Theme: Machine Learning (algorithm)

Topic: Deep learning-based High-precision LiDAR Localization for Autonomous Driving

Background

High-precision Localization, as one of the core technologies of autonomous driving, provides accurate and reliable self-driving positions for autonomous vehicles, which is the basis of autonomous driving. A typical solution is to use a lidar to scan the surrounding environment to obtain structured 3D geometric feature information, and match with the pre-built map to obtain centimeter-level positioning accuracy. In order to obtain stable 3D geometric features, a large amount of parameter tuning and adaptation work is usually required when processing various application scenarios. Although it can achieve excellent performance in most cases, this rule-based approach lacks the general capabilities of business batch replication. For large-scale challenging and unknown application scenarios, a new general framework for LiDAR localization is needed. Recently, there has been research on high-precision localization based on point cloud deep learning. Although in the experimental stage, this large-scale data-driven approach provides the possibility to solve the generalization problem. Moreover, in the process of autonomous driving, a large amount of data will be generated for deep learning training, which can greatly reduce the cost of data collection.

Target

- The deep neural network is used to extract the multi-dimensional features of the laser point cloud for localization, including geometry, semantic, embedding and other information.
- Point cloud registration is achieved through end-to-end deep neural network to improve matching accuracy.
- Combining the point cloud deep neural network model to compress the map, thereby reducing the on-board storage required by the map and reducing processing latency.

Related Research Topics

- Fast Classification and Segmentation of Point cloud.
- End-to-End Deep Neural Network for Point Cloud Registration.
- Robust LiDAR-based place descriptor.
- Data-Driven Descriptors.
- Point cloud Compression.
- Learning to Localize Using a LiDAR intensity/elevation Map.
- Learning to Localize through Compressed Map.
- Long-term LiDAR Localization.

Suggested Collaboration Method

AIR (Alibaba Innovative Research), one-year collaboration project.