Method	bathtub	bed	bookshelf	chair	desk	dresser	nightstand	sofa	table	toilet	3D mAP
DSS (?)	44.2	78.8	11.9	61.2	20.5	6.4	15.4	53.5	50.3	78.9	42.1
2d-driven (?)	43.5	64.5	31.4	48.3	27.9	25.9	41.9	50.4	37.0	80.4	45.1
Pointfusion (?)	37.3	68.6	37.7	55.1	17.2	24.0	32.3	53.8	31.0	83.8	44.1
COG (?)	58.3	63.7	31.8	62.2	45.2	15.5	27.4	51.0	51.3	70.1	47.6
F-Pointnet(v1) (?)	43.3	81.1	33.3	64.2	24.7	32.0	58.1	61.1	51.1	90.9	54.0
V1-1024	51.6	82.0	32.2	54.6	33.5	32.4	67.9	66.3	48.0	**88.2**	55.7
V1-2048	51.6	83.1	35.4	54.5	33.0	**33.7**	**68.2**	66.7	48.2	87.1	56.1
Ours-1024	61.5	83.3	38.1	57.7	33.8	32.8	67.3	**67.4**	51.3	87.3	58.1
Ours-2048	**64.0**	**84.4**	**38.4**	**57.9**	**34.1**	32.2	67.7	67.3	**51.4**	86.2	**58.4**

Table 3: Comparison with the state-of-the-art methods on SUN-RGBD test dataset.

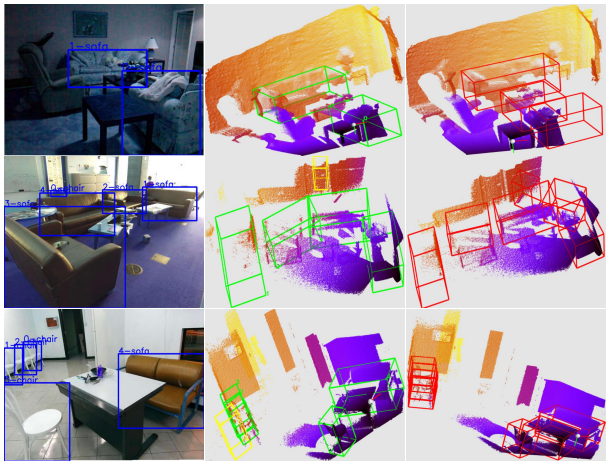

Figure 5: The visualization results for 3D object detection on SUN-RGBD test set. The first column shows the 2D bounding boxes based on YoloV3. The second column displays the 3D bounding boxes on 3D point clouds. The green boxes are true positives and yellow boxes are false positives. The 3D IoU threshold is 0.25. The last column illustrates the groundtruths which are in red.

2D mAP	3D mAP		
	V1	Our	Gain
40.6	46.1	**48.1**	2.0
47.1	49.6	**51.6**	2.0
50.5	52.2	**54.3**	2.1
52.9	55.5	**57.6**	2.1
53.9	56.1	**58.4**	2.3
GT	84.1	**86.7**	2.6

Table 4: The influence of 2D detection.

Number of input points	3D mAP					
	$V1_{53.9}$	$Our_{53.9}$	Gain	$V1_{GT}$	Our_{GT}	Gain
32	43.9	**51.1**	7.2	63.1	**70.2**	7.1
128	53.1	**56.3**	3.2	79.2	**83.2**	3.0
256	54.4	**56.9**	2.5	81.4	**85.3**	2.9
512	55.4	**57.8**	2.4	83.2	**86.0**	2.8
1024	55.7	**58.1**	2.4	83.7	**86.3**	2.6
2048	56.1	**58.4**	2.3	84.1	**86.7**	2.6

Table 5: The influence of the number of input points.

Conclusion

In this paper, SIFRNet is put forward for 3D object detection, which is suitable for both indoor and outdoor scenes. The proposed architecture can make full use of the advantages of both RGB images and 3D point clouds. Outstanding experiment results both on KITTI dataset which contains a large number of sparse point clouds and SUN-RGBD dataset which contains many occluded objects reveal that our model has a certain generalization ability and robustness on 3D object detection tasks. Even when the point clouds are extremely sparse, our method can still obtain very satisfied results, which also demonstrates that our model can provide a better 3D representation. In future work, we will focus on the end-to-end trainable model for Lidar-only 3D data to improve the efficiency of 3D object detection tasks.

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