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论文

基于平面激光测量的移动机器人自定位方法

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摘要
提出了两种基于平面激光测量的移动机器人自定位方法. 第一种方法是改进的Hough 密度谱的方法, 它的主要优点是避免了现有方法Hough 变换离散化过程中的信息损失问题，提高了算法的精度和鲁棒性. 该方法在引进一种新的Hough 密度谱的基础上，根据谱相关函数值和运动参数的密度得到机器人运动参数的候选值，并应用Hausdor® 相似性度量从候选值确定运动参数的最终估计. 第二种方法是基于Fourier-Mellin 变换的方法，主要利用Fourier 变换的位移理论和Fourier-Mellin不变量来估计运动参数. 为了避免图像离散化造成的信息损失，在该方法中使用基于Hausdor® 距离的最近点迭代(ICP) 算法来进一步精化平移向量. 实验结果表明，这两种方法均可有效地提高机器人的定位精度，具有一定的实际应用价值.

关键词 机器人自定位 Hough 密度谱 Fourier-Mellin 变换 Hausdorff 距离
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Robot Self-Localization Based on Planar Laser Measurement

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Abstract
This paper presents two novel robot self-localization methods based on planar laser measurement. The first one is an improved Hough density spectrum based method, into which a novel Hough density spectrum is introduced, and by which the location accuracy and robustness can be both enhanced. The key advantageous aspect of our new spectrum is that its implementation does not involve any discretization error in the Hough space, which is the major source of location inaccuracy in the conventional method. The second one is an Fourier-Mellin transform based method. This method first converts the two measurement point sets into two binary images, then uses the Fourier-Mellin based image matching technique, a popular technique in image matching field, to determine the rotation parameter and finally invokes a standard ICP technique with the Hausdorff distance as its cost to estimate the two translation parameters. Experimental results show that both methods can perform robustly and accurately.

Key words Robot self-localization Hough density spectrum Fourier-Mellin transform Hausdorff distance

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