Correspondence Reweighted Translation Averaging Supplementary Material

Lalit Manam and Venu Madhav Govindu

Indian Institute of Science, Bengaluru, India - 560012
{lalitmanam,venug}@iisc.ac.in

1 Additional results

Synthetic Experiments: In Sec. 4.1 of the main paper, we provided results for NRMSE for one scenario, i.e. $\sigma = 3$ with outliers. Here, we present the results for the rest of the cases. Fig. 1 shows the NRMSE distribution in 10 instances for synthetic datasets with different noise levels and outliers. The leftward shift in the NRMSE distribution implies significant improvement in performance using our method over the corresponding translation averaging method used, especially in the cases that contain outliers.

Large-scale Errors: To understand the quality of camera translation estimates beyond mean and median errors, we checked for cameras with very large errors (> 50 m). Table 1 shows the percentage of cameras with such errors. It can be seen that, for most datasets, our framework reduces cameras with large errors. In particular, CReTA-BATA has the least percentage of cameras with large errors compared to other schemes.

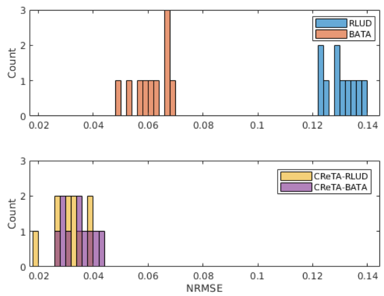
Impact on 3D Reconstruction: In Fig. 4 of the paper, we presented 3D reconstructions after triangulation and BA using CReTA-RLUD solution. We provide reconstructions using CReTA-BATA solution in Fig. 2. It is observed that in the case of CReTA-BATA as well, we get reasonable reconstructions just with triangulation when compared to the reference BA results. Moreover, the differences between reconstructions using CReTA-RLUD (Fig. 4 of the main paper) and CReTA-BATA (Fig. 2) are not significant. This implies that our approach of reweighting point correspondences can enhance any translation averaging scheme to similar levels in terms of the reconstruction quality.

We also provide a comparison of 3D reconstructions between different methods using 1DSfM provided relative translations (1DSfM-RT) and RANSAC refined relative translations (Ref-RT) after triangulation (refinement is done as described in Sec 4.2 of the main paper). In Tables 3 and 4 of the main paper, the relatively high mean errors for the Tower of London dataset (compared to other datasets) using all the methods suggest that this is a challenging dataset to solve. We compare the reconstructions of the Tower of London dataset in

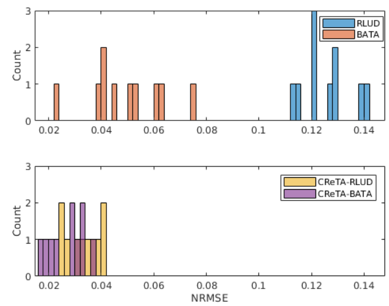
Table 1: Percentage of cameras with very large errors (> 50 m) for 1DSfM datasets

Dataset	**LUD**	**BATA**	**CReTA-RLUD**	**CReTA-BATA**
ALM	0.34	1.21	**0.17**	**0.17**
ELS	3.96	6.60	3.57	**2.69**
GMM	20.88	18.63	17.58	**16.94**
MDR	7.14	7.14	3.91	**3.90**
MND	**0**	**0**	**0**	**0**
ND	**0**	1.85	**0**	**0**
NYC	**0.30**	1.21	**0.30**	**0.30**
PDP	**0**	0.59	**0**	0.31
PIC	**0.37**	1.30	0.38	0.47
ROF	6.77	3.26	4.08	**2.37**
TOL	9.61	10.30	9.42	**8.97**
TFG	2.81	3.49	1.96	**1.68**
USQ	**1.57**	3.97	3.21	3.32
VNC	4.56	5.64	3.64	**1.46**
YKM	5.27	4.13	3.04	**2.11**

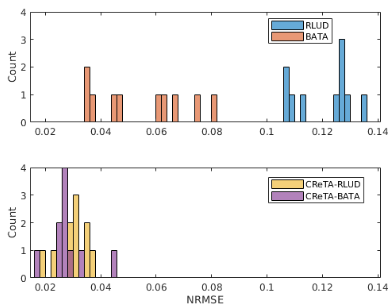
Fig. 3. It can be seen that there is a significant improvement in the reconstruction quality with 1DSfM-RT. Moreover, in the case of Ref-RT, CReTA is able to better recover the structure compared to the respective translation averaging schemes used. Specifically, the structure of the Tower is recovered by CReTA-BATA with both types of inputs. In Fig. 4, we compare the reconstructions of the Alamo dataset where the camera locations are more uniformly distributed compared to other datasets (also reported in [36]). Our method improves the reconstructions significantly with 1DSfM-RT but the reconstructions obtained with Ref-RT look similar. These results reveal that CReTA is able to give good quality reconstructions for both low and high quality relative translations. Additionally, the results suggest that, with superior quality relative translations, the gain brought by CReTA is noteworthy for relatively difficult datasets.



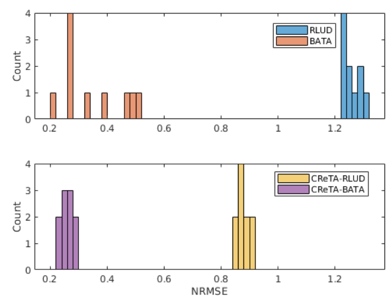
(a) MND_{syn}, $\sigma = 1$



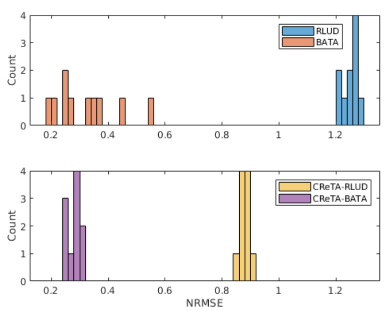
(b) MND_{syn}, $\sigma = 1$ with outliers



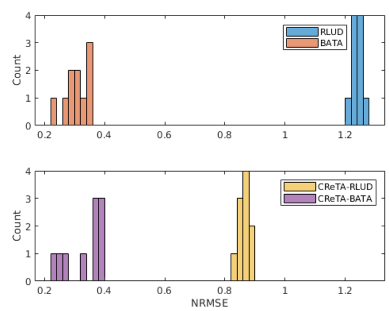
(c) MND_{syn}, $\sigma = 3$



(d) TOL_{syn}, $\sigma = 1$



(e) TOL_{syn}, $\sigma = 1$ with outliers



(f) TOL_{syn}, $\sigma = 3$

Fig. 1: Comparison of the histograms of NRMSE in 10 instances for synthetic datasets

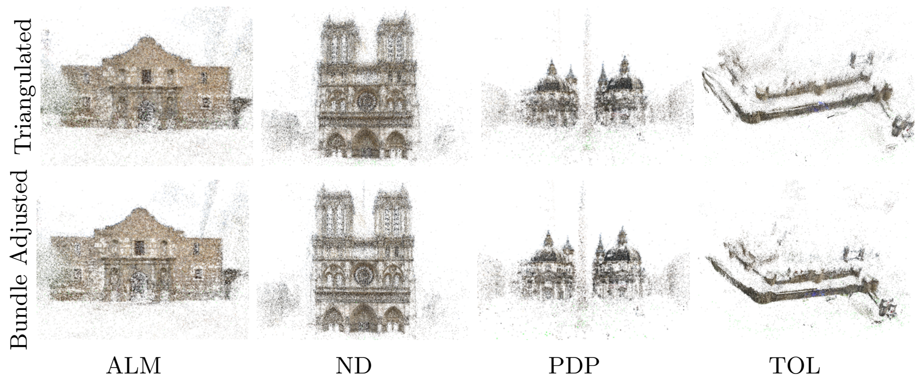


Fig. 2: Reconstructions after triangulation (first row) with CReTA-BATA solutions compared to bundle adjustment (second row)

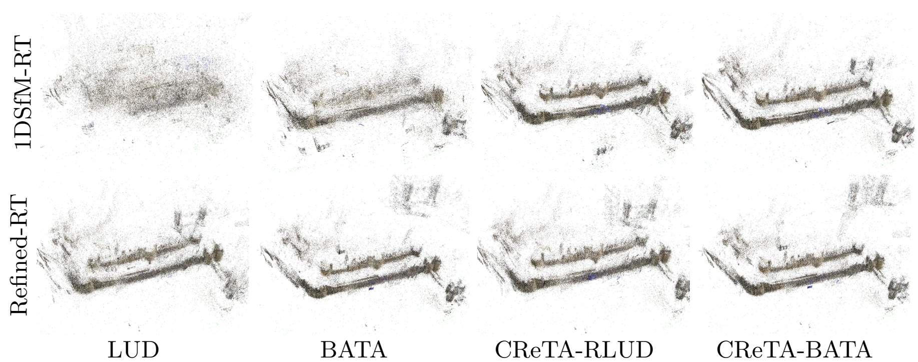


Fig. 3: Reconstructions of Tower of London dataset after triangulation with 1DSfM provided relative translations (first row) and RANSAC refined relative translations (second row)

Fig. 4: Reconstructions of Alamo dataset after triangulation with 1DSfM provided relative translations (first row) and RANSAC refined relative translations (second row)