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Mapping and Correction Method in Static Environments for Autonomous Mobile Robot

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In recent years, robotic applications have increased in many fields and robots are being actively developed for use in human environments. Robots need maps comprising geometric features such as obstacles. However, it is difficult to construct maps of human environments. Therefore, robots in such environments require autonomous mapping techniques. In this study, we aim to develop simultaneous localization and mapping (SLAM) to construct a detailed map based on sensor data acquired at constant intervals. We consider two types of environments: an office that contains many geometric features and a corridor that has few geometrical features. We describe the process for three online SLAM methods showing the maps developed using the acquired data and evaluations of the accuracy for each. As a result, we construct a map using SLAM with ICP scan matching. However, when a map is constructed for a large environment, the map is distorted by accumulated errors such as sensor and modeling errors. We examine a correction method for maps of large environments and evaluate it experimentally. We also evaluate the applicability experimentally. The results showed that the proposed method could correct both the office and corridor maps without distortion to produce a high-accuracy map.

Key Words : Simultaneous localization and mapping, Laser range finder, Iterative closest point algorithm, Autonomous mobile robot