

Robot Simultaneous Localization and Mapping Using a Calibrated Kinect Sensor

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In this paper, we present an algorithm for robot simultaneous localization and mapping (SLAM) using a Kinect sensor, which is a red-green-blue and depth (RGB-D) sensor. The distortions of the RGB and depth images are calibrated before the sensor is used as a measuring device for robot navigation. The calibration procedure includes the correction of the RGB image as well as alignment of the RGB lens with the depth lens. In SLAM tasks, the speeded-up robust features (SURFs) are detected from the RGB image and used as landmarks for building the environmental map. The depth image further provides the stereo information to initialize the three-dimensional coordinates of each landmark. Meanwhile, the robot estimates its own state and landmark locations using the extended Kalman filter (EKF). Two SLAM experiments were carried out in this study and the results showed that the Kinect sensors could provide reliable measurement information for mobile robots navigating in unknown environments.

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