Decoupled Deep Hough Voting for Point Cloud Registration

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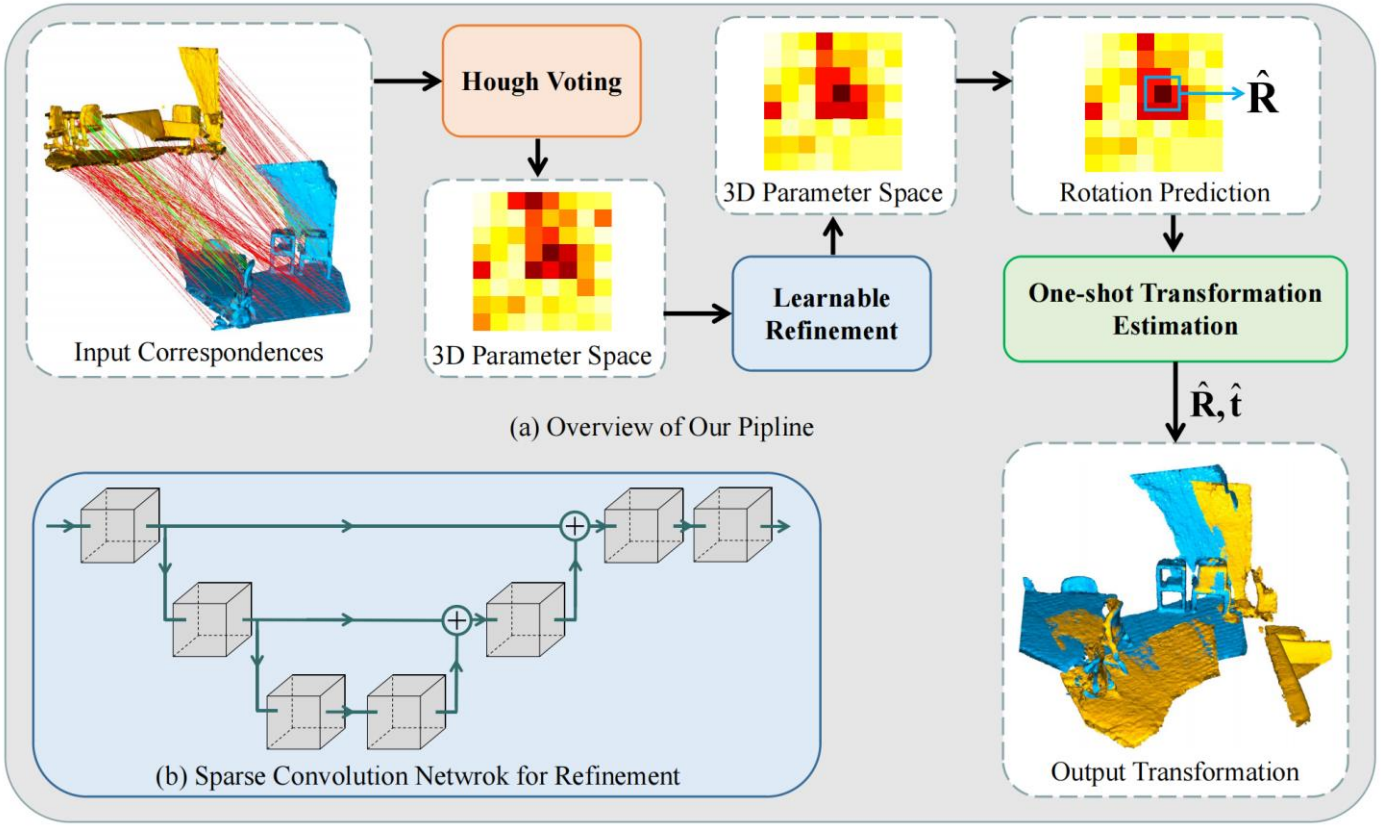
Frontiers of Computer Science, DOI: 10.1007/s11704-023-2471-8

Problems & Ideas

- Problems of previous deep hough voting-based method: simultaneous voting for rotation and translation leads to high complexity.
- Ideas: decouple 6D voting space into the rotation space and translation space, and estimate rigid transformation sequentially.



The proposed framework for point cloud registration. It takes the putative correspondences as input and first estimates rotation by deep hough voting. Then based on the accurate estimation on rotation, it can estimate translation efficiently by a one-shot transformation estimation. Finally, our framework outputs a rigid transformation.

Main Contributions

- Contributions:
  - We propose a new deep hough voting-based method, which decouples previous 6D voting space into the rotation and translation spaces. By sequential estimation on rotation and translation, it improves previous hough voting-based method on both accuracy and speed.
  - We test our method on multiple datasets and it achieves comparable performances over the state-of-the-art methods.

	Registration Recall (%)	RRE (°)	RTE (cm)	Time (s)
FGR	87.25	2.31	7.18	0.96
RANSAC-1M	90.94	2.66	8.25	1.43
RANSAC-2M	91.31	2.56	8.07	1.99
RANSAC-4M	91.74	2.52	7.81	3.97
TEASER	87.80	2.45	7.44	**0.26**
DHVR	91.99	**2.09**	**6.73**	0.83
Ours	**92.61**	2.17	7.11	0.31

	Registration Recall (%)	RRE (°)	RTE (cm)	Time (s)
FGR	97.84	0.20	10.39	11.79
RANSAC-1M	97.84	0.20	10.37	1.42
RANSAC-2M	98.20	0.20	10.34	2.27
RANSAC-4M	98.37	0.20	10.32	3.77
TEASER	**98.92**	0.35	14.29	**0.21**
DHVR	96.76	**0.18**	**8.89**	0.62
Ours	98.74	**0.18**	9.99	0.47

The registration performance on 3DMatch (left) and KITTI (right).