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软件、算法与仿真

基于改进的二维交叉熵及Tent映射PSO的阈值分割

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摘要：

最近提出的二维交叉熵阈值分割方法所依据的灰度级-平均灰度级直方图存在错分，且寻求最优阈值时，即使采用递推算法仍需遍历整个搜索空间，运行速度有待进一步提高。为此，本文给出改进的灰度级-梯度二维直方图，据此导出了相应的二维最小交叉熵阈值选取公式及其递推算法，并且采用改进Tent映射混沌粒子群优化(particle swarm optimization, PSO)算法搜寻二维最优阈值。大量实验及与现有二维交叉熵方法的对比表明，所提出的方法在计算最优阈值时尽可能考虑了所有目标点和背景点，从而使分割结果更加精确；而求取阈值因只需遍历其中小部分解空间，使运行时间约减少到原来的10%~40%。

关键词： 图像分割；阈值选取；交叉熵；Tent映射；混沌粒子群优化算法；二维直方图

Thresholding based on improved two-dimensional cross entropy and Tent-map PSO

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Abstract:

Two-dimensional cross entropy thresholding method proposed recently is based on a gray level average gray level histogram which is wrongly divided. Although the recursive algorithm is adopted, the whole search space still has to be traversed for the optimal threshold, and the running speed needs to be further improved. Thus, an improved two-dimensional gray level-gradient histogram is given. The corresponding formulas of threshold selection based on two-dimensional minimum cross entropy and its recursive -algorithm are derived. And the chaotic particle swarm optimization (PSO) algorithm based on the improved Tent map is used to search for the two-dimensional optimal threshold, so as to reduce the running time. A large number of experimental results and a comparison with the existing two-dimensional cross entropy method based on gray level-average gray level histogram show that the proposed method takes almost all the object points and background points into account while computing the optimal threshold. As a result, it makes the segmentation results more accurate. Meanwhile, only a small part of the solution space needs to be searched to find the optimal threshold, and the required running time reduces to about 10%~40% of the original level.

Keywords: image segmentation threshold selection cross entropy Tent map chaotic particle swarm-optimization (PSO) algorithm two-dimensional histogram

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