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# Efficient Rotation Estimation for 3D Registration and Global Localization in Structured Point Clouds

Yanxin Ma<sup>a</sup>, Yulan Guo<sup>a,c</sup>, Yinjie Lei<sup>b</sup>, Min Lu<sup>a</sup>, Jun Zhang<sup>a</sup>

<sup>a</sup>*College of Electronic Science and Engineering, National University of Defense Technology*

<sup>b</sup>*College of Electronic and Information Engineering, Sichuan University*

<sup>c</sup>*Institute of Computing Technology, Chinese Academy of Sciences*

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## Abstract

Fully automatic 3D point cloud registration for structured scenes is a highly challenging task. In this paper, an efficient rotation estimation algorithm is proposed for point clouds of structured scenes. This algorithm fully employs the geometric information of structured environment. For rotation estimation, a direction angle is defined for a point cloud and then the rotation matrix is obtained by comparing the difference between the distributions of angles. The proposed rotation estimation algorithm is used for both 3D registration and global localization. To conduct a full 3D registration, the translation parameters are estimated by aligning the centers of the corresponding points while the rotation parameters are estimated by the proposed algorithm. For global localization, a translation estimation algorithm is proposed using projection information. The point clouds are projected onto the orthogonal plane and template matching is performed on the projection im-

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\*Corresponding author.

*Email addresses:* mayanxin@nudt.edu.cn (Yanxin Ma), yulan.guo@nudt.edu.cn (Yulan Guo), yinjie@scu.edu.cn (Yinjie Lei), lumin@nudt.edu.cn (Min Lu), zj67068@sina.com (Jun Zhang)

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