



## 论文摘要

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ZHONGNAN DAXUE XUEBAO(ZIRAN KEXUE BAN)

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## 人工免疫网络算法的改进及免疫优化应用

郭鹏飞<sup>1, 2</sup>, 王 嘉<sup>3</sup>, 赵云丰<sup>1</sup>

- (1. 北京科技大学 信息工程学院, 北京 100083;
2. 辽宁工程技术大学 软件学院, 辽宁 葫芦岛, 125000;
3. 煤炭科学研究总院 经济与信息研究所, 北京 100013)

**摘 要:** 基于人工免疫网络算法(aiNet)模型, 借鉴禁忌搜索算法(TS)的思想, 提出一种禁忌搜索与人工免疫的混合算法, 即人工免疫网络算法(TS-aiNet)。在算法中引入禁忌表, 禁忌那些在网络迭代中亲和度连续不再增加的细胞, 并通过特赦准则赦免一些被禁忌的优良状态; 增加1个记忆表, 用于保存成熟的记忆细胞; 重新定义高斯变异方式, 以保证多样化的有效搜索。利用Markov链证明算法全局收敛性, 通过对多个典型系统测试函数的仿真实验定量分析该算法的性能, 并与经典克隆选择算法和opt-aiNet算法进行比较研究, 分析特征参数对算法性能的影响。实验结果表明, 该算法在多模态搜索空间中具有更强的全局收敛性、稳定性和寻找极值点能力, 能够克服早熟现象, 是一种有效的全局优化搜索方法。

**关键字:** 人工免疫; 优化; 免疫网络算法; 禁忌搜索算法

## Improved artificial immune network algorithm and its application of immune optimization

GUO Peng-fei<sup>1, 2</sup>, WANG Jia<sup>3</sup>, ZHAO Yun-feng<sup>1</sup>

- (1. School of Information Engineering, University of Science and Technology Beijing, Beijing 100083, China;
2. Software College, Liaoning Technical University, Huludao 125000, China;
3. Institute of Economy and Information, China Coal Research Institute, Beijing 100013, China)

**Abstract:** A hybrid approach, tabu search artificial immune algorithm (TS-aiNet) was proposed based on aiNet model inspired by mechanism of tabu search algorithm. A tabu list was introduced to taboo such cell whose affinities didn't continuously increase any more in the network. In some phrases the tabooed excellent cells were released according to aspiration criteria. To save mature memory cells, a memory table was added to cells network. In addition, the expression of Gauss mutation was redefined for diversity search in the process of global optimization. Markov chain was applied to prove global convergence. Performance analysis of optimization was carried out based on random simulation of some typical systems, which was compared with that of KLONG and opt-aiNet algorithms. Finally, the influence of feature parameters on TS-aiNet algorithm was analyzed. The simulation results show that the presented approach has preferable global convergent ability and stability in multi-modal search space, and can avoid prematurity effectively. So it is demonstrated as a global optimized algorithm with feasibility and high efficiency.

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地 址：湖南省长沙市中南大学 邮编： 410083

电 话： 0731-88879765 传真： 0731-88877727

电子邮箱： zngdx@mail.csu.edu.cn 湘ICP备09001153号