Week 6 Report

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1 Week 6 Goals

This week, we wanted to continue with experimenting on PointPWC[1]. For this reason, we aimed for implementing a pipeline for coloring SemanticKITTI[2] scans, leveraging the RGB camera on the ego vehicle.

2 Point Cloud Coloring for Improving PointPWC Inference

Previously, RGB values of point clouds were randomized for PointPWC inference, since SemanticKITTI does not provide this information. We implemented a point cloud coloring pipeline for SemanticKITTI to see whether we can have better PointPWC inferences.

2.1 Pipeline

Given the velodyne to camera coordinates transformation matrix, and the camera matrix, we process the point cloud for it to be in homogeneous coordinates, then apply the transformation. This way, we project the velodyne scan to left RGB camera of the ego vehicle. Following the projection, point clouds outside the camera view are filtered out. This way, we end up with the points shown in Figure 22 and Figure 33. Finally, RGB values from pixels corrresponding to the points and their indices in the velodyne scan are output.

We also planned on implementing a ball query to color points outside of the camera view, based on the colors of the points within the ball. Since, usually less than quarter of points are assigned RGB, this would not allow us to significantly increase the number of colored points so we did not implement it this time.

2.2 Results

We run inference again with assigning RGB values to points in the camera view. Unfortunately, it did not seem to improve. One reason for that is many objects in the scan such as signs are behind the camera, thus do not have assigned RGB values. However, it seems there is not much improvement for the objects in

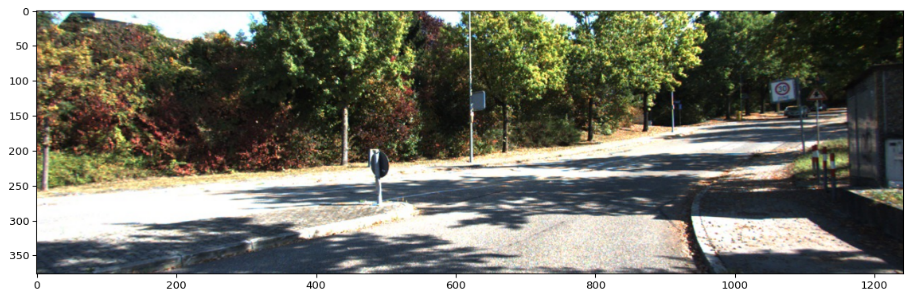

Figure 1: point Cloud projected to Left RGB Camera.

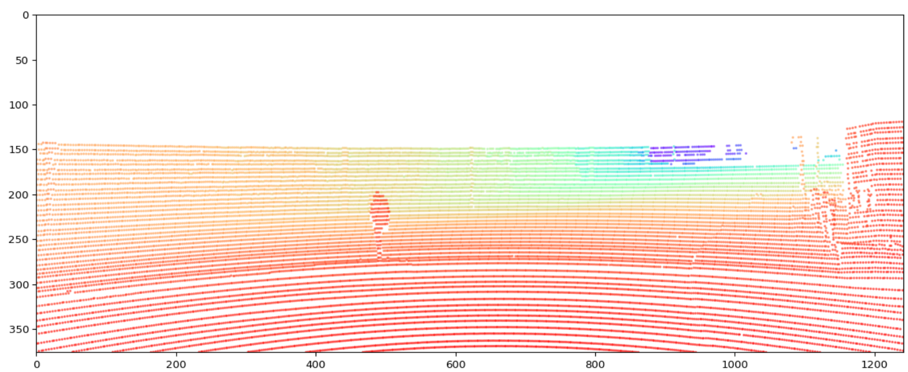

Figure 2: Point Cloud projected to Left RGB Camera.

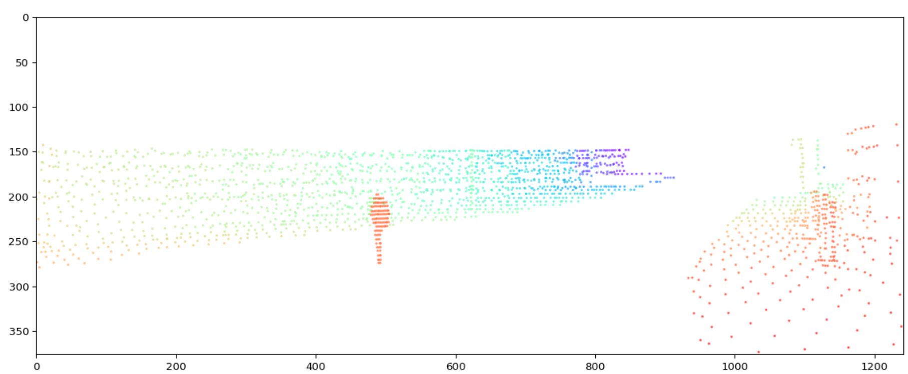

Figure 3: Downsampled Voxels projected to Left RGB Camera.

front of the camera either. Therefore, a retraining process on SemanticKITTI seems to be a must.

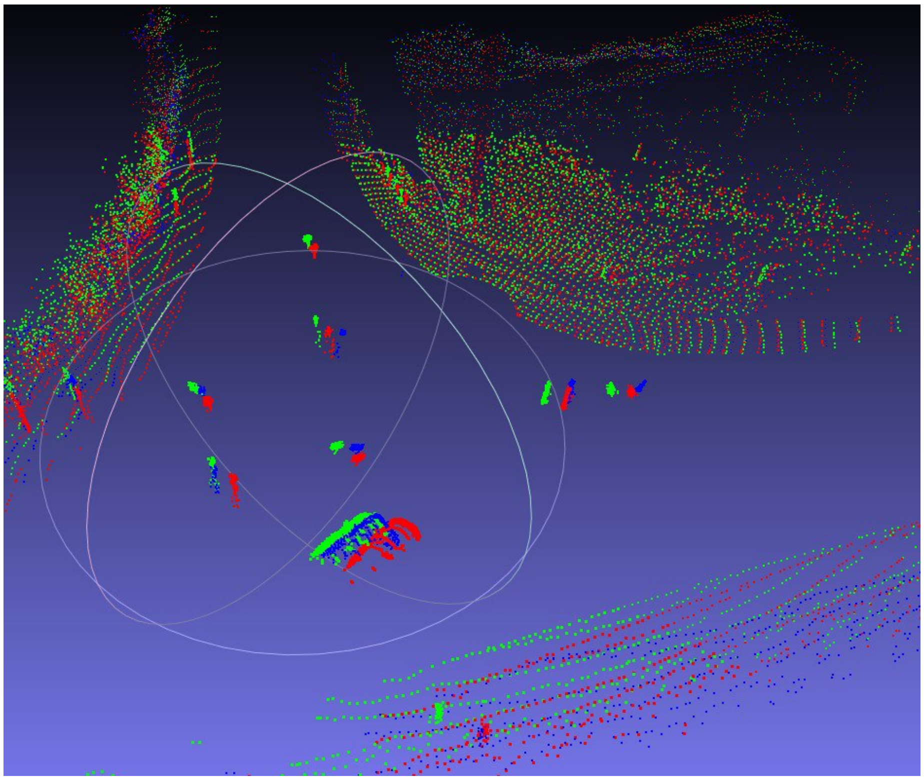

Figure 4: PointPWC inference on colored point cloud.

2.2.1 Outlook

From this results we have high hopes that performance can be further boosted with training the network on data of a preprocessed semanticKitti dataset and train the color values based on the intensity. Or in general that self-supervised sceneflow can achieve great results on the SemanticKitti dataset.

References

[1] W. Wu, Z. Wang, Z. Li, W. Liu, and L. Fuxin, "Pointpwc-net: A coarse-to-fine network for supervised and self-supervised scene flow estimation on 3d point clouds," *arXiv preprint arXiv:1911.12408*, 2019.

[2] J. Behley, M. Garbade, A. Milioto, J. Quenzel, S. Behnke, J. Gall, and C. Stachniss, "Towards 3D LiDAR-based semantic scene understanding of

3D point cloud sequences: The SemanticKITTI Dataset," *The International Journal on Robotics Research*, vol. 40, no. 8-9, pp. 959–967, 2021.