A Monocular Measurement for 3D Objects Based on Distance Area Number and New Minimize Projection Error Optimization Algorithms

Authors : Feixiang Zhao, Shuangcheng Jia, Qian Li

Abstract : High-precision measurement of the target's position and size is one of the hotspots in the field of vision inspection. This paper proposes a three-dimensional object positioning and measurement method using a monocular camera and GPS, namely the Distance Area Number-New Minimize Projection Error (DAN-NMPE). Our algorithm contains two parts: DAN and NMPE; specifically, DAN is a picture sequence algorithm, NMPE is a relatively positive optimization algorithm, which greatly improves the measurement accuracy of the target's position and size. Comprehensive experiments validate the effectiveness of our proposed method on a self-made traffic sign dataset. The results show that with the laser point cloud as the ground truth, the size and position errors of the traffic sign measured by this method are ± 5% and 0.48 ± 0.3m, respectively. In addition, we also compared it with the current mainstream method, which uses a monocular camera to locate and measure traffic signs. DAN-NMPE attains significant improvements compared to existing state-of-the-art methods, which improves the measurement accuracy of size and position by 50% and 15.8%, respectively.

Keywords : monocular camera, GPS, positioning, measurement
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