Abstract

Multiple sensors registration technology is widely used in applications such as autonomous driving, robotics, and remote sensing. Research has shown that there is still room for improvement in the accuracy of the point cloud obtained from rigid registration. Currently, research can be divided into two aspects. On the one hand, data fusion is used to improve the accuracy of partial point cloud, but this method can only be used to repair overlapping areas of the point cloud. On the other hand, high-precision feature calculation in multiple dimensions is used to improve registration accuracy or compensate for registration, but the overall accuracy of this method is generally not high. In order to address the problem of high-precision registration in multiple sensors, this paper proposes the concept of flexible registration, which deforms the point cloud by adjusting the sub-sensor model to achieve the highest accuracy of the combined point cloud after registration. This is a new approach for multi-sensor registration. In order to verify the effectiveness of this method, we use multi-line laser vision sensor group as an experimental carrier. In order to avoid interference from other factors, various error sources of the sub-sensors are corrected in this paper. On this basis, the measurement accuracy after rigid registration and flexible registration is compared respectively. The experiment shows that flexible registration makes the surface shape error of the sensor group more continuous and improves the measurement accuracy. Taking cylinder diameter measurement as an example, the system's measurement accuracy has improved by 80% through flexible registration compared to rigid registration, demonstrating the effectiveness of flexible registration.

Keywords: Flexible registration, Multiple sensor group, Point cloud, Rigid registration