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Accuracy Evaluation of a Correction Table for Calibration of an RGB-D Sensor

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In recent years, RGB-D sensors, such as Kinect and Xtion have been actively used by mobile robots for three-dimensional environment map construction. RGB-D sensors are advantageous because they are inexpensive and easy to use. However, these sensors cannot perform high-precision measurements. Consequently, the depth information obtained by the sensors contains individual differences and distortions. In this work, we investigate various calibration techniques for RGB-D sensors, with the aim of using indoor mobile robots to autonomously construct high-precision three-dimensional environment maps. The results indicate that the RGB-D sensor depth measurement errors vary between each sensor and image pixel. It is possible to correct the depth measurements by using two types of linear functions for long and short distances. However, two drawbacks of previous studies remain unresolved, which leads to measurement errors. The correction results for long-distance depth data had low accuracy and the boundaries of the correction formulae for short and long distances were discontinuous. In this paper, the correction method for RGB-D sensors is improved. Additionally, a comparative analysis of the accuracy of environmental maps before and after corrections is performed.

Keywords : Image processing, RGB-D sensor, Calibration, Autonomous mobile robot