

Article

Reconstruction of Three-Dimensional (3D) Indoor Interiors with Multiple Stories via Comprehensive Segmentation

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The input parameters in this paper are shown in Table 1. The parameters for the real datasets are shown in Table 2. The parameters for the synthetic datasets are shown in Table 3.

Table 1. The parameters of proposed indoor reconstruction model

Parameters	Values	Descriptions
Story Segmentation processing parameters		
t_s	5-15 cm	The thickness in each slice in the distribution.
gap_d	0.2-1 m	The gap between the ceiling in the first floor and the floor in the second floor.
Cell Decomposition processing parameters		
num_s	*	The number of slices is influenced by height and density of the input point cloud.
θ_{th}	3-10	θ_{th} is a smoothness threshold, which should be specified in terms of the angle between the normals of the current seed and its neighbors.
r	1-5	r is a residual threshold, which should be specified by the percentile of the sorted residuals.
Room Space Segmentation processing parameters		
ps	15-50 mm	The pixel size in the binay image.
∂	*	The interval along z-axis higher than the door.
τ_{up}	*	The size of largest room.
τ_{low}	*	The size of smallest room.
Story Reconstruction processing parameters		
t_w	0.1-1 m	The thickness of wall.
The symbol ‘*’ represents the parameters determined by the datasets.		

Table 2. The value of parameters in real dataset

Parameters	Values				
	Dataset-1	Dataset-2(1)	Dataset-2(2)	Dataset-3	Dataset-4(1)
t_s	10 cm	10 cm	10 cm	15 cm	5 cm
gap_d	-	1 m	1 m	-	0.5 m
num_s	10	12	12	11	9
θ_{th}	4	4,7	4,7	4,7	3,7
r	1	1	1	1	1
ps	17 mm	25 mm	25 mm	25 mm	25 mm
∂	2 m	4.1m	1.4 m	0.8 m	4.7 m
τ_{up}	15	50	70	90	16
τ_{low}	3	3	20	5	3
t_w	0.5 m	0.7 m	0.7 m	0.7 m	0.3 m

Parameters	Values				
	Dataset-4(2)	Dataset-5(1)	Dataset-5(2)	Dataset-5(3)	Dataset-6
t_s	5 cm	5 cm	5 cm	5 cm	10 cm
gap_d	0.5 m	0.5 m	0.5 m	0.5 m	-
num_s	9	10	10	10	9
θ_{th}	3, 7	5,7	5,7	5,7	4,7
r	1	1	1	1	1
ps	25 mm	25 mm	25 mm	25 mm	50 mm
∂	2 m	5.8 m	2.5 m	0.5 m	2 m
τ_{up}	35	16	50	30	15
τ_{low}	3	2	3	4	1
t_w	0.3 m	0.3 m	0.3 m	0.3 m	0.3 m

Parameters	Values
	Dataset-7
t_s	10 cm
gap_d	-
num_s	9
θ_{th}	4,7
r	1
ps	50 mm
∂	2.2 m
τ_{up}	15
τ_{low}	3
t_w	0.25 m

Table 3. The value of parameters in synthetic dataset

Parameters	Values				
	Synthetic Data-1 (1)	Synthetic Data-1 (2)	Synthetic Data-2 (1)	Synthetic Data-2 (2)	Synthetic Data-2 (3)
t_s	10 cm	10 cm	7 cm	7 cm	7 cm
gap_d	0.7 m	0.7 m	0.5 m	0.5 m	0.5 m
num_s	10	10	13	13	13
θ_{th}	4	4	4	4	4
r	1	1	1	1	1
ps	25 mm	25 mm	25 mm	25 mm	25 mm
∂	4.7 m	2.0 m	5.9 m	2.6 m	-0.5 m
τ_{up}	15	100	100	100	16
τ_{low}	3	3	8	8	3
t_w	0.7 m	0.7 m	0.5 m	0.5 m	0.5 m

Parameters	Values				
	Synthetic Data-3 (1)	Synthetic Data-3 (2)	Synthetic Data-4 (1)	Synthetic Data-4 (2)	Synthetic Data-5
t_s	10 cm	10 cm	10 cm	15 cm	5 cm
gap_d	1 m	1 m	0.8 m	0.8 m	-
num_s	12	12	10	10	15
θ_{th}	4	4	4,7	4,7	3,7
r	1	1	1	1	1
ps	25 mm	25 mm	25 mm	25 mm	30 mm
∂	5.7 m	2.3 m	6.7 m	0.4 m	2 m
τ_{up}	50	50	80	60	200
τ_{low}	1	3	4	5	2
t_w	0.5 m	0.5 m	0.7 m	0.7 m	0.7 m

Parameters	Values				
	Synthetic Data-6 (1)	Synthetic Data-6 (2)	Synthetic Data-7 (1)	Synthetic Data-7 (2)	Synthetic Data-8 (1)
t_s	10 cm	10 cm	10 cm	10 cm	10 cm
gap_d	0.7 m	0.7 m	0.7 m	0.7 m	0.7 m
num_s	13	13	13	13	13
θ_{th}	4,7	4,7	4,7	4,7	4,7
r	1	1	1	1	1
ps	35 mm	35 mm	35 mm	35 mm	35 mm
∂	5.7 m	2.3 m	5.7 m	2.3 m	5.7 m
τ_{up}	150	150	150	150	150
τ_{low}	1	5	1	5	1
t_w	0.5 m	0.5 m	0.5 m	0.5 m	0.5 m

Parameters	Values
	Synthetic Data-8 (2)
t_s	10 cm
gap_d	0.7 m
num_s	13
θ_{th}	4,7
r	1
ps	35 mm
∂	2.3 m
τ_{up}	150
τ_{low}	5
t_w	0.5 m