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Indoor Real-Time Positioning and Mapping Based on Manhattan Hypothesis Optimization

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Abstract : This paper investigated a method of indoor real-time positioning and mapping based on the Manhattan world assumption. In indoor environments, relying solely on feature matching techniques or other geometric algorithms for sensor pose estimation inevitably resulted in cumulative errors, posing a significant challenge to indoor positioning. To address this issue, we adopt the Manhattan world hypothesis to optimize the camera pose algorithm based on feature matching, which improves the accuracy of camera pose estimation. A special processing method was applied to image data frames that conformed to the Manhattan world assumption. When similar data frames appeared subsequently, this could be used to eliminate drift in sensor pose estimation, thereby reducing cumulative errors in estimation and optimizing mapping and positioning. Through experimental verification, it is found that our method achieves high-precision real-time positioning in indoor environments and successfully generates maps of indoor environments. This provides effective technical support for applications such as indoor navigation and robot control.

Keywords : Manhattan world hypothesis, real-time positioning and mapping, feature matching, loopback detection
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