3D Boundary Integration Based Stair Region Reconstruction in Floating Object Detection for Visually Impaired People

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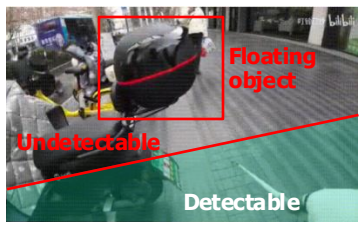
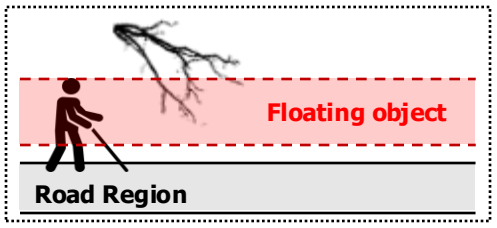
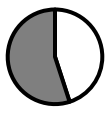
Background







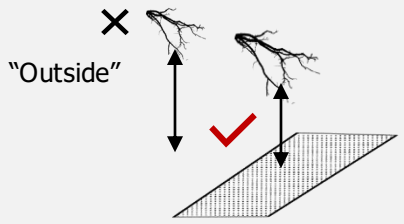
55% visually impaired get hit more than once a month

Cannot detect & High collision risk

Dangerous

Challenges

Floating object detection



Any object inside the road or not?
If has, then what is its height?

Ground configuration
(ex. boundary / height)

Stair

Contains many planes

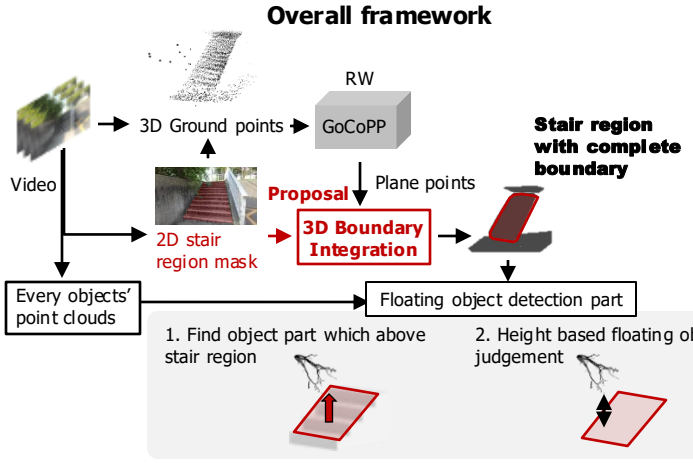
Complex structure
Difficult to compute configuration

Target

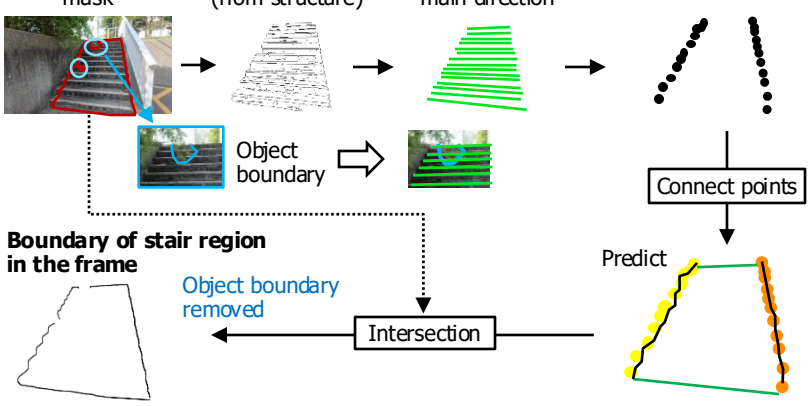
Designed a stair reconstruct method in used of floating object detection

Proposals

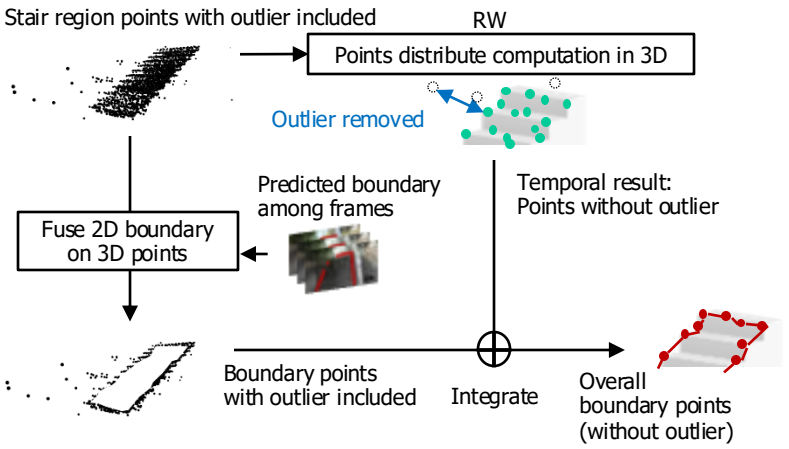
Overall framework



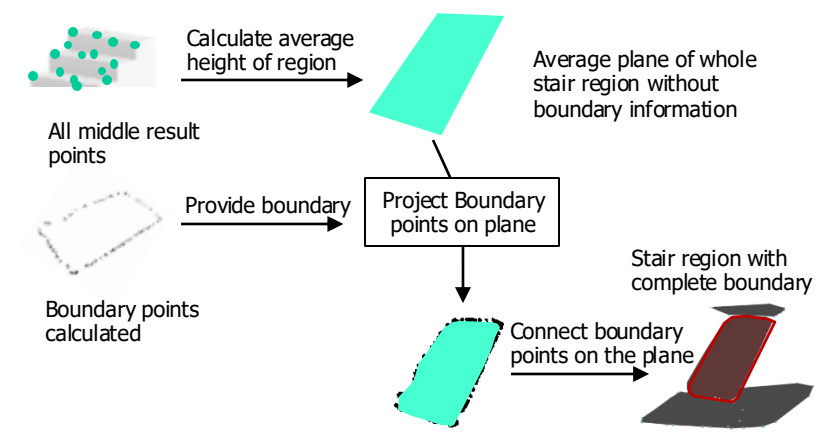
Structural line guided 2D occluded stair boundary prediction



3D boundary integration based outlier removal



Reconstruction of stair region



Experiment Results

Stair Type	Method	Stair angle		Floating object entry location		
		Gentle	Steep	Side	Above	Overall
Ascending	Baseline	0.43	0.25	0.40	0.33	0.36
	Baseline + Proposal	0.71	0.75	0.60	0.83	0.73
Descending	Baseline	0.63	1.00	0.50	1.00	0.73
	Baseline + Proposal	0.88	1.00	0.83	1.00	0.91
Total	Baseline		0.55	Baseline + Proposal		0.82

Conclusion

- Detection rate is defined here under a threshold of height difference of each object's real height; proposed method raises detection rates from 0.36 to 0.73 (ascending), from 0.73 to 0.91 (descending), and from 0.55 to 0.82 overall.

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