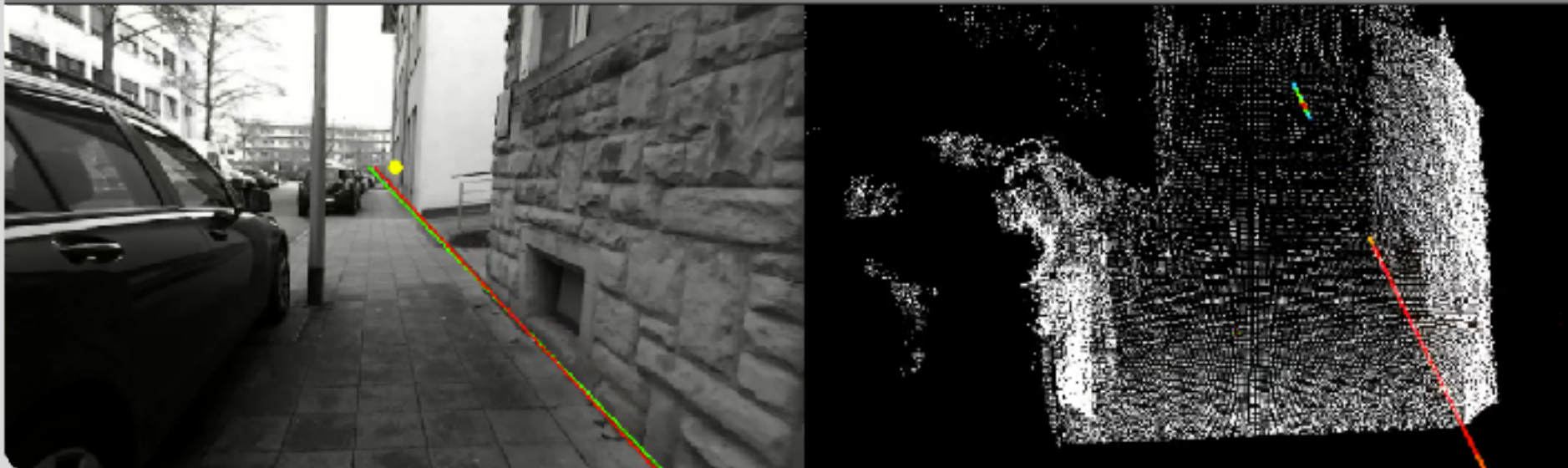


Visual Shoreline Detection for Blind and Partially Sighted People

Daniel Koester, Tobias Allgeyer, Rainer Stiefelhagen

INSTITUTE FOR ANTHROPOMATICS AND ROBOTICS – COMPUTER VISION FOR HUMAN COMPUTER INTERACTION



Motivation

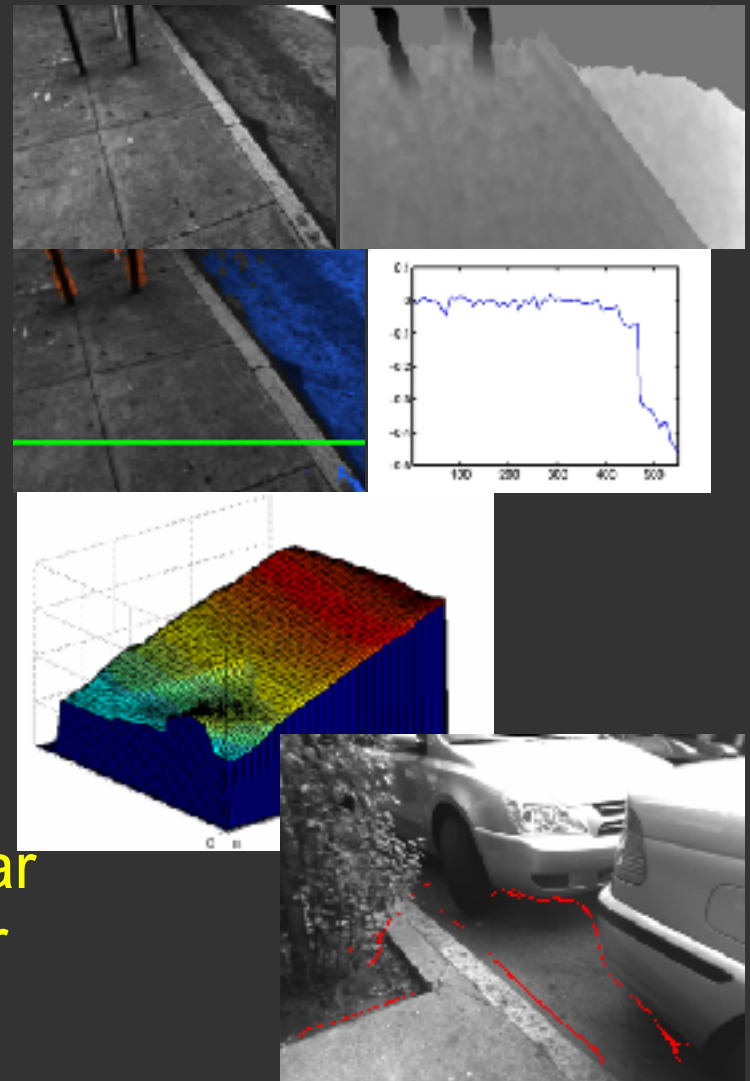


Motivation



Related Work

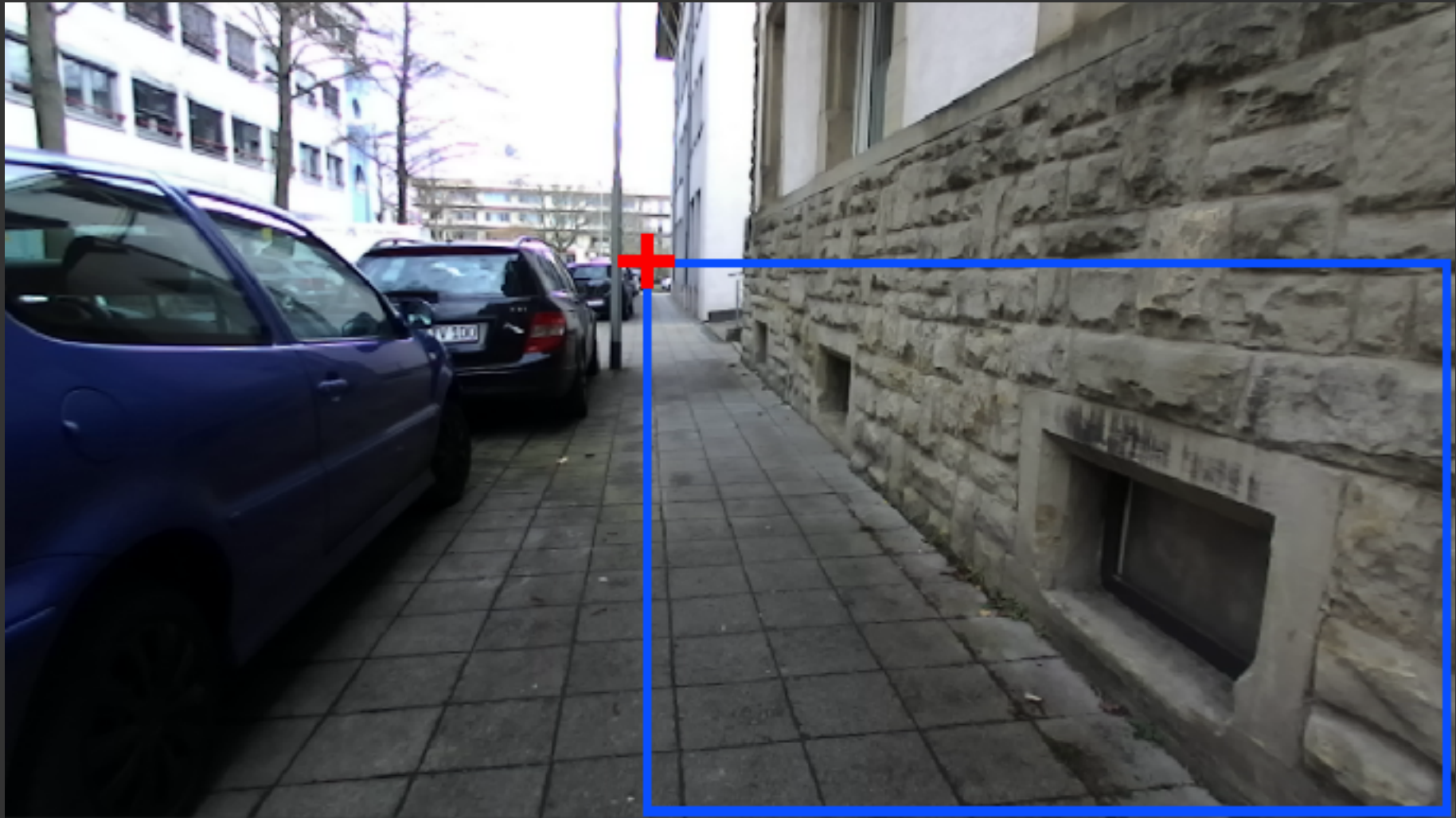
- Coughlan, Manduchi, Shen: Computer Vision-Based Terrain Sensors for Blind Wheelchair Users, ICCHP 2006
- Coughlan, Shen: Terrain Analysis for Blind Wheelchair Users: Computer Vision Algorithms for Finding Curbs and other Negative Obstacles, CVHI 2007
- Ivanchenko, Coughlan, Gerrey, Shen: Computer vision-based clear path guidance for blind wheelchair users, SIGACCESS 2008



Algorithm: Manhattan-World



Algorithm: Vanishing Point Detection



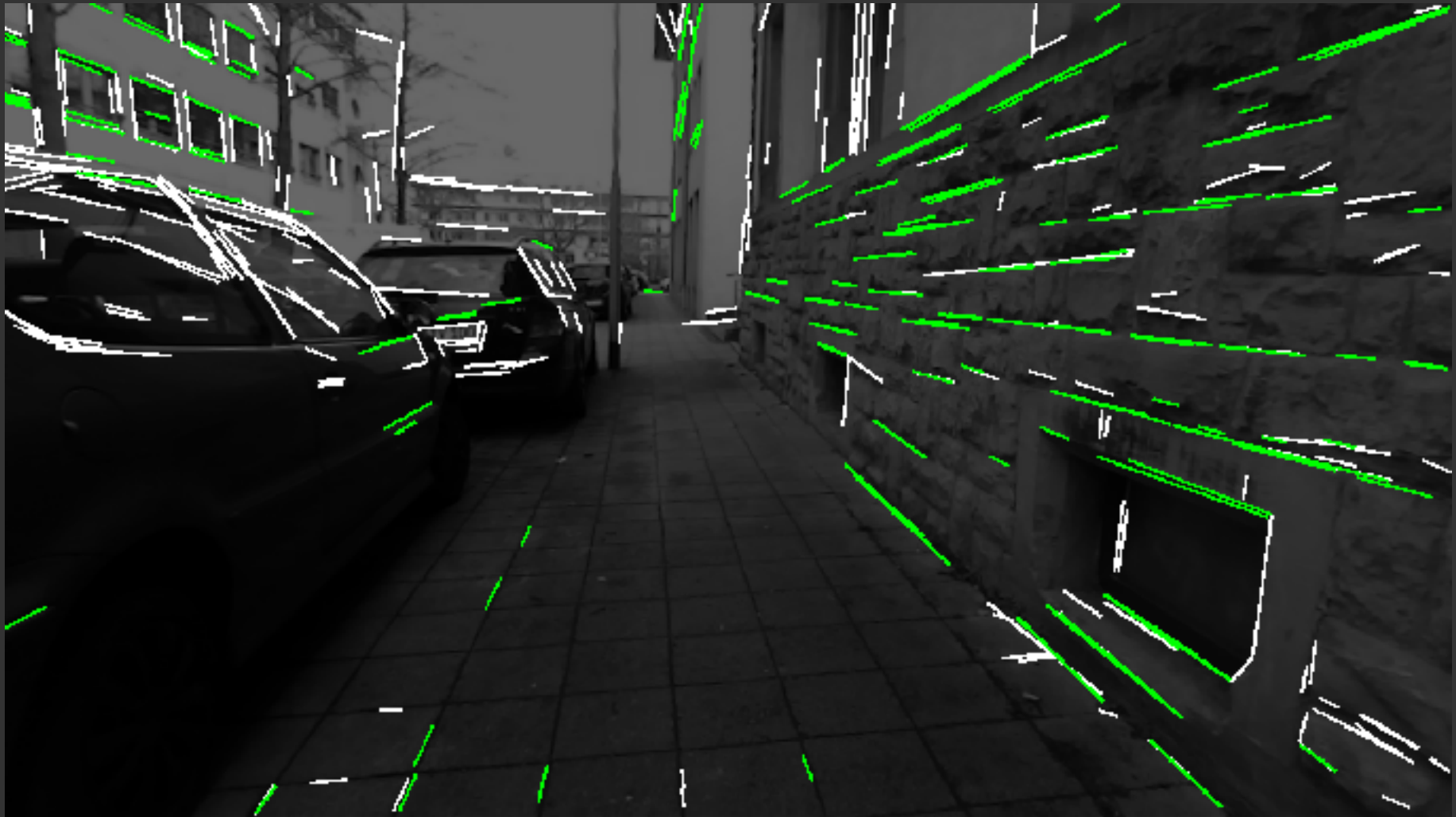
Algorithm: Vanishing Point Detection



Algorithm: Vanishing Point Detection



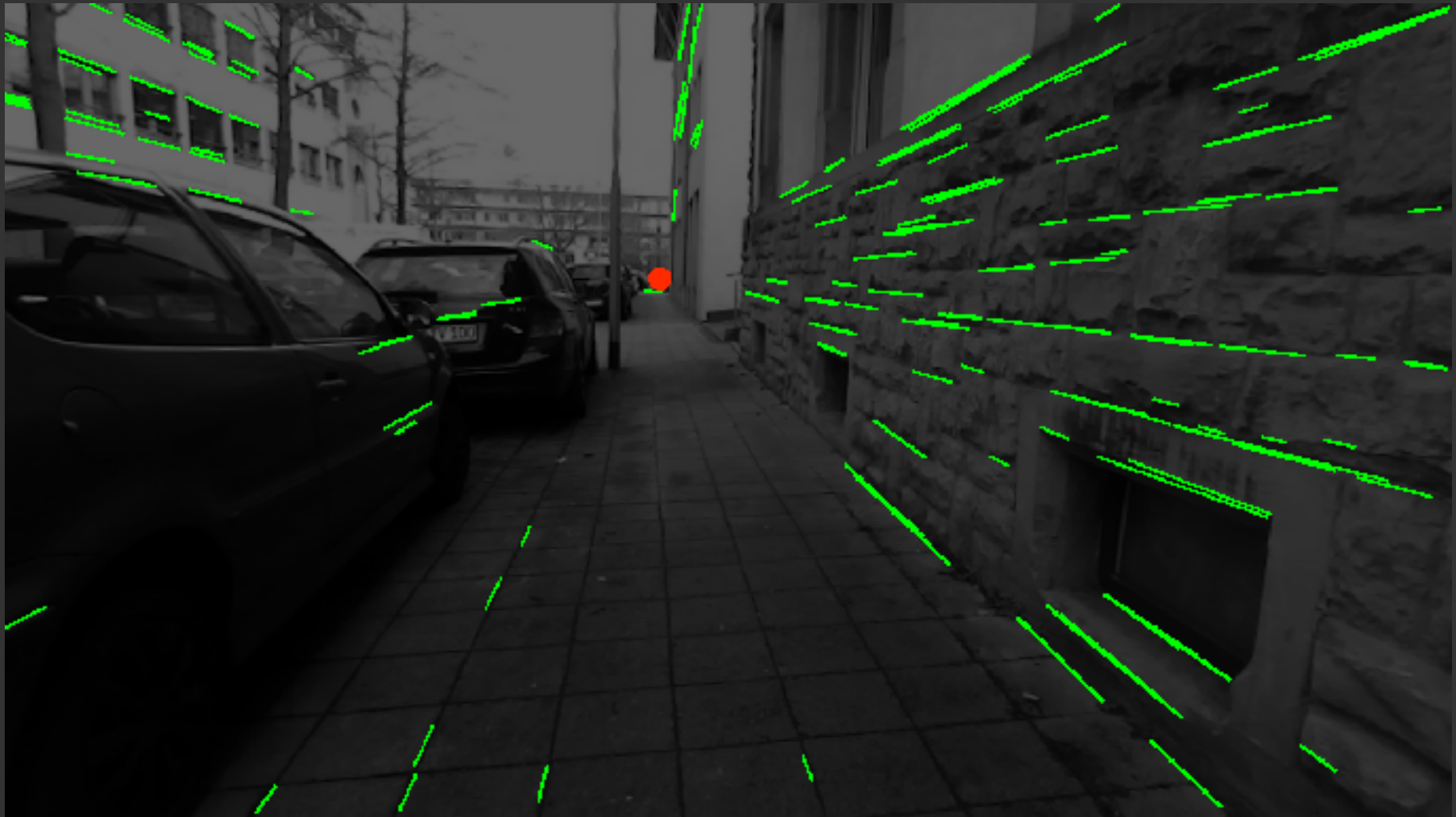
Algorithm: Vanishing Point Detection



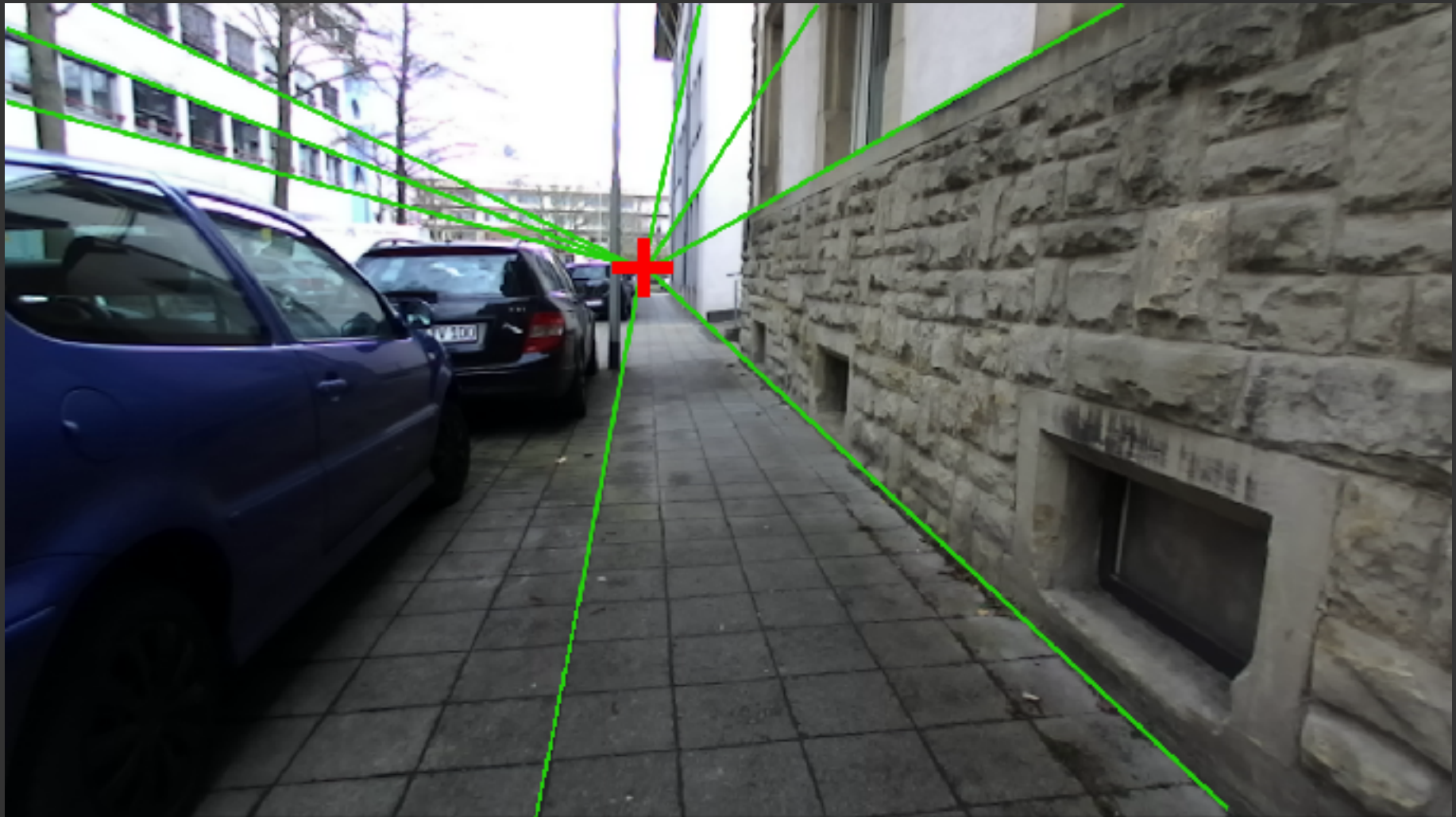
Algorithm: Vanishing Point Detection



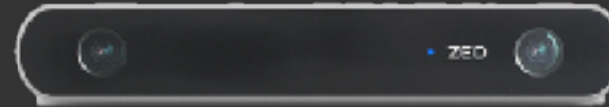
Algorithm: Vanishing Point Detection



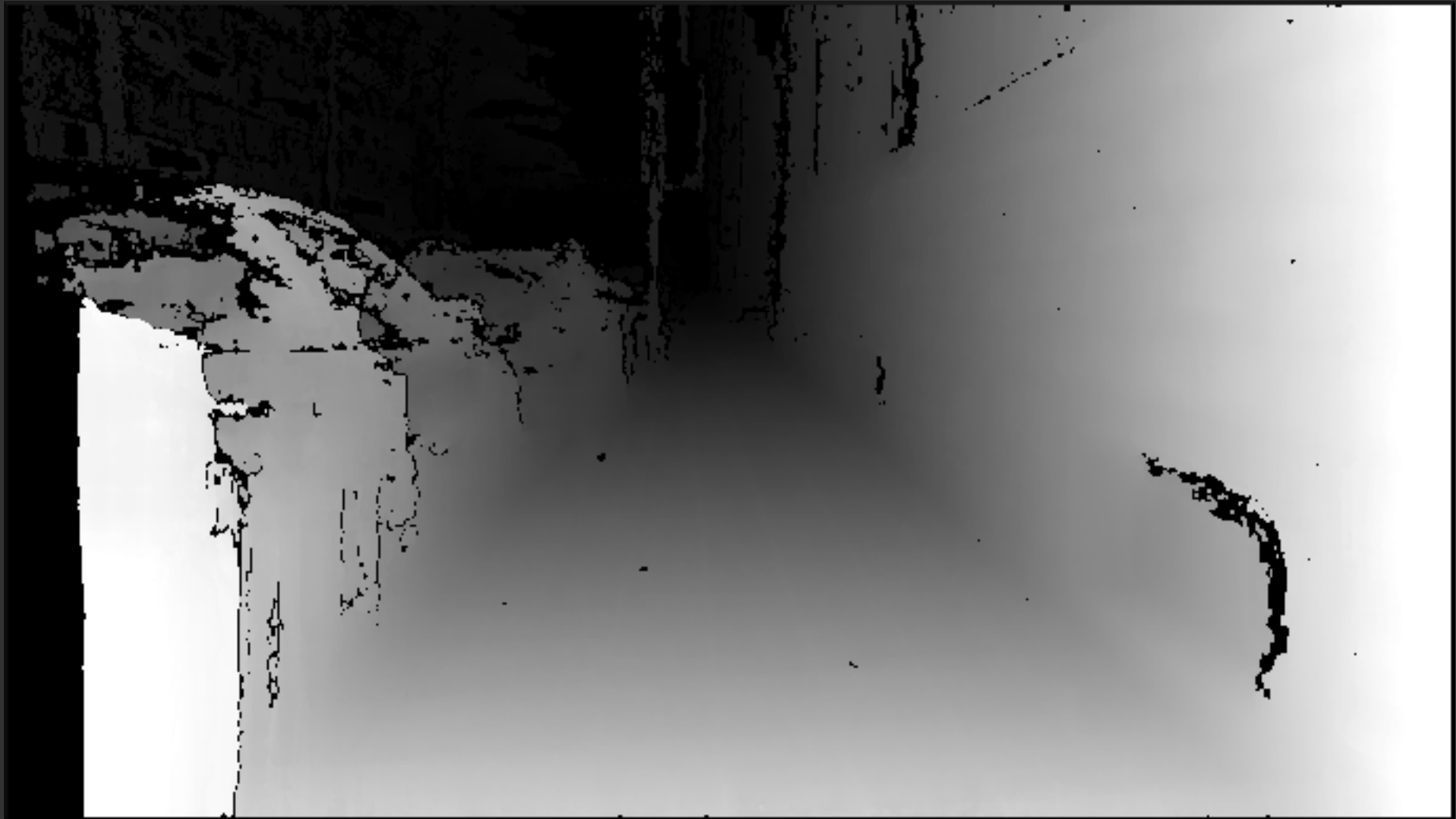
Algorithm: Vanishing Point Detection



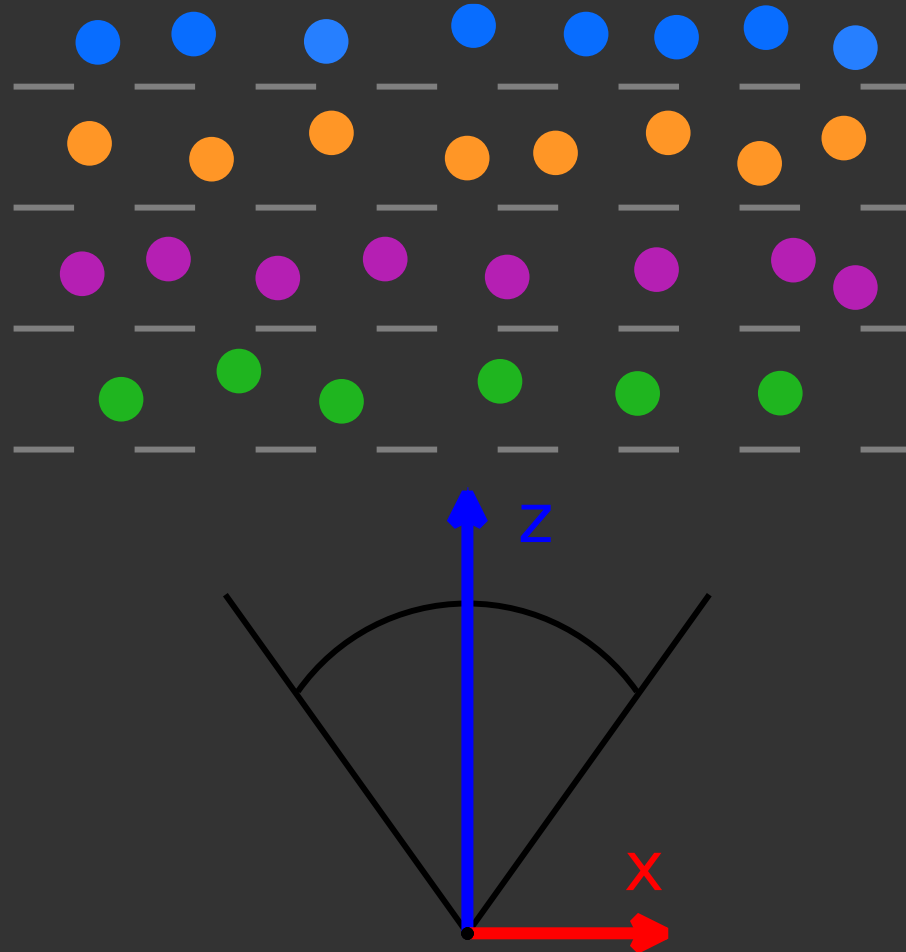
Algorithm: Depth Data



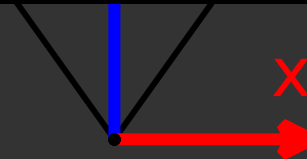
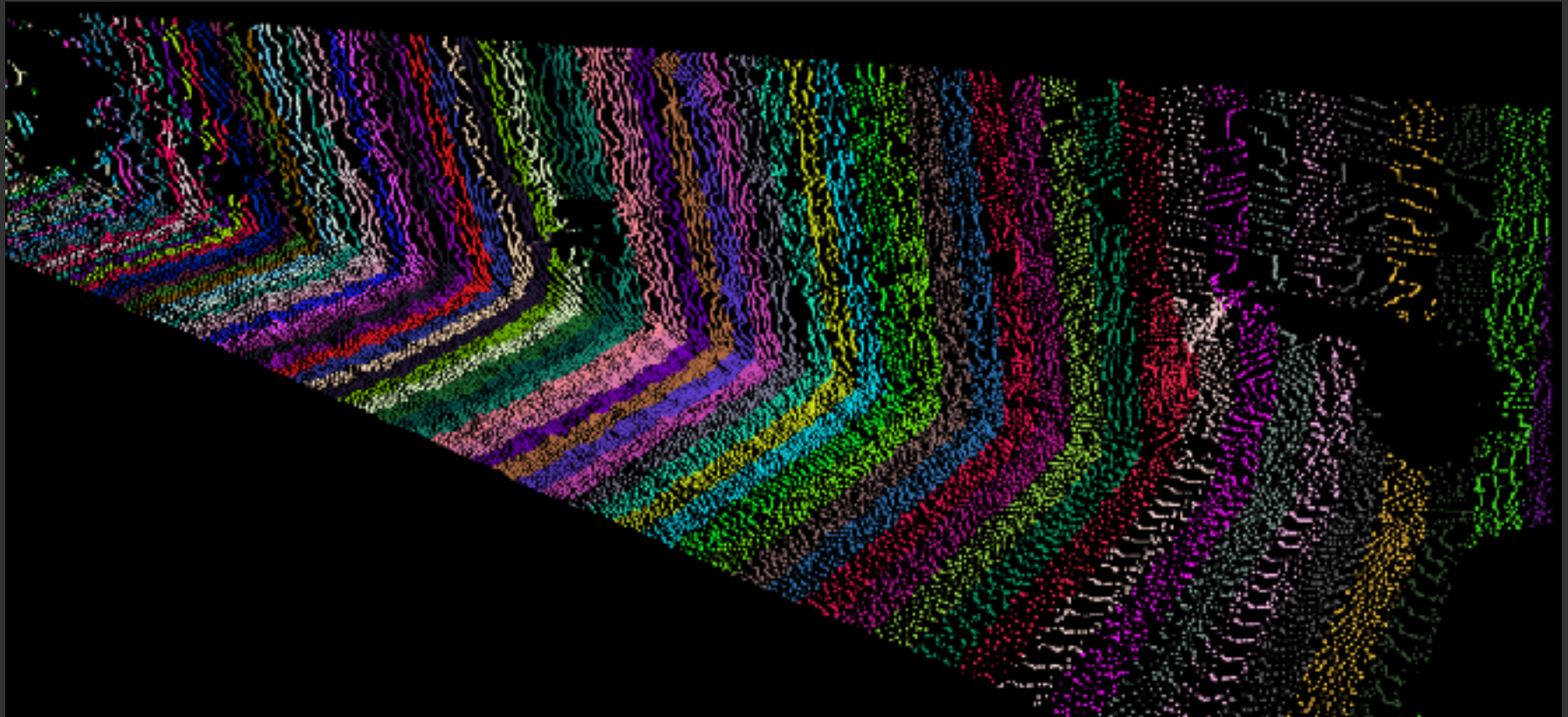
Algorithm: Depth Data



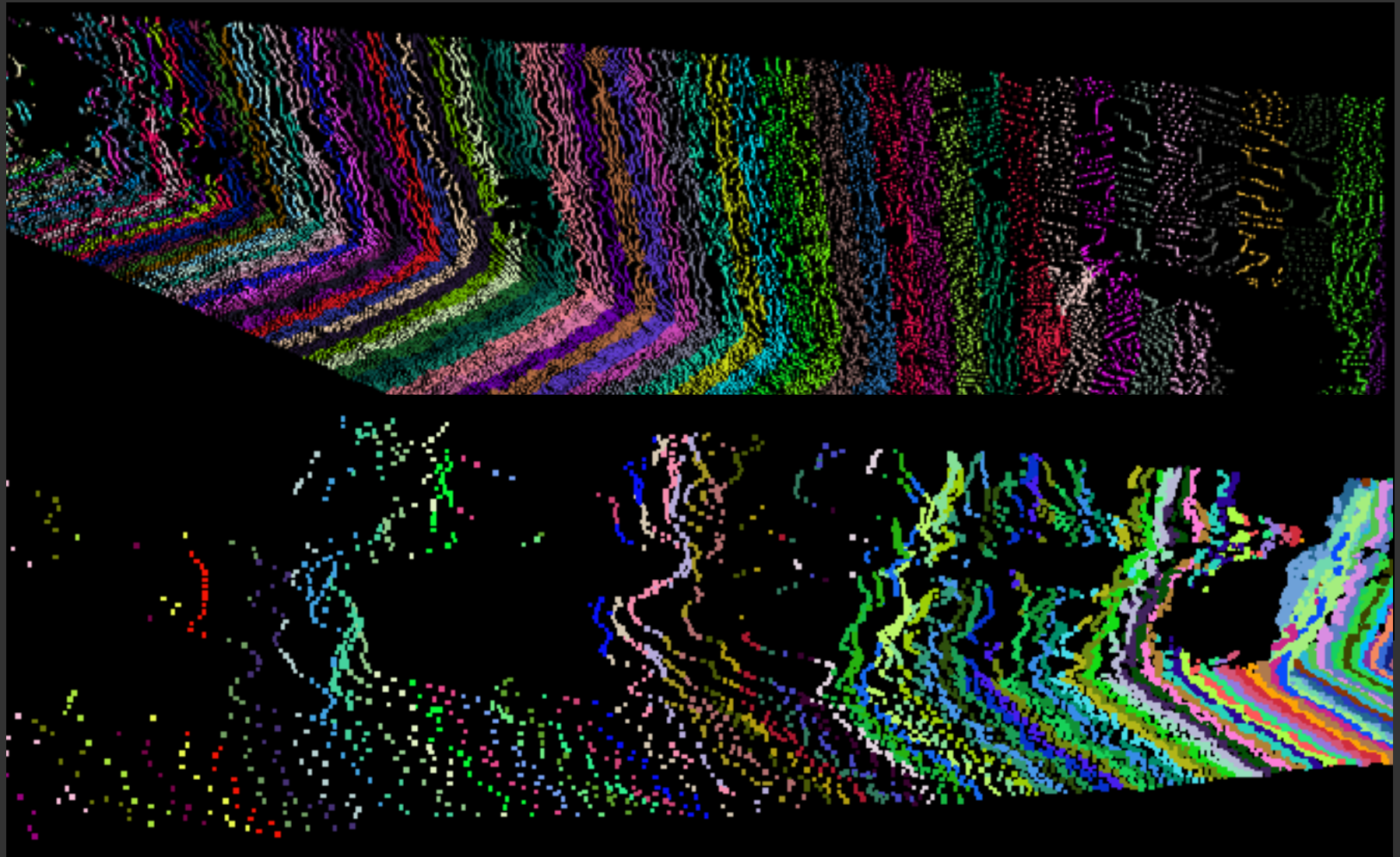
Algorithm: Slice&Dice



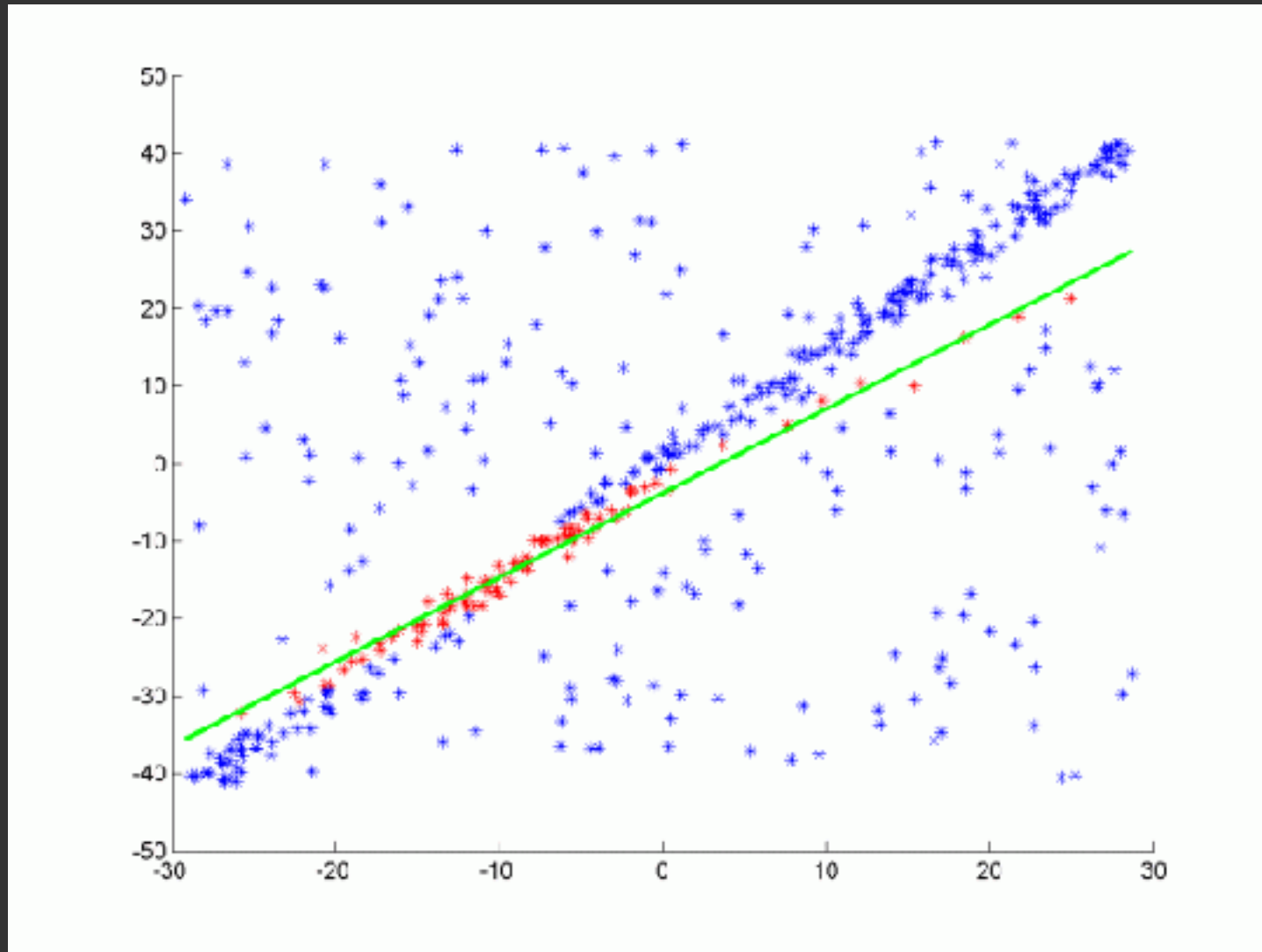
Algorithm: Slice&Dice



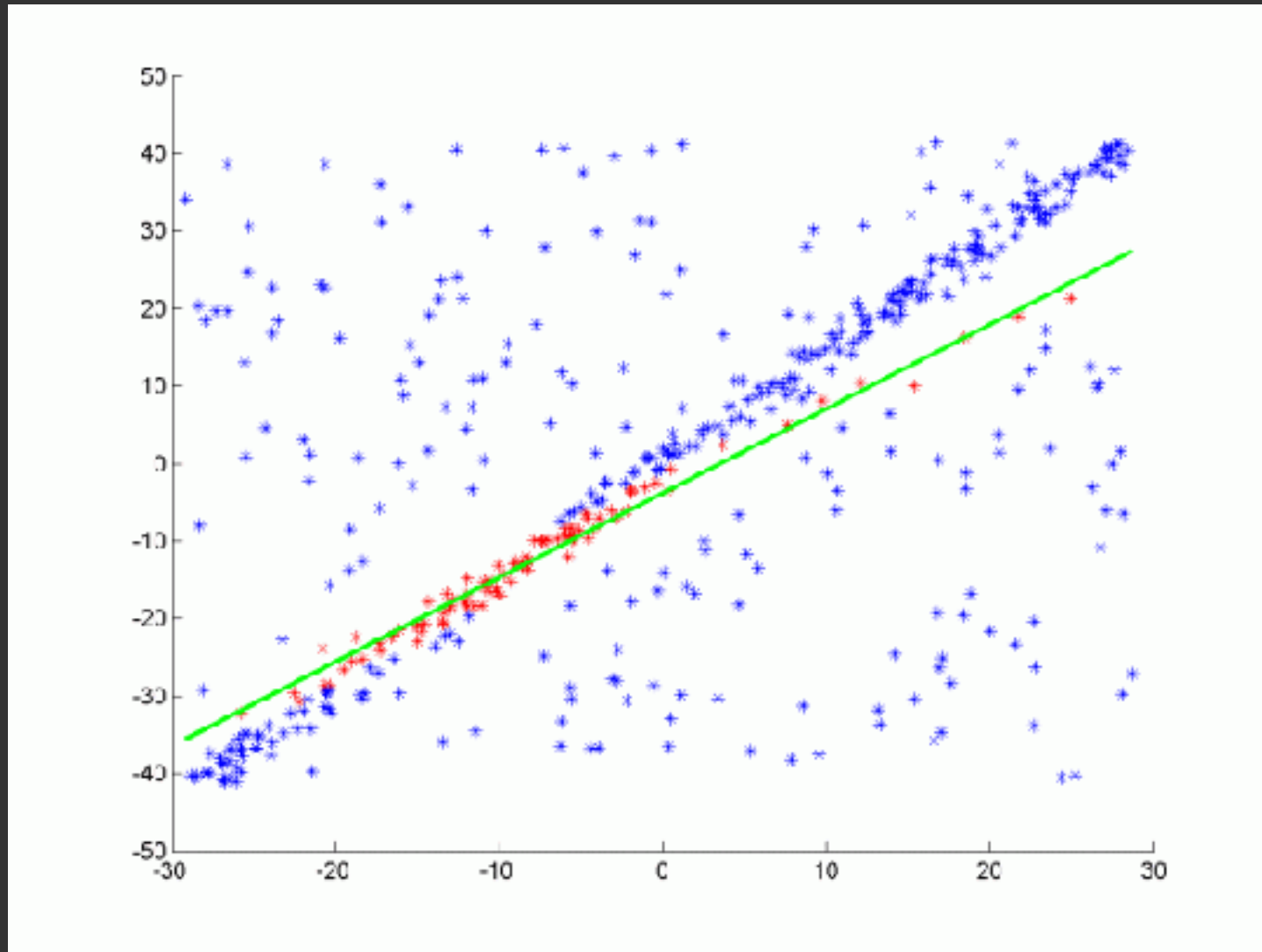
Algorithm: Slice&Dice



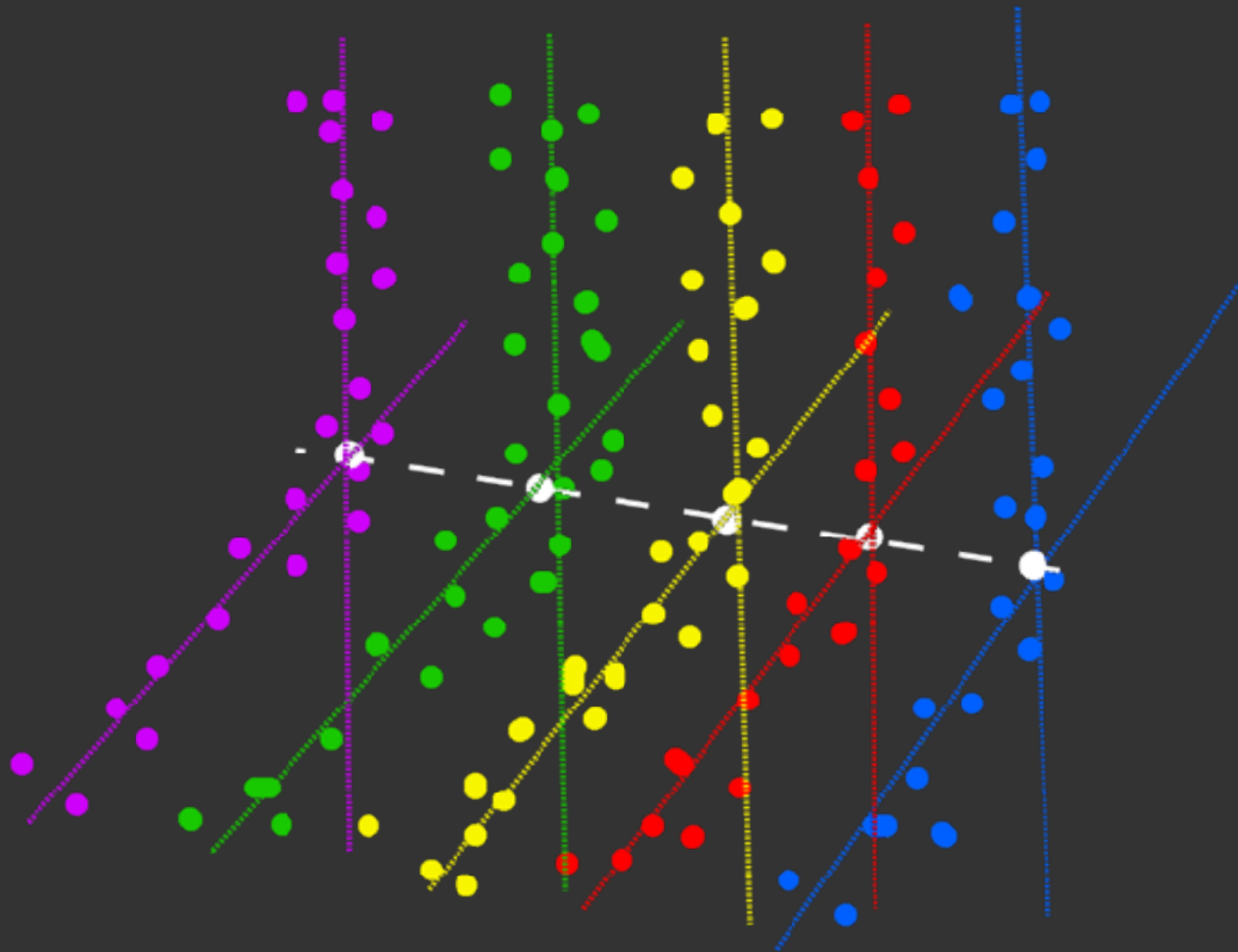
Algorithm: RANSAC



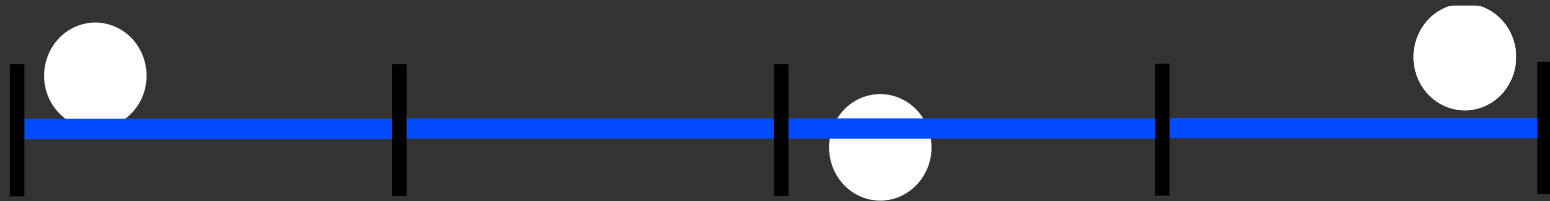
Algorithm: RANSAC



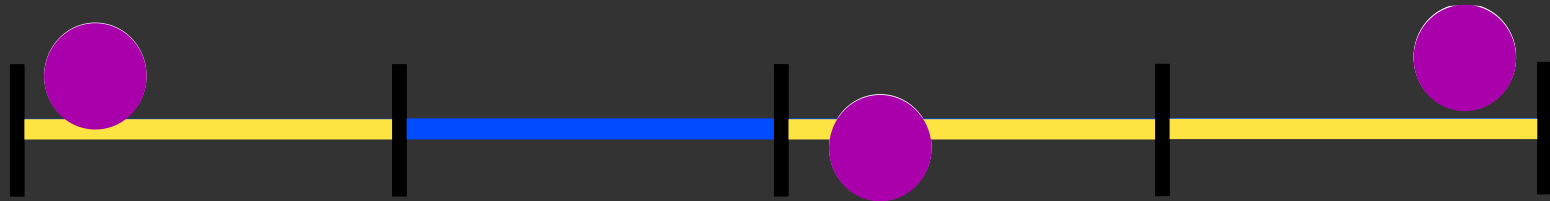
Algorithm: RANSAC



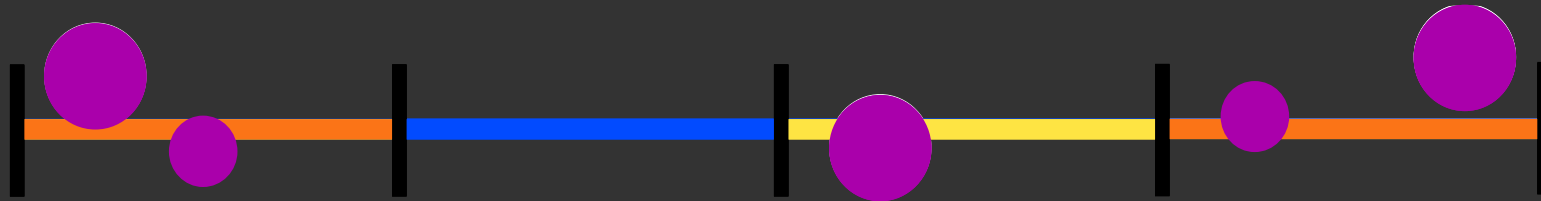
Algorithm: Segments



Algorithm: Segments



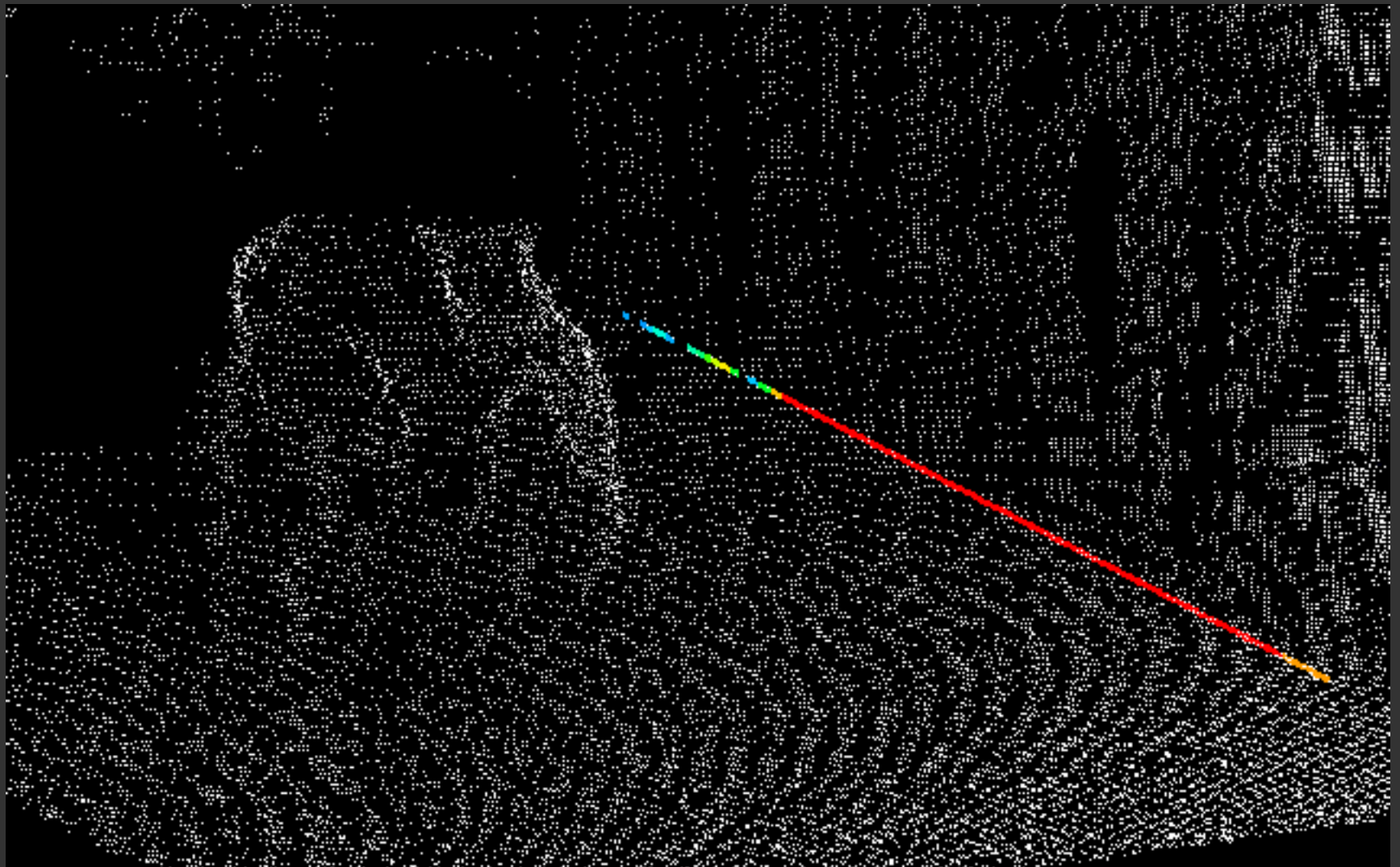
Algorithm: Segments



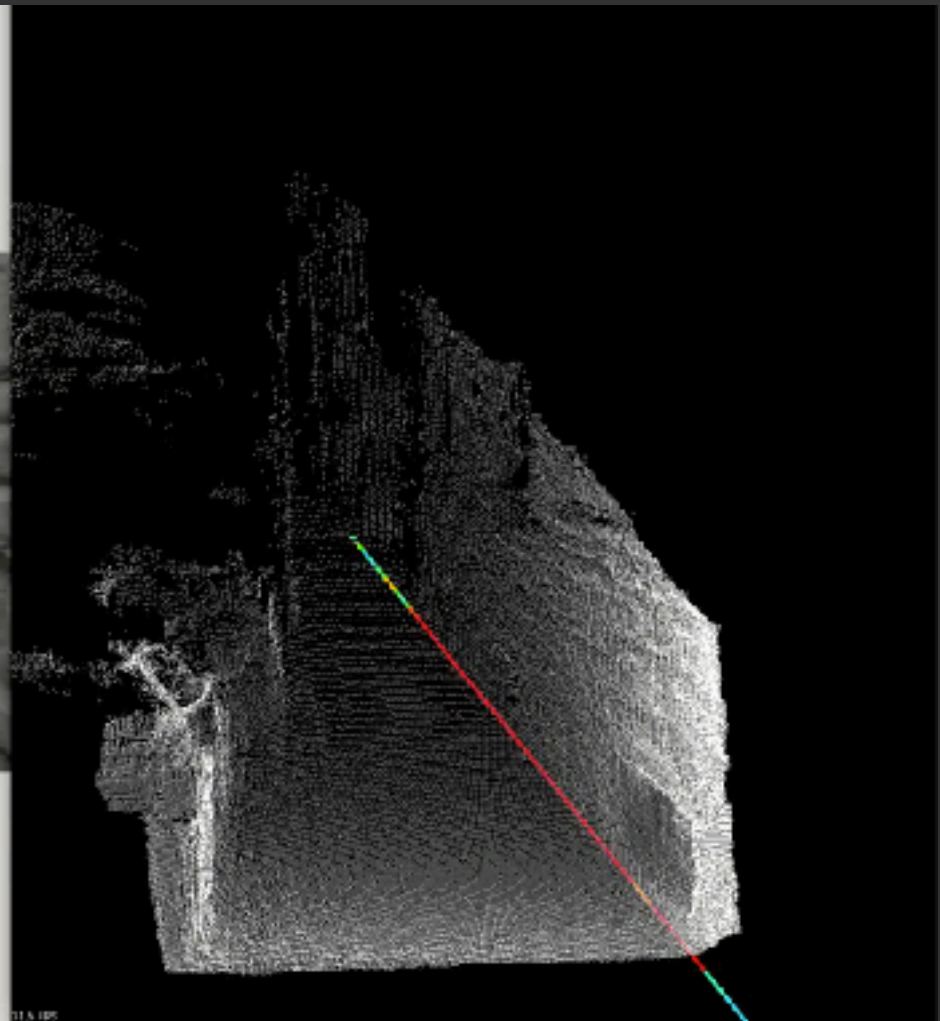
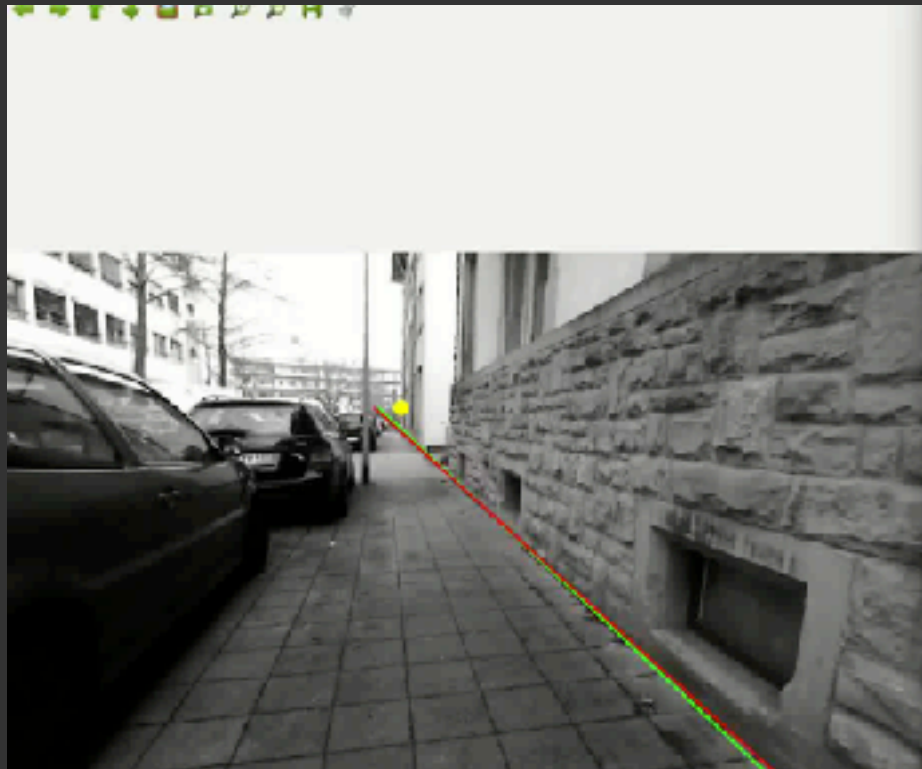
Algorithm: Segments



Evaluation



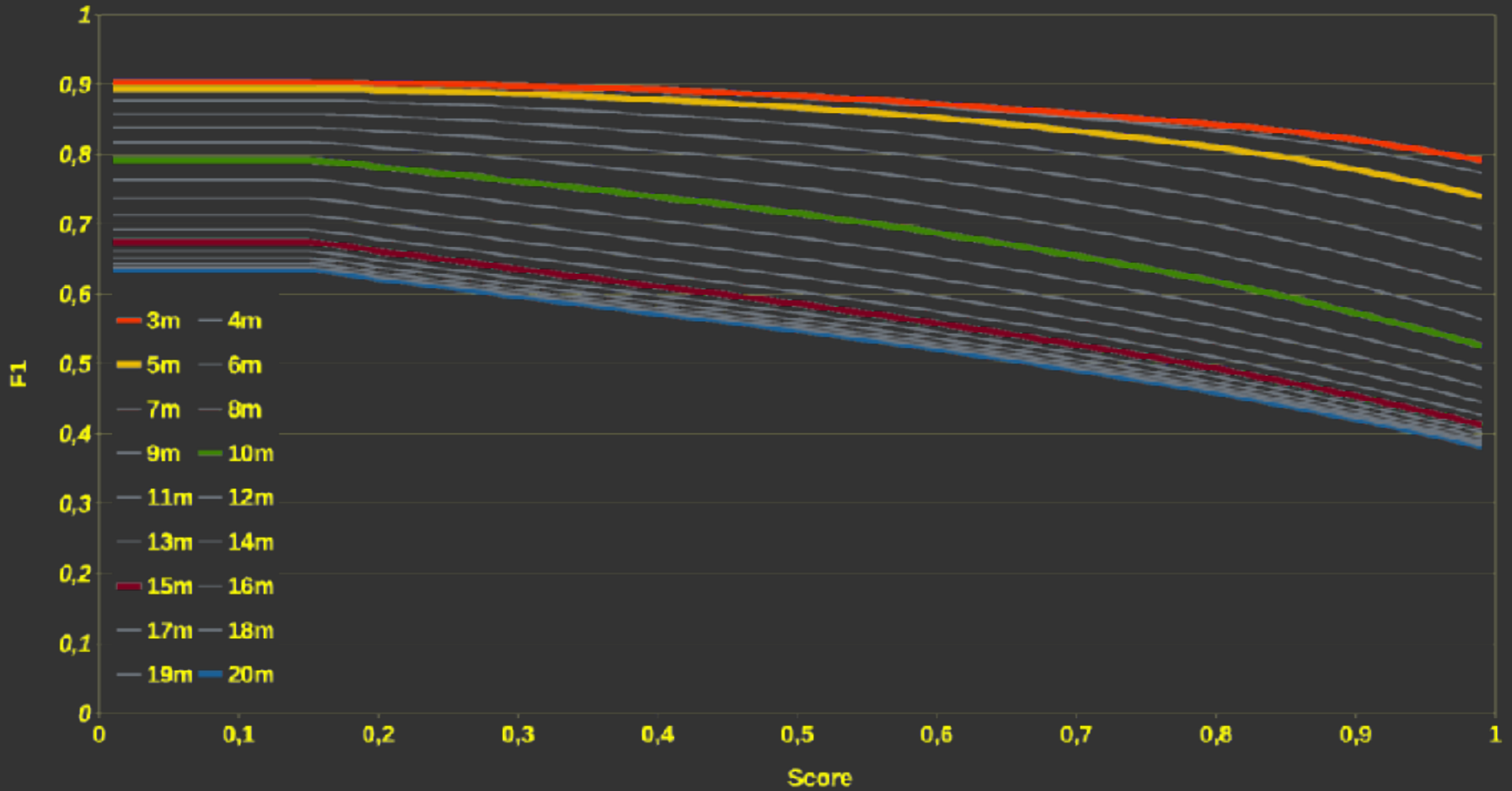
Evaluation



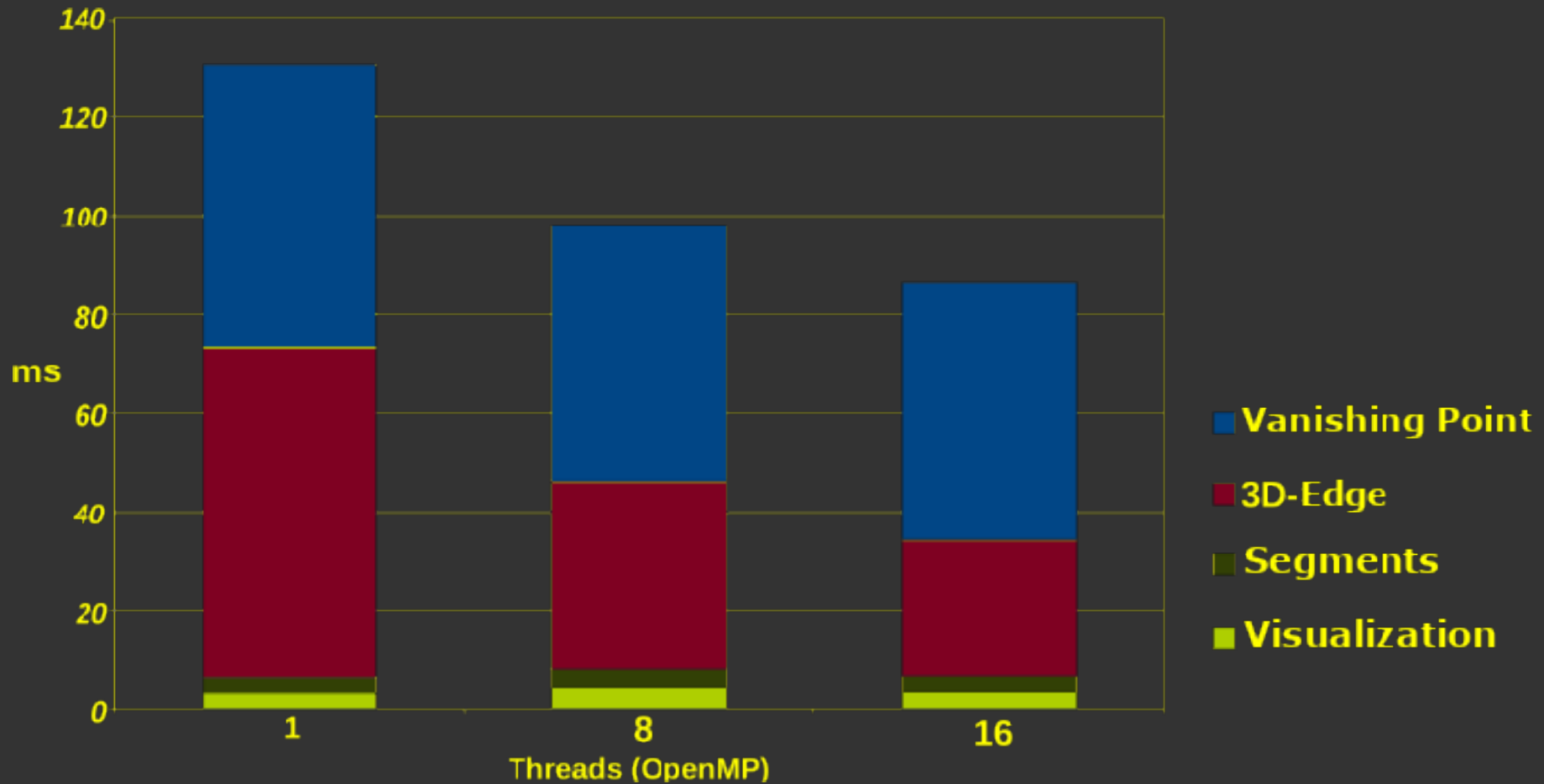
Evaluation

	frame-wise detection						averaged detection					
	$\tilde{\Theta}$	$\bar{\Theta}$	δ_{Θ}	\tilde{d}	\bar{d}	δ_d	$\tilde{\Theta}$	$\bar{\Theta}$	δ_{Θ}	\tilde{d}	\bar{d}	δ_d
I	2.0	6.2	14.2	0.07	0.15	0.26	1.5	2.9	3.4	0.12	0.20	0.24
II	3.0	5.4	7.7	0.05	0.09	0.20	1.6	2.0	1.8	0.06	0.07	0.08
III	1.5	4.6	9.2	0.04	0.06	0.13	1.1	2.0	2.8	0.03	0.03	0.02
III	1.5	4.6	9.2	0.04	0.06	0.13	1.1	2.0	2.8	0.03	0.03	0.02
IV	4.2	7.7	14.1	0.03	0.04	0.06	2.4	3.0	1.8	0.02	0.06	0.14
V	1.2	1.7	2.4	0.03	0.04	0.07	1.1	1.3	0.8	0.02	0.03	0.11
VI	1.4	4.1	8.4	0.04	0.06	0.17	1.3	1.6	1.0	0.02	0.05	0.04

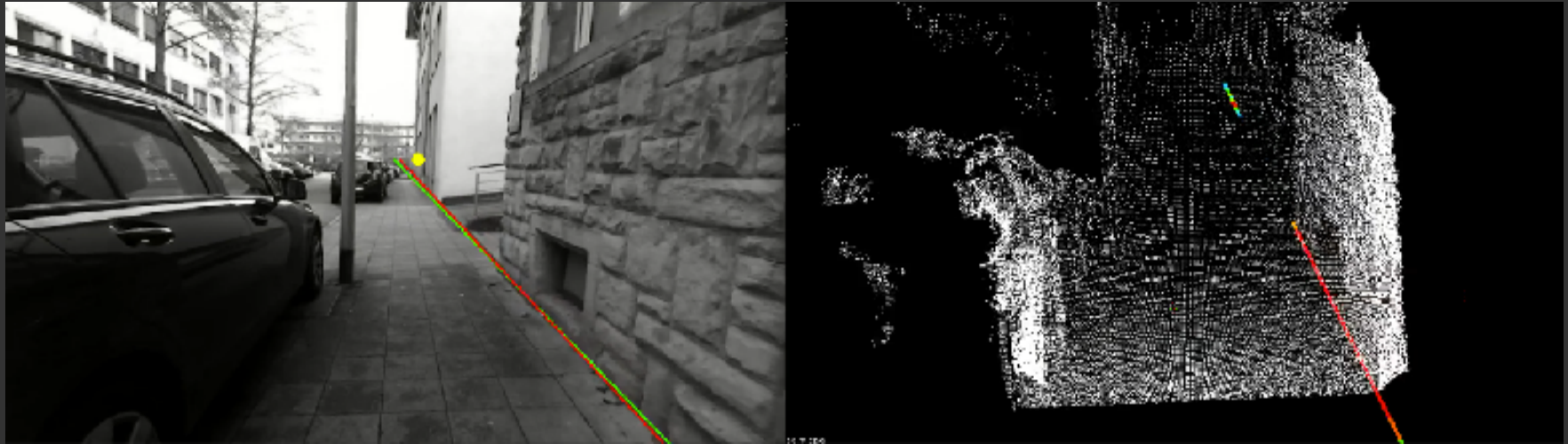
Evaluation



Evaluation: Runtime



Conclusion



- Virtual/visual shoreline detection in urban scenarios
- Achieve great accuracy
- Realtime capability vs. quality trade-off
- Useful step towards a greater mobility assistance

Questions?

 Thank you for your attention!



Image Sources

#2: “Don’t judge too quickly”, Source Unknown

#3: <http://blog.cengagebrain.com/blog/wp-content/uploads/2017/11/White-Cane-Safety.png>

#6: <https://pixabay.com/en/manhattan-new-york-new-york-city-2430572/>

#10: https://commons.wikimedia.org/wiki/File:RANSAC_LINIE_Animiert.gif

#19: <https://pxhere.com/en/photo/668263>