

Registration Based On Lie Group Representation For Low Overlap Datasets

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Abstract: In this paper, we propose a registration method for two datasets with small overlap regions. We term our algorithm as Lie-Tr-ICP, which is an acronym for Lie Trimmed Iterative Closest Point algorithm, inspired by the trimmed ICP method and Lie group representation. Given two datasets, i.e. the source and target datasets, Lie-Tr-ICP first finds the tie points in corresponding datasets, then maps the source to the target dataset via affine transform by minimizing an energy functional. The novelties of this algorithm lie in that 1) we provide a solution for registration of two datasets with small overlap, by using trimming technique; and 2) we put the affine registration into the Lie group framework, as linear transforms and translations form Lie transformation groups respectively. The algorithm is implemented by following two steps. First, we use an iterative method to determine the overlap ratio and corresponding overlapping points; Then, we use Lie group representation to calculate the registration parameters of linear transform matrix and translation constant by solving a quadratic programming. The experimental results demonstrate that, compared with some state-of-the-art algorithm, our algorithm is more accurate and robust.

Keyword: registration, iterative closest point, trimmed iterative closest point, Lie group