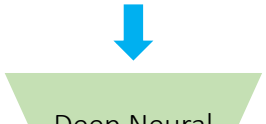
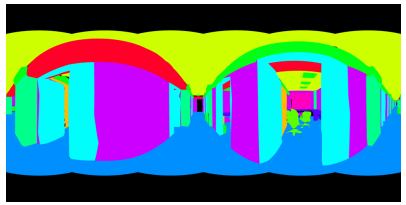
Geometric Exploitation for Infoor Panoramic Semantic Segmentation

Cao Dinh Duc, Seok Joon Kim, Kyusung Cho
{caodinhduc, seokjoon, kscho} @maxst.com
Laboratory Department, MAXST Co. Ltd, Seoul, Korea

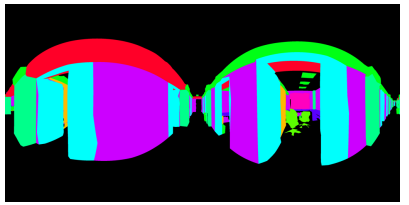
Approach for Indoor Panoramic Semantic Segmentation



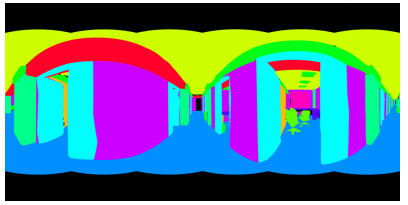


Traditional approach

Over-sampled segments

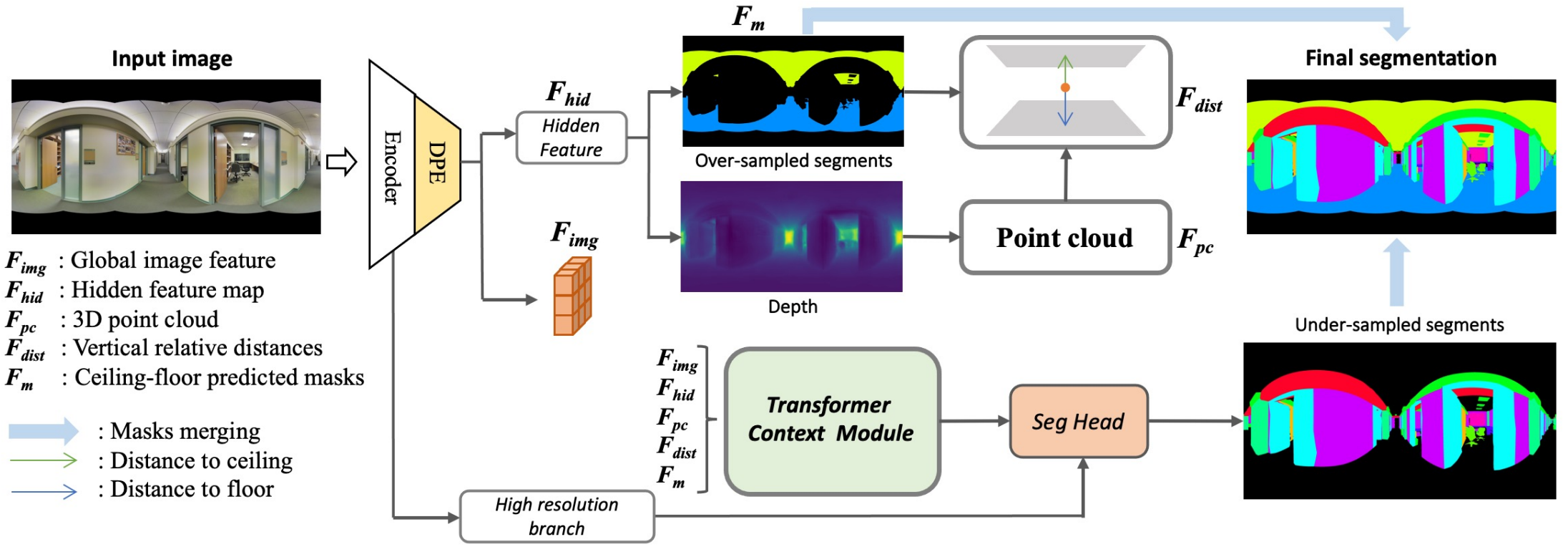


Under-sampled segments

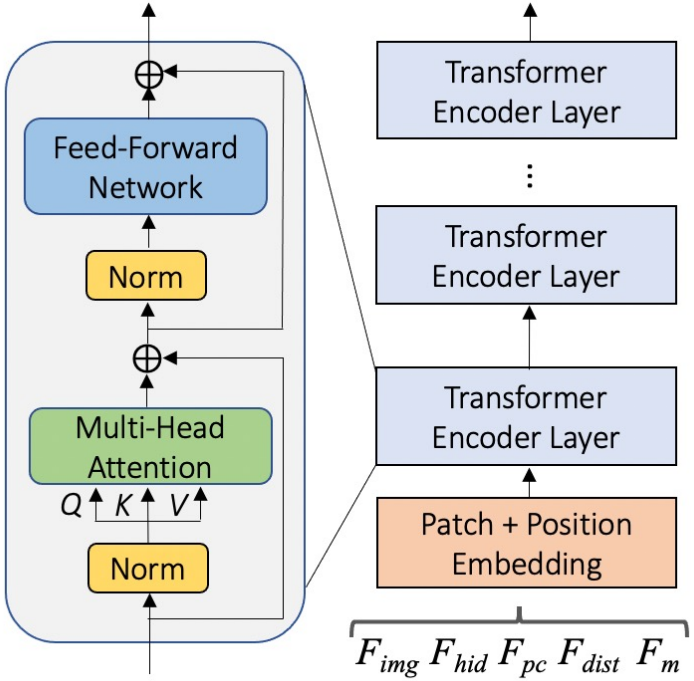


Our approach

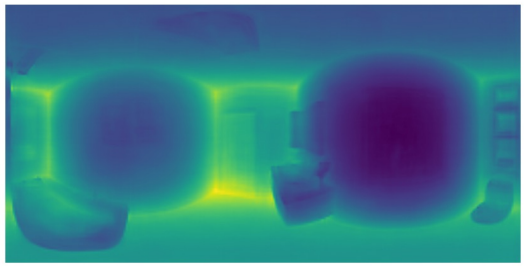
Method


Input image
Encoder
DPE
F_{hid}
Hidden Feature
F_{img}
F_m
Over-sampled segments
Depth
F_{dist}
Point cloud
F_{pc}
Final segmentation
Under-sampled segments
F_{img} : Global image feature
F_{hid} : Hidden feature map
F_{pc} : 3D point cloud
F_{dist} : Vertical relative distances
F_m : Ceiling-floor predicted masks
: Masks merging
: Distance to ceiling
: Distance to floor
F_{img}
F_{hid}
F_{pc}
F_{dist}
F_m
Transformer Context Module
Seg Head
High resolution branch

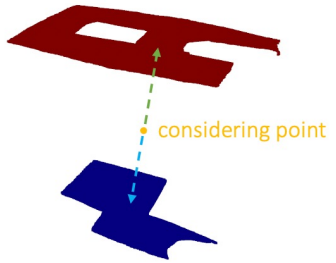
Proposed Concepts



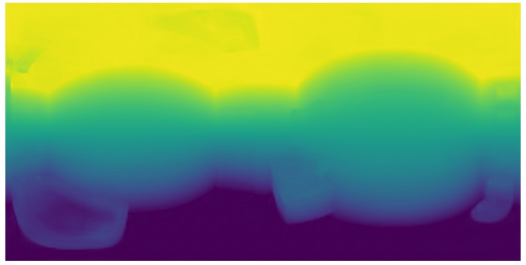
Transformer Based Context Module



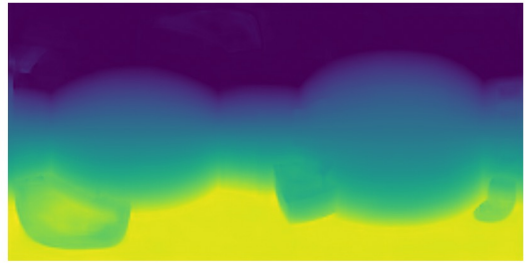
Estimated Depth



Fitting planes



Distance to Floor



Distance to Ceiling

Vertical Relative Distance

Quantitative results

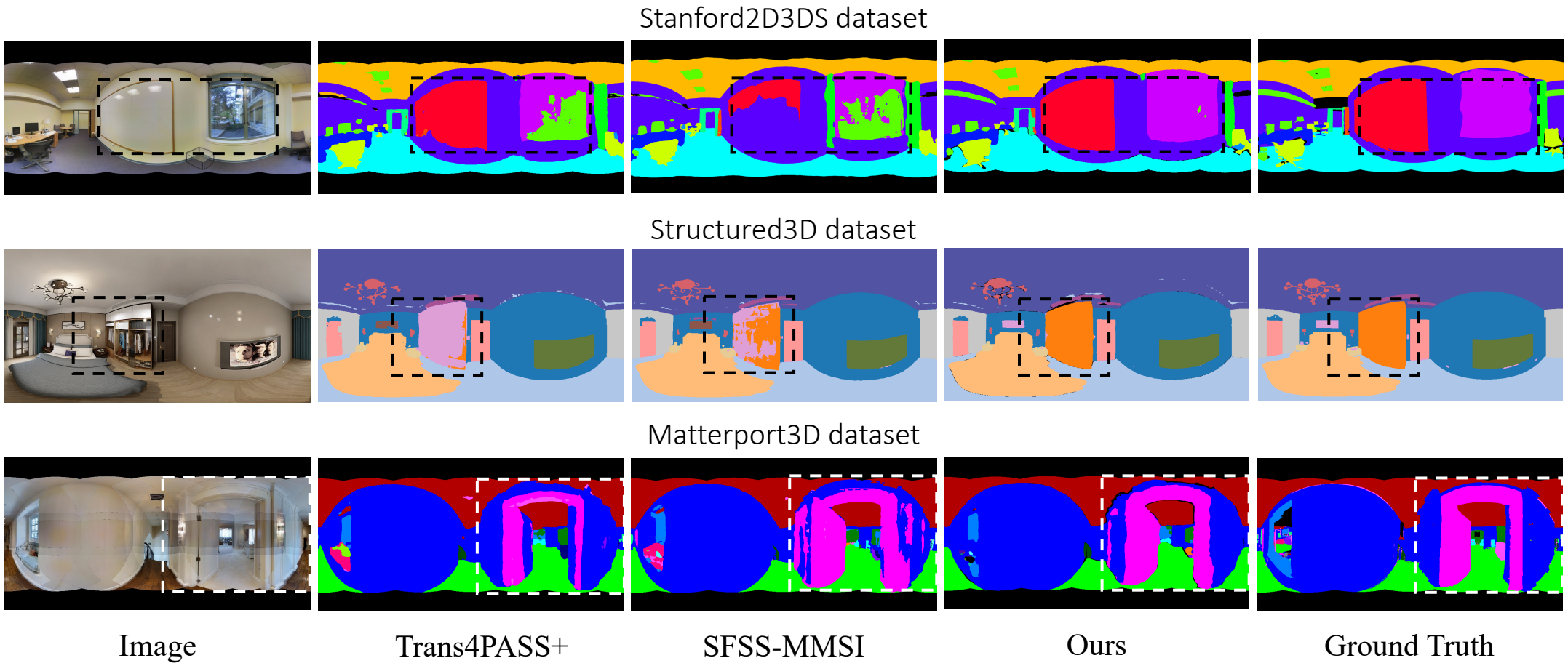
Quantitative comparison on the **Stanford2D3DS** dataset

Method	Venue	Validation Avg mIoU (%)	Validation F1 mIoU (%)
Tangent [10]	CVPR 2019	45.6	-
FreDSNet [4]	ICRA 2022	-	46.1
PanoFormer [22]	ECCV 2022	48.9	-
SFSS-MMSI [12]	WACV 2024	-	52.9
HoHoNet [24]	CVPR 2021	52.0	53.9
Trans4PASS [34]	CVPR 2022	52.1	53.3
Trans4PASS+ [35]	Arxiv 2022	53.7	53.6
SGAT4PASS [18]	IJCAI 2023	55.3	56.4
Ours		**55.5**	**56.8**

Quantitative comparison on the **Structured3D** and **Matterport3D** datasets

Methods	Modal	Structured3D		Matterport3D	
		Val mIoU (%)	Test mIoU (%)	Val mIoU (%)	Test mIoU (%)
PanoFormer [22]	RGB	55.57	54.87	30.04	26.87
Trans4PASS+ [35]	RGB	66.74	66.90	33.43	29.21
SFSS-MMSI [12]	RGB	71.94	68.34	35.15	31.30
PanoFormer [22]	RGBD	60.98	59.27	33.99	31.23
SFSS-MMSI [12]	RGBD	**73.78**	70.17	**39.19**	**35.92**
Ours	RGB	**72.86**	**71.66**	**36.42**	**33.06**

Qualitative results



Thank you!