3D Point-Based High-Definition Road Maps for Autonomous Driving

Jonathan Li, Lingfei Ma (Canada), Yiping Chen and Cheng Wang (China, PR)

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SUMMARY

The research and development for autonomous vehicles have attracted more than half of today's venture capital investment worldwide. Multiple sensors installed on vehicles are playing a critical role for vehicle navigation. However, on-board sensors have limitations such as short detection ranges, especially in an urban canyon and GPS-denied indoor environment. As such, 3D high-definition road maps are urgently required for autonomous driving. Mobile laser scanners (MLS) installed on a SUV or a mini Van have been proved the feasible technology for rapid collection of citywide road network data to create 3D road maps. However, unstructured MLS point clouds with its large volume, varied density, and lack of surface texture, make the automation in point-based road mapping extremely challenging. This paper presents the machine leaning and deep learning based approaches to automated detection and extraction of road edge line, lane lines and driving lines from 3D point clouds. The results obtained demonstrate that the developed approaches are very promising. The progress in intelligent processing of point clouds also show mobile laser scanners' advantages over its counterpart digital cameras. The paper also presents preliminary results obtained by a SLAM-based laser scanning backpack and a low-cost mobile system for support automatic parking in the GPS-denied indoor environment.