm against two publicly available datasets [1, 3] to further demonstrate the effectiveness of our method.

Both datasets offer RGB-D frames, whereas the RGB images have resolutions of 1280×1024 px^2, 1296×968 px^2 and 640×480 px^2, respectively and the depth images come with a resolution of 640×480 px^2. Additionally, the corresponding multi-view reconstructions based on each of the methods described in [2, 4] are provided.

Figures 1, 2, 3, 4 show that our method provides good depth estimates on each of the additional datasets. Even in the case of cast- or self-shadows we are able to recover fine details of the depth without inducing too strong bias from the companion color image, see Figure 2 the cast-shadow of the camera or Figure 4 the self-shadows. Our method also seems to be robust to more complex lighting, see Figure 3 that the upper-right area of the RGB image is much darker compared to the well illuminated lower-left area of the image.

References

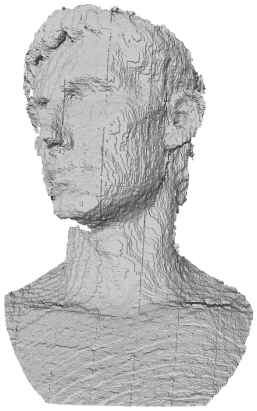
[1] R. Maier, K. Kim, D. Cremers, J. Kautz, and M. Nießner. Intrinsic3D Dataset. http://vision.in.tum.de/data/datasets/intrinsic3d, 2017. 1, 5

[2] R. Maier, K. Kim, D. Cremers, J. Kautz, and M. Nießner. Intrinsic3d: High-quality 3D reconstruction by joint appearance and geometry optimization with spatially-varying lighting. In *Proceedings of the IEEE International Conference on Computer Vision*, 2017. 1, 5

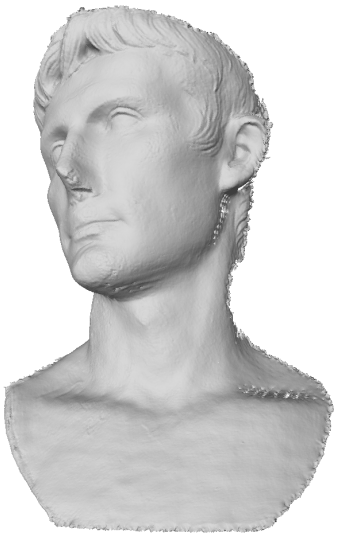
[3] M. Zollhöfer, A. Dai, M. Innman, C. Wu, M. Stamminger, C. Theobalt, and M. Nießner. Shading-based Refinement on Volumetric Signed Distance Functions. http://graphics.stanford.edu/projects/vsfs/, 2015. 1, 2, 3, 4

[4] M. Zollhöfer, A. Dai, M. Innman, C. Wu, M. Stamminger, C. Theobalt, and M. Nießner. Shading-based refinement on volumetric signed distance functions. *ACM Transactions on Graphics*, 34(4):96:1–96:14, 2015. 1, 2, 3, 4

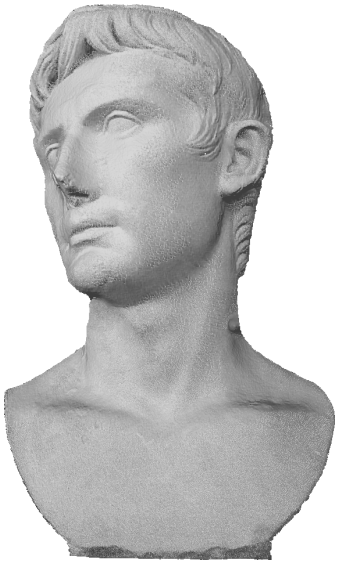
(a) RGB input



(b) Depth input

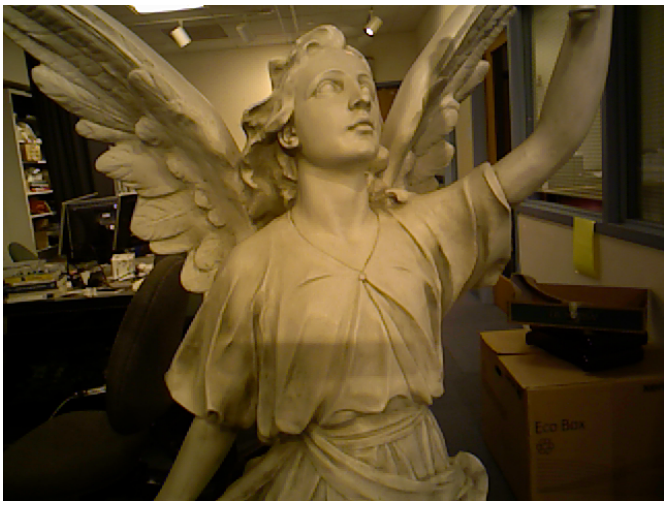


(c) Result of the multi-view approach [4]



(d) Our result using a single RGB-D frame

Figure 1: Augustus dataset of [3]



(a) RGB input

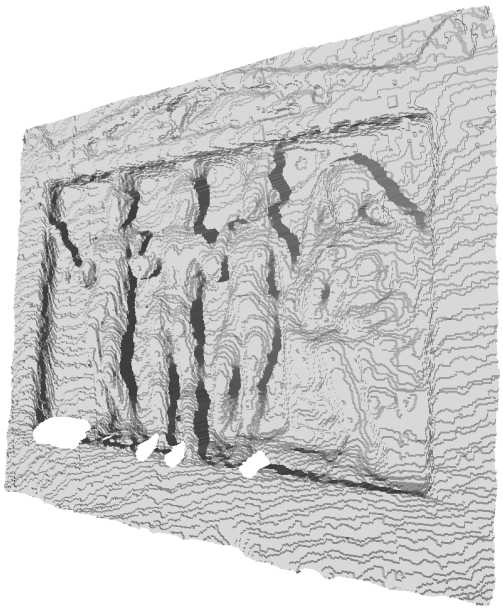
(b) Depth input

(c) Result of the multi-view approach [4]

(d) Our result using a single RGB-D frame

Figure 2: Lucy dataset of [3]

(a) RGB input



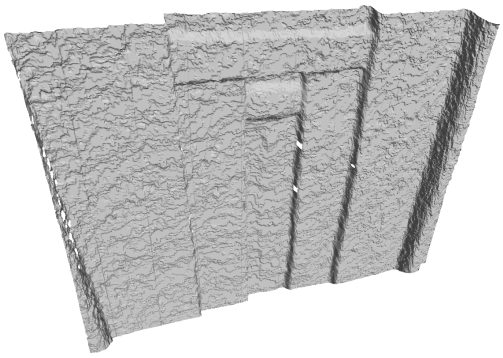
(b) Depth input

(c) Result of the multi-view approach [4]

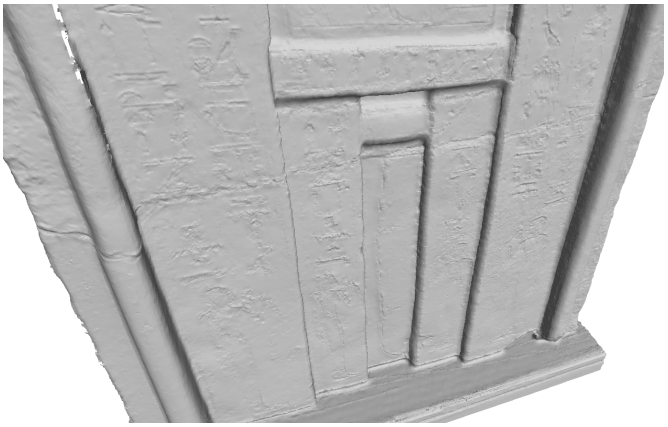
(d) Our result using a single RGB-D frame

Figure 3: Relief dataset of [3]

(a) RGB input



(b) Depth input



(c) Result of the multi-view approach [2]

(d) Our result using a single RGB-D frame

Figure 4: Gate dataset of [1]