

Team 2

P2X (Points to Everything)



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Ankit Patnala



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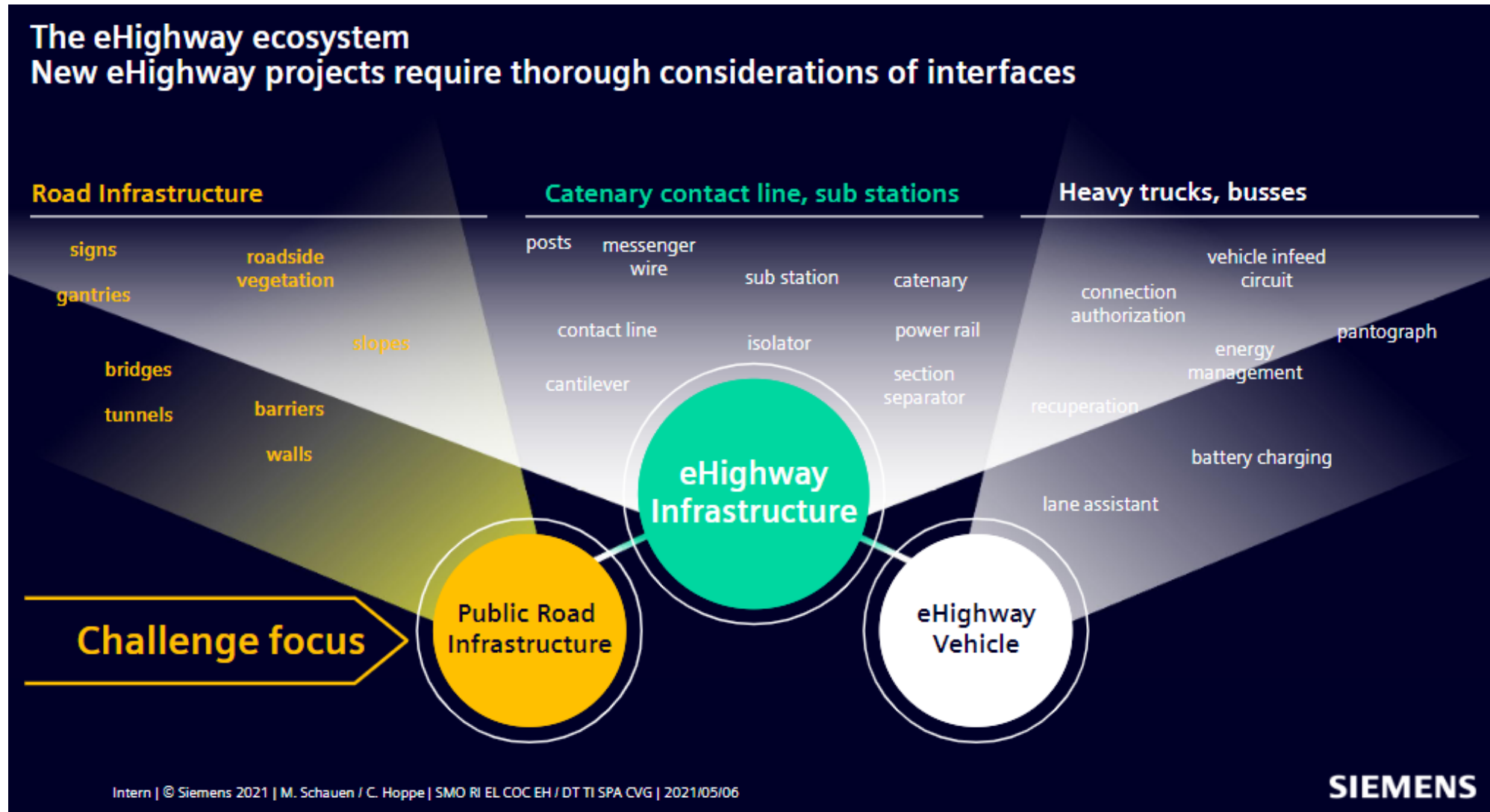
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0. Challenge of the eHighway ecosystem

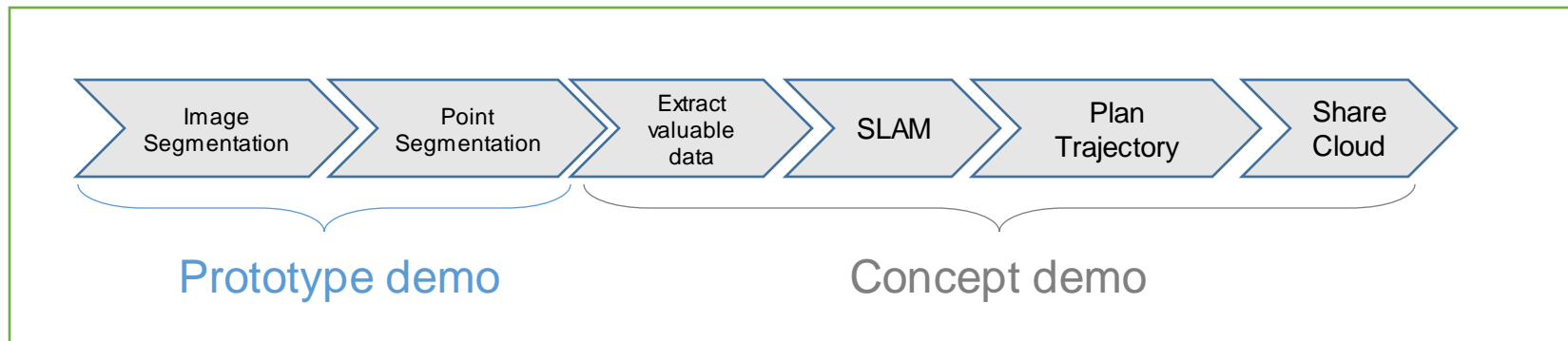


0. Challenge of the eHighway ecosystem

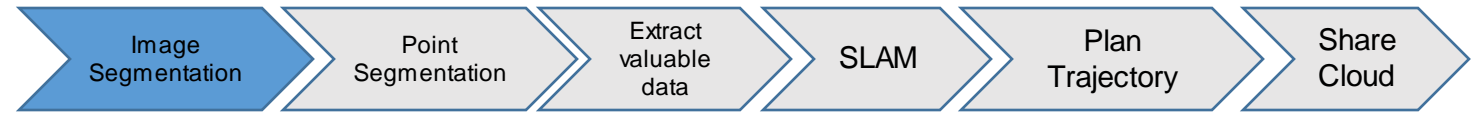
P2X (Points to Everything)

- Create segmented pointcloud for versatile purposes
- Improve the quality of planning
- Assist the driver's driving

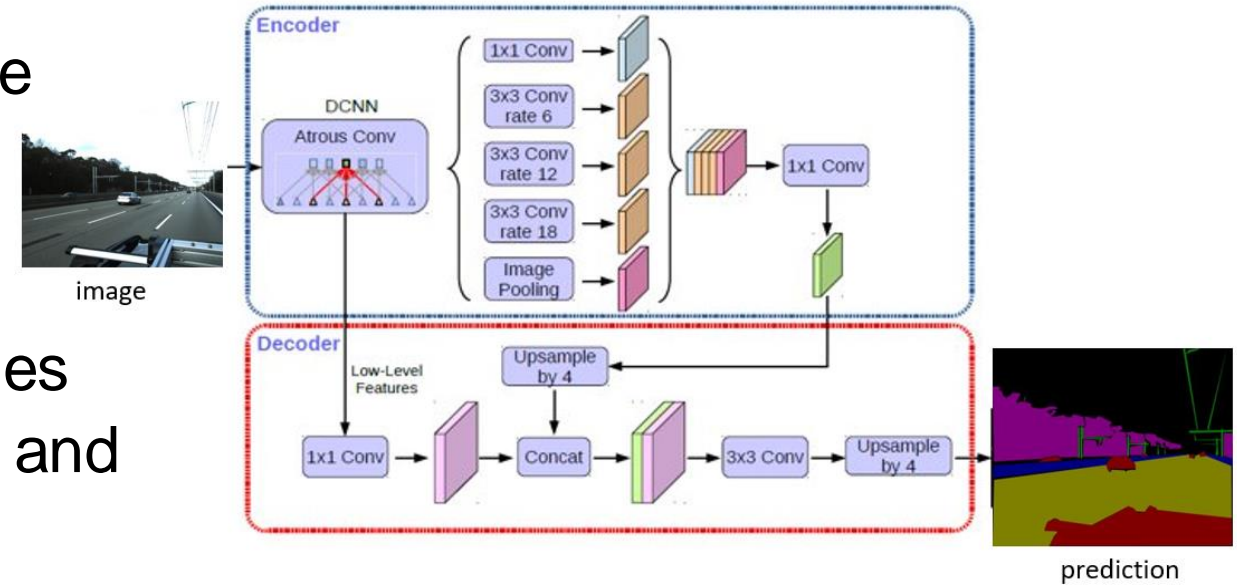
Pipeline



1. Image Segmentation



- DeepLabV3 [Architecture]
 - Semantic Segmentation architecture
 - Atrous/Dilated Convolutions
 - Spatial Pyramid Pooling
 - Encoder-Decoder
 - Segmenting objects at multiple scales
 - Processing images of arbitrary size and resolution.
 - No post processing techniques required
- Resnet 18 [Backbone]



1. Image Segmentation



- Pretrained with the Cityscapes Dataset due to the similarity with our image dataset.

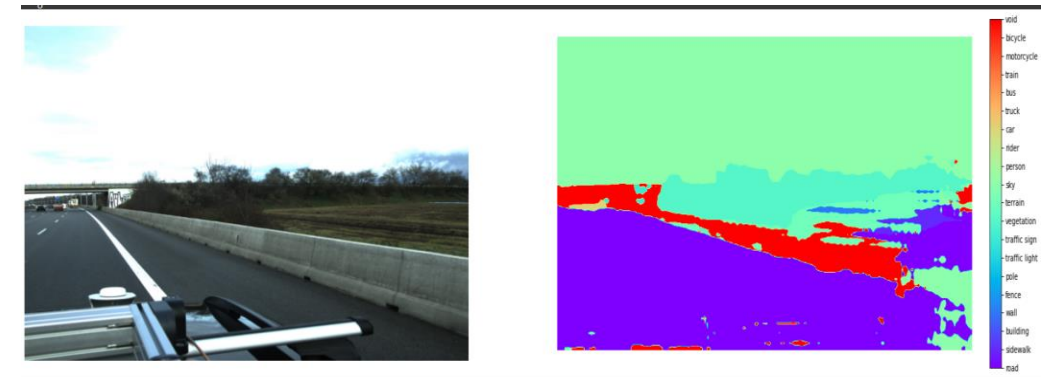
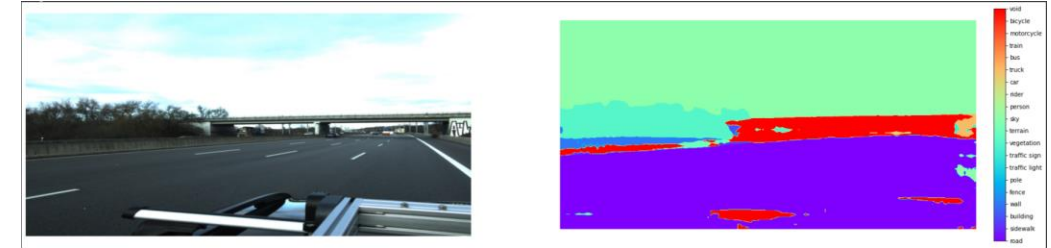
Group	Classes
flat	road · sidewalk · parking ⁺ · rail track ⁺
human	person [*] · rider [*]
vehicle	car [*] · truck [*] · bus [*] · on rails [*] · motorcycle [*] · bicycle [*] · caravan ^{**} · trailer ^{**}
construction	building · wall · fence · guard rail ⁺ · bridge ⁺ · tunnel ⁺
object	pole · pole group ⁺ · traffic sign · traffic light
nature	vegetation · terrain
sky	sky
void	ground ⁺ · dynamic ⁺ · static ⁺



1. Image Segmentation




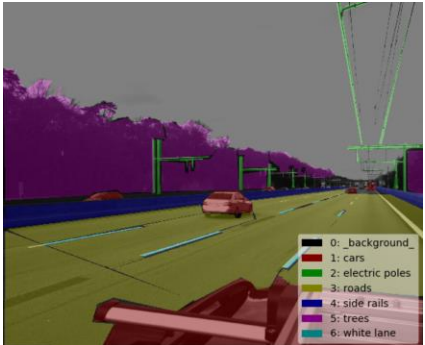
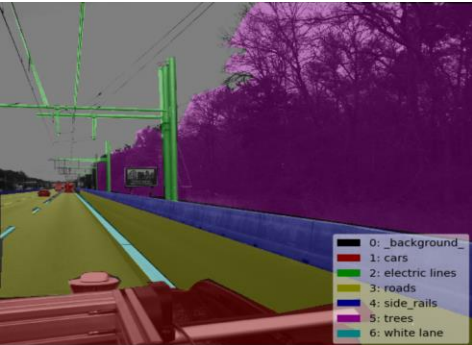
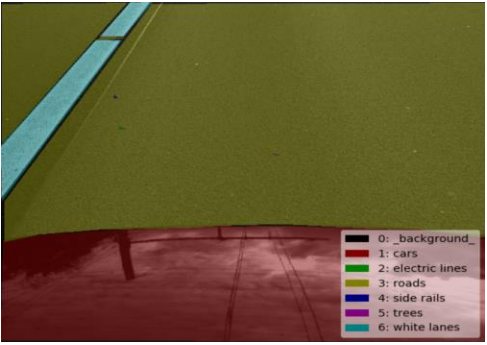
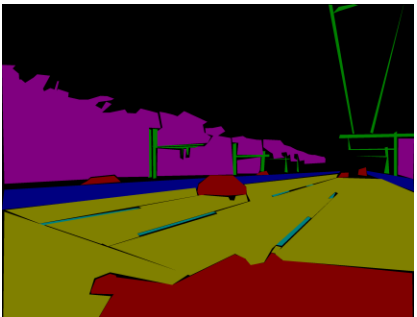
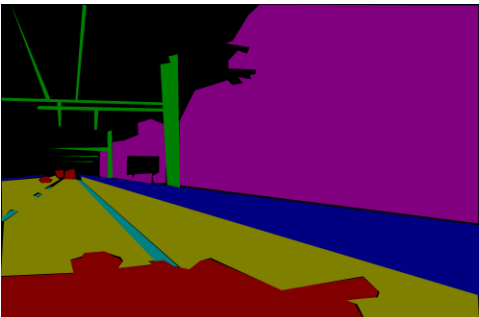
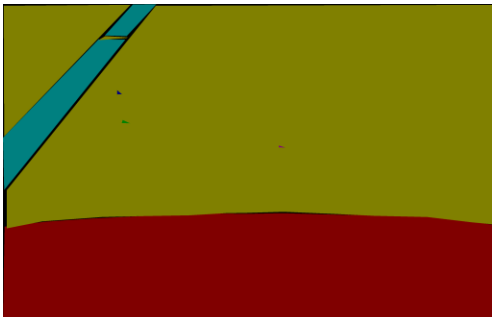


- Feasibility with pre-trained model only
 - It performs generally good.
- Better performance will be guaranteed with fine-tuning on manually annotated dataset.
- Generating annotated data (Future plan)

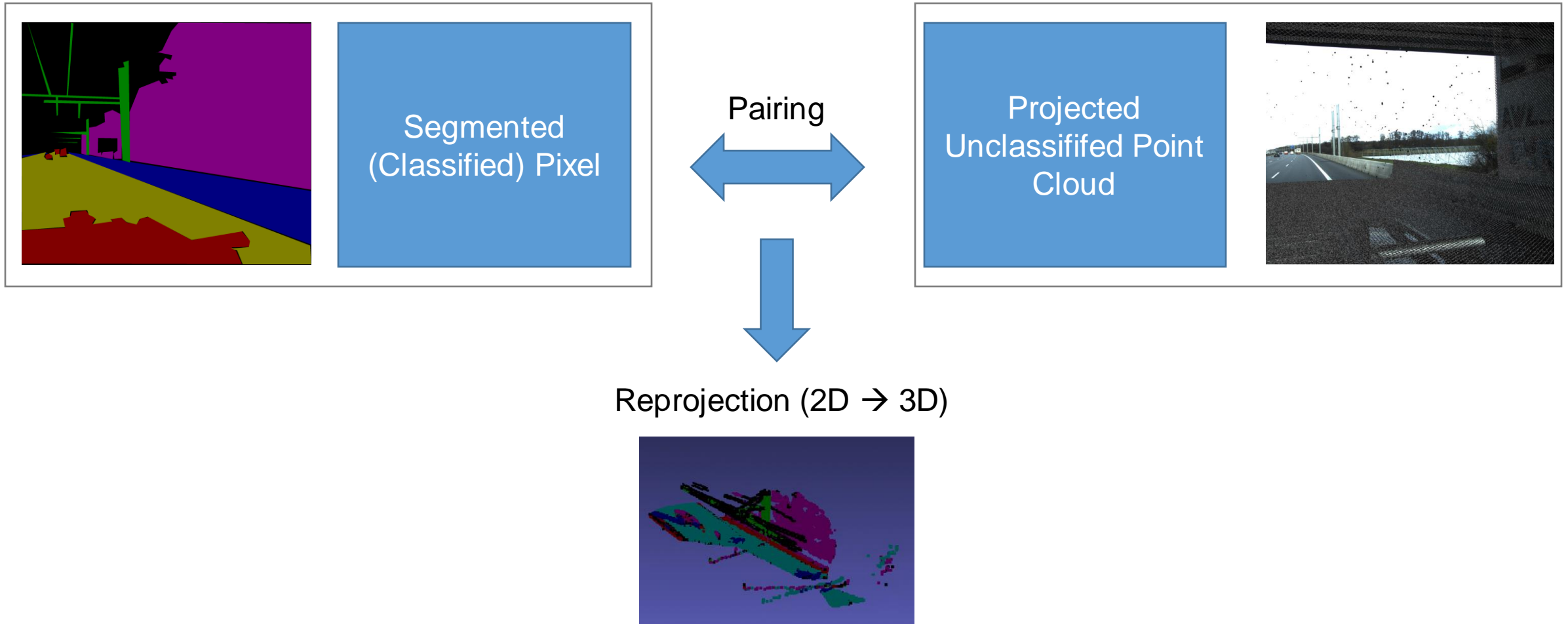
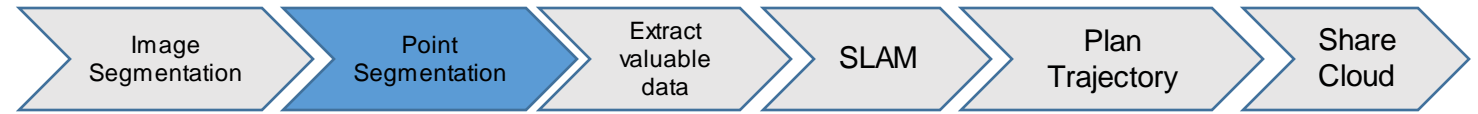


1. Image Segmentation



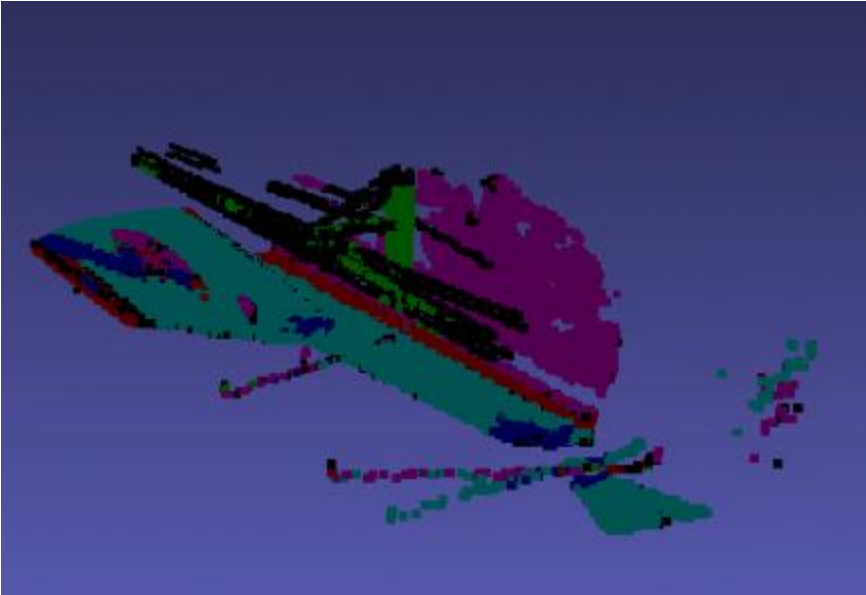
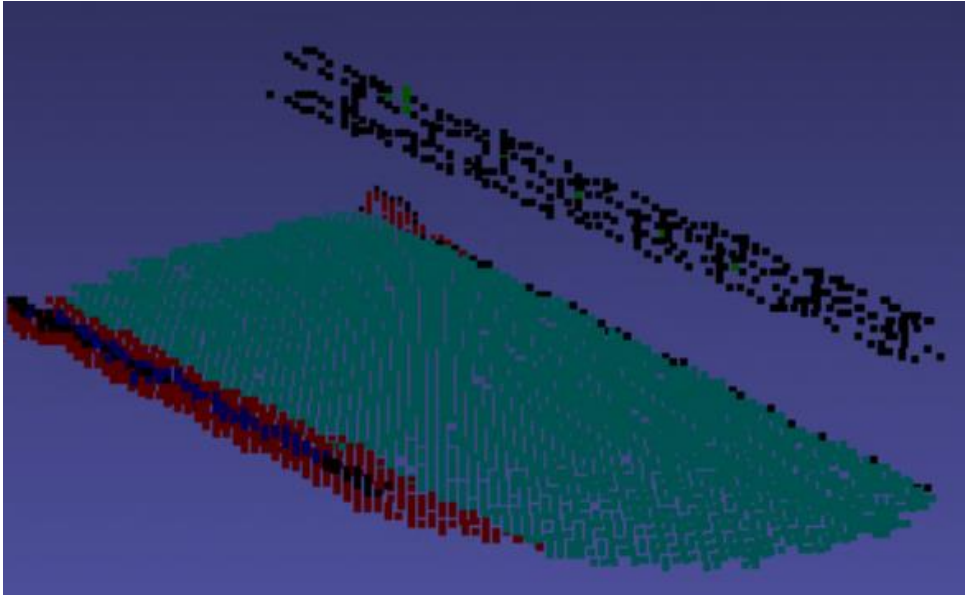


	Image left	Image right	Image center
Input			
Segmentation			
Output			

2. Point Segmentation

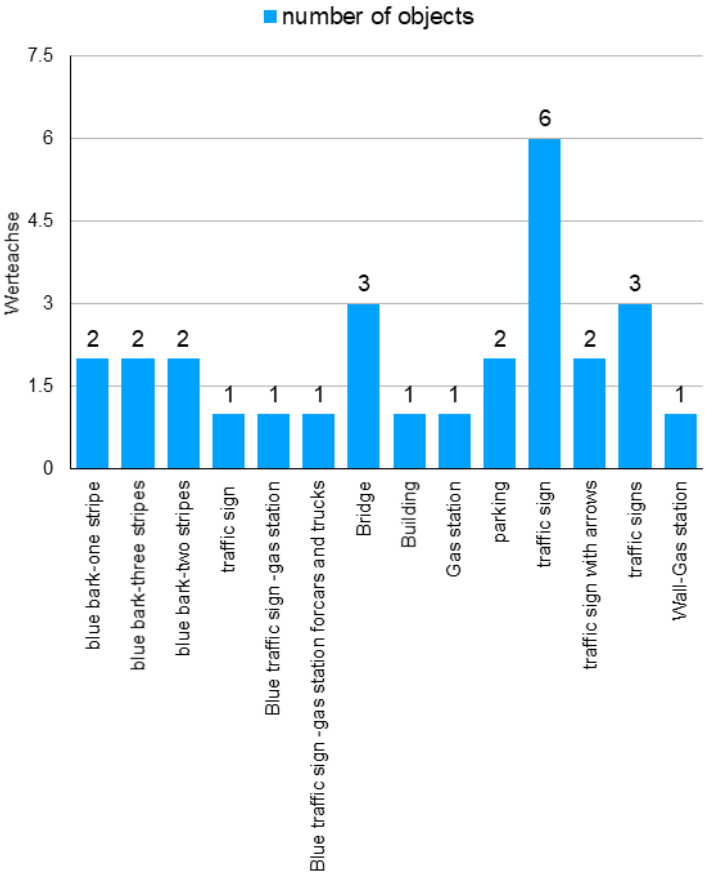
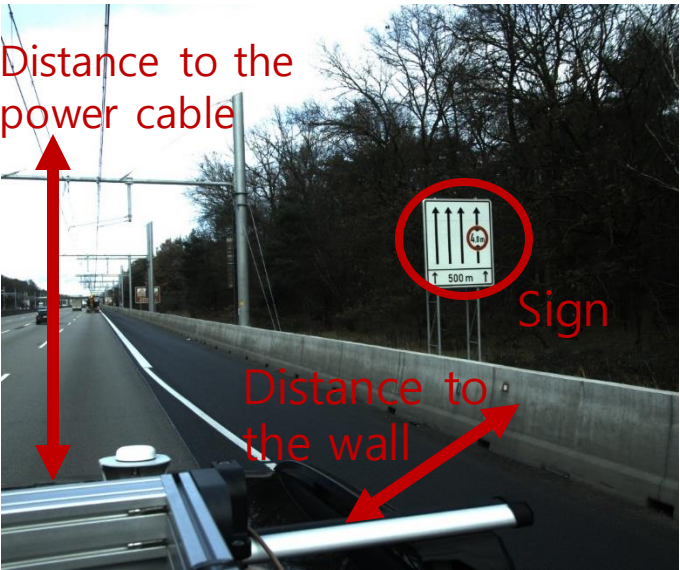
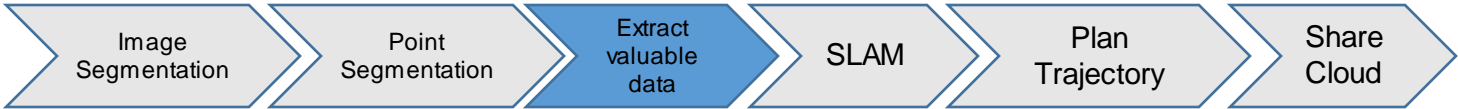


2. Point Segmentation



	Point Cloud example 1	Point Cloud example 2
Image		
Demo Video	 Point Cloud 1.mp4	 Point Cloud 2.mp4

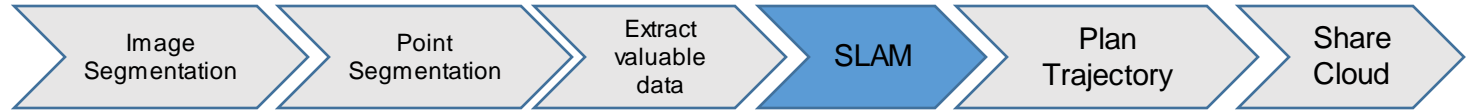
3. Extract Valuable data



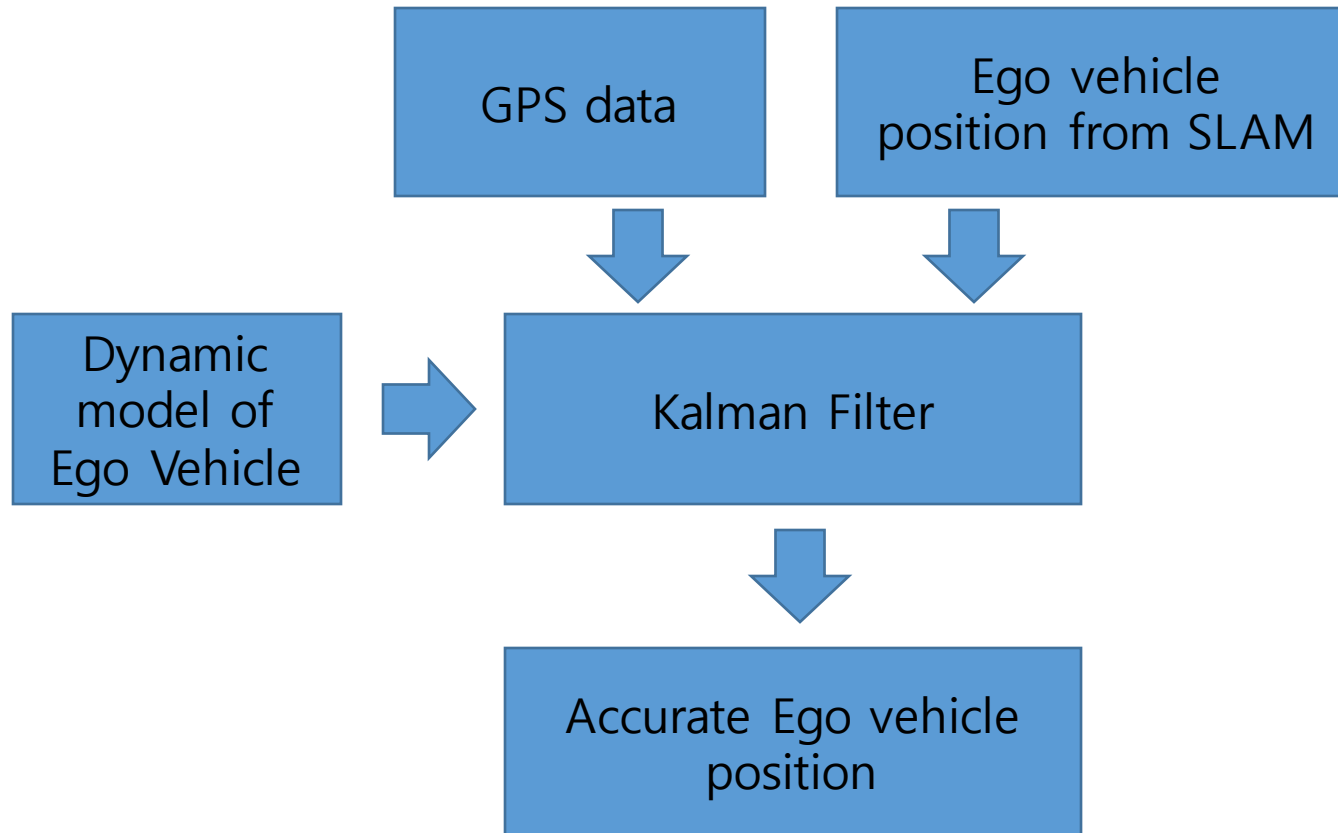
Using pointnet, measure key values

	Distance to Wall	Distance to Lanes	...	Economic Performance: 78 Safety Performance: 85
avg	5.2m	0.6m		
min	1.2m	0.2m		

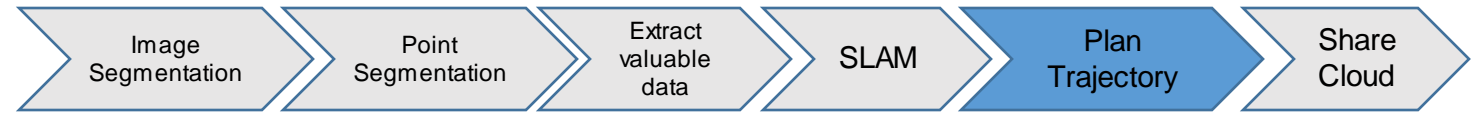
4. SLAM



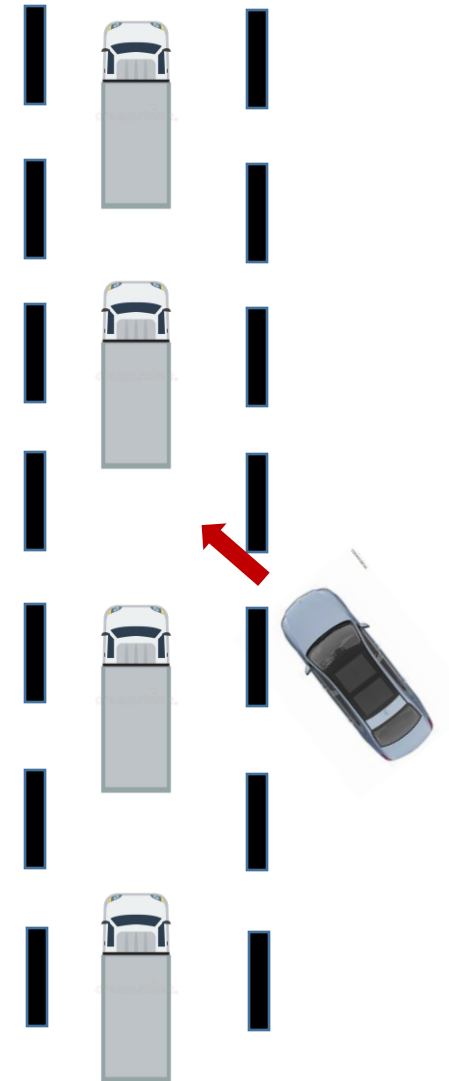
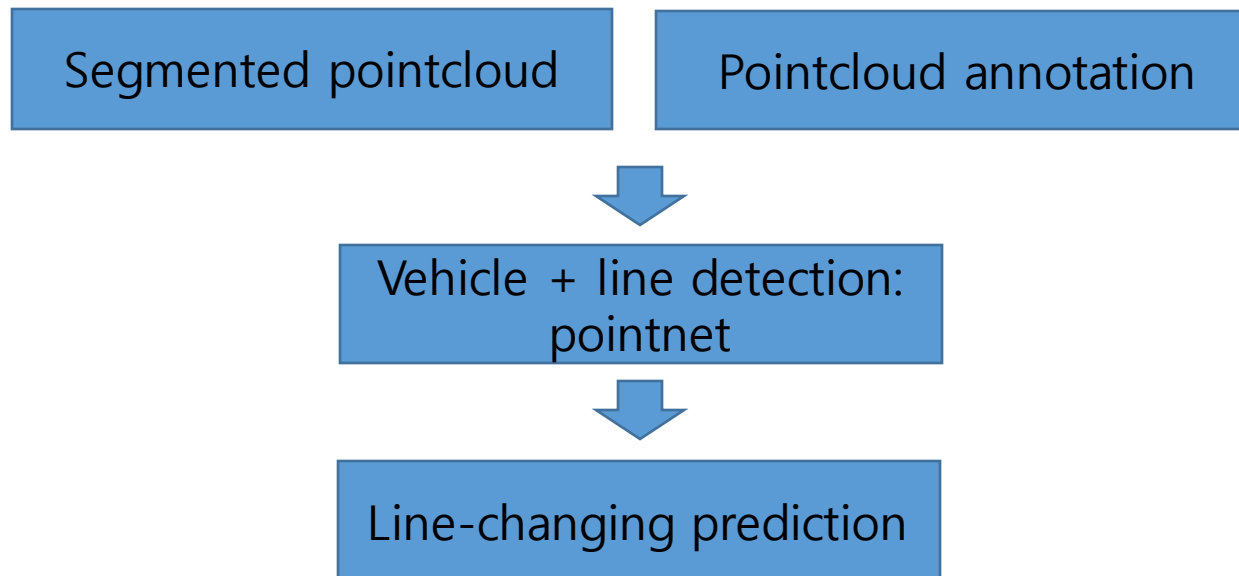
The accuracy of vehicle's GPS is 4.9 m.
However, distance between lane is 3m.
Therefore, the position of ego-vehicle should be enhanced by SLAM.



5. Plan trajectory



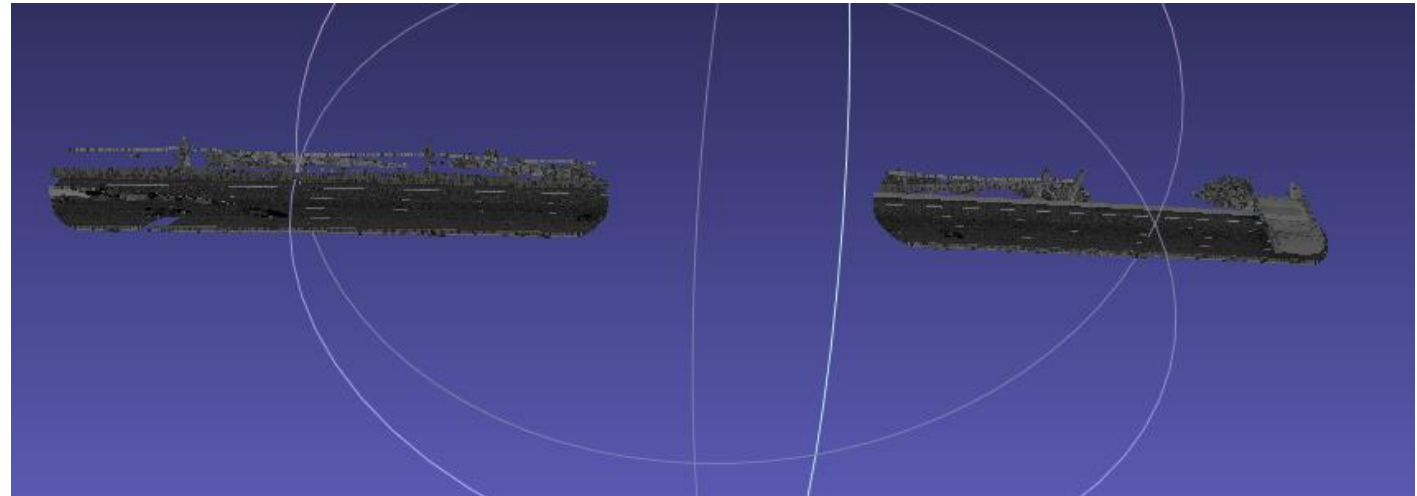
Following cars should fix the trajectory based on the real time data. For example, when a car is intervening into between the trailing cars. Here, Segmented point cloud data is very helpful to fix the trajectory.



6. Share pointcloud Info



In case, multiple group of vehicles are driving on the same road, segmented pointcloud of a vehicle ahead can be used to plan the following vehicle better.





THANK
you