Automatic interpretation of pole-like street furniture

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Abstract:

Automatic semantic interpretation of street furniture has received much attention in recent years. Mobile laser scanning systems have been well developed to capture images and point clouds of street scene. Current studies detect street furniture as connected components of points above the ground level. Street furniture classification based on properties of such components suffers from large intra class variability of shapes and cannot deal with mixed classes like traffic signs attached to light poles. Therefore, more work is needed in mixed classes street furniture interpretation. In this presentation, we focus on interpreting point clouds of pole-like street furniture based on its logical relations. In other words, pole-like street furniture components are decomposed into different parts based on their logical relations. A novel street furniture decomposition method is proposed, which consists of four steps: (i) pre-processing to get the pole type, (ii) pole extraction, (iii) components separation, (iv) rules for splitting and merging components. The assumption is that we already get the above ground connected components. Firstly, the pre-processing is done by computing the bias of diameters of cut slices and the length in the dominant horizontal direction to get the pole type and choose the corresponding pole extraction method. For the pole extraction, a novel global pole extraction approach is proposed to handle 3 different cases of street furniture which corresponds to 3 different methods, 2D point density, RANSAC line fitting and slice cutting based method. We separate these components which are attached to poles by using connected component analysis afterwards. At the end, rules are defined to merge and split components by using contextual information generated from separated components. In the evaluation of results, 25 different instances of street furniture from Enschede and Paris mobile laser scanning dataset are involved (Figure 1). Compared with the previous result, our method can improve the completeness of decomposition from 79.0% to 93.4% and correctness of decomposition from 89.5% to 96.6%. The decomposition result is as shown in Figure 2. In conclusion, we demonstrate that our method decomposes mixed classes street furniture into poles and other different components with respect to their logical relations.

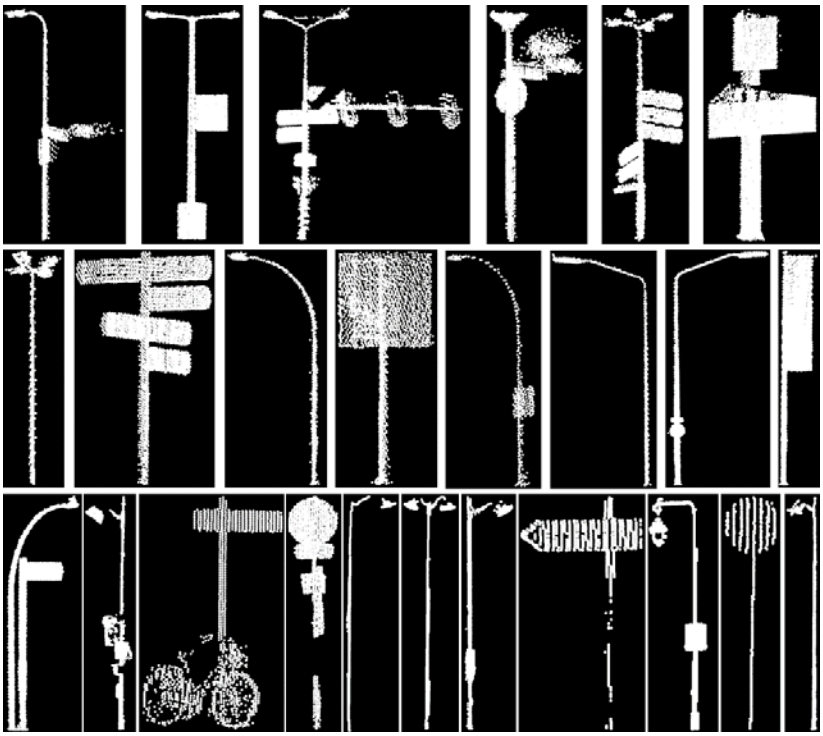

Figure 1 pole-like street furniture (25 instances)

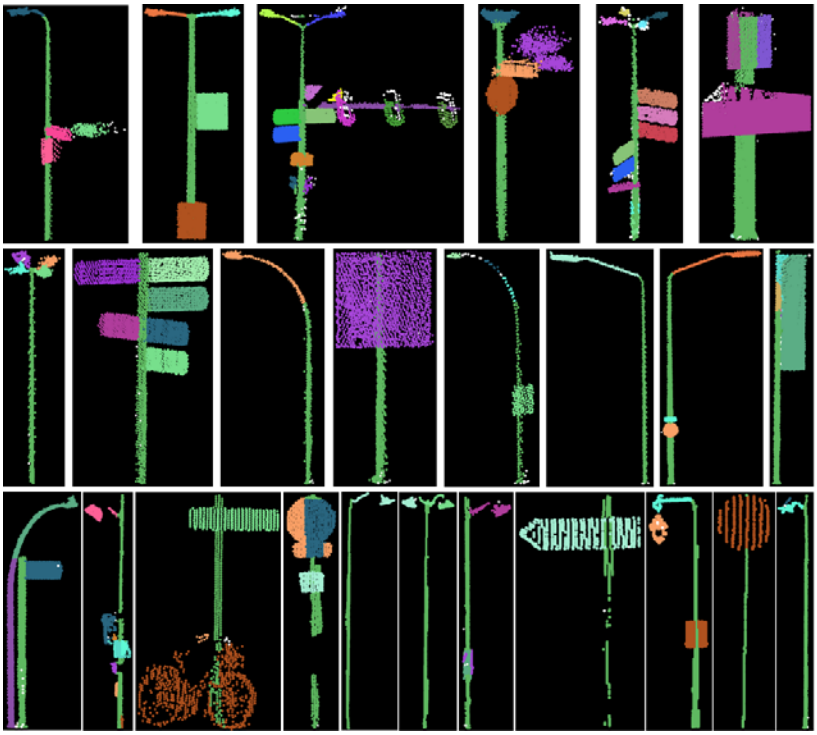

Figure 2 The interpretation of pole-like street furniture