LSTNet: Local Shape Transformer network for Road Marking Extraction

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SUMMARY

Road markings are vital for HD maps and autonomous driving, yet only LiDAR-based extraction is challenging due to missing RGB, severe class imbalance, and thin geometry under sparse/noisy returns. In this work, we propose LSTNet, which performs local-shape tokenization by grouping points on tangent planes and encoding tokens from relative coordinates, normals, curvature, and intensity contrast. A geometry-aware transformer aggregates these tokens across scales with attention biased by relative position and normal similarity, capturing long thin structures while preserving edges. To promote research in LiDAR-only road marking understanding, we have built Toronto-Whu-Road3D, a curated benchmark of urban mobile LiDAR scenes with expert annotations for road markings. This dataset covers diverse roadway layouts and sensing conditions, and also provides standardized train/validation/test splits for both binary (marking vs. background) and fine-grained settings. Extensive experiments showed that the proposed LSTNet delivered consistently higher mIoU (74.53%) and overall accuracy (96.68%) than advanced point cloud baselines (i.e., RandLA-Net and LACVNet), with particularly large gains on thin and low-intensity regions.

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