基于改进遗传算法的棉花异性纤维目标特征选择　Feature Selection for Cotton Foreign Fiber Objects Based on Improved Genetic Algorithm

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关键词：　棉花 异性纤维 特征选择 改进遗传算法

摘　要：　为提高基于机器视觉的棉花异性纤维在线分类的精度和速度，提出了一种基于改进遗传算法的特征选择方法。采用分段式染色体管理方案实现对多质特征空间局部化管理；利用分段交叉和变异算子避免出现无效染色体，提高搜索效率；通过自适应调整交叉和变异概率实现强搜索能力和快收敛速度的动态平衡。实验结果表明，该方法比基本遗传算法搜索能力更强、收敛速度更快，所得最优特征子集较小，更适用于棉花异性纤维在线分类。　An optimal feature subset selection method based on improved genetic algorithm (IGA) was presented. A novel scheme named segmented chromosome management was adopted in IGA. This scheme encodes the chromosome in binary as a whole while separates it logically into three segments for local management. These three segments are segment C for color feature, segment S for shape feature and segment T for texture feature separately. A segmented crossover operator and a segmented mutation operator are designed to operate on these segments to generate new chromosomes. These two operators avoid invalid chromosomes, thus improve the search efficiency extremely. The probabilities of crossover and mutation are adjusted automatically according to the generation number and the fitness value. By this way, the IGA could obtain strong search ability at the beginning of the evolution and achieve accelerated convergence along evolution. The experiment results indicate that IGA has stronger search ability and faster convergence speed than the simple genetic algorithm (SGA). The optimal feature subset that the IGA obtained has much smaller size than that of the SGA did, so it is more suitable for the online classification of foreign fibers.

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