

## 基于灰色关联聚类的特征提取算法

鲁峰, 黄金泉

南京航空航天大学 能源与动力学院, 南京 210016

### Feature extraction algorithm of clustering based on grey relational theory

LU Feng, HUANG Jin-quan

College of Energy and Power Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China

- 摘要
- 参考文献
- 相关文章

全文: PDF (KB) HTML (KB) 输出: BibTeX | EndNote (RIS) 背景资料

**摘要** 针对航空发动机气路部件故障样本特点,提出了一种基于灰色关联聚类的特征提取算法.论述了邓氏、相对变率和斜率三种灰色关联度分析方法,并以利用灰色关联度作为动态聚类欧氏距离的思想,构建灰色关联聚类特征提取模型.以某型涡扇发动机常见气路部件故障为例,利用ESVR算法验证特征提取能满足故障诊断要求.仿真结果表明:该方法可以提取特征传感器,使核与约简更精确.

**关键词:** 航空发动机 气路部件故障 特征提取 灰色关联度 聚类

**Abstract:** Considering the common fault samples of aero-engine, a feature extraction algorithm of clustering based on grey relational theory was proposed. The three kinds of grey correlation analysis methods, containing Deng, relative change rate, and slope correlation degree were discussed. The idea of taking advantage of Grey correlation degree as Euclidean distance of dynamic clustering was given, and the feature extraction model was built. According to the simulation experiment of aero-engine gas components fault, the precision of fault diagnosis meet the requirements. The results showed that this method could be used to extract feature sensors, and made the ultimate core and reduction more accurate.

**Key words:** aero-engine gas component fault feature extraction grey relational analysis clustering method


**收稿日期:** 2010-04-02;

**基金资助:**南京航空航天大学基本科研业务费项目(V1042-021)

#### 引用本文:

鲁峰,黄金泉. 基于灰色关联聚类的特征提取算法[J]. 系统工程理论实践, 2012, 32(4): 872-876.

LU Feng, HUANG Jin-quan. Feature extraction algorithm of clustering based on grey relational theory[J]. Systems Engineering - Theory & Practice, 2012, 32(4): 872-876.

[1] 戴金星,胡见义,贾承造,等.科学安全勘探开发高硫化氢天然气田的建议[J].石油勘探与开发,2004,31(2): 1-4. Dai J X, Hu J Y, Jia C Z, et al. Suggestions for scientifically and safely exploring and developing high H<sub>2</sub>S gas fields[J]. Petroleum Exploration and Development, 2004, 31(2): 1-4. 

[2] 贾承造,赵政璋,杜金虎,等.中国石油重点勘探领域-地质认识、核心技术、勘探成效及勘探方向[J].石油勘探与开发,2008,35(4): 385-396. Jia C Z, Zhao Z Z, Du J H, et al. Petro China key exploration domains: Geological cognition, core technology, exploration effect and exploration direction[J]. Petroleum Exploration and Development, 2008, 35(4): 385-396.




[3] 刘铁民.低概率重大事故风险与定量风险评价[J].安全与环境学报,2004,4(2): 89-91. Liu T M. Quantified risk assessment for low probability major

#### 服务

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ E-mail Alert
- ▶ RSS

#### 作者相关文章

- ▶ 鲁峰
- ▶ 黄金泉

- [4] 高永海,孙宝江,曹式敬,等.用事故树法对深水井控进行风险评估[J].石油钻采工艺,2008,30(2): 23-27.Gao Y H,Sun B J,Cao S J,et al.Risk assessment on well control in deep water drilling based on fault tree analysis[J].Oil Drilling & Production Technology,2008,30(2): 23-27. 
- [5] 吴庆善,钱新明,郭再富.含硫气井井喷事故受体致死概率分析[J].石油勘探与开发,2009,36(5): 641-645.Wu Q S,Qian X M,Guo Z F.Probability of receptor lethality in blowout of sour gas wells[J].Petroleum Exploration and Development,2009,36(5): 641-645.
- [6] Francisco A,Luciano D.A weighted partitioning dynamic clustering algorithm for quantitative feature data based on adaptive euclidean distances[C]// 8th International Conference on Hybrid Intelligent Systems,2008,44: 398-403.
- [7] Mohit K,Regina S,Norbert S.A min-max approach to fuzzy clustering,estimation and identification[J].IEEE Transactions on Fuzzy Systems,2006,14(2): 248-262. 
- [8] 朱大明,朱之丽.结合统计的模型辨识在发动机故障诊断中应用[J].航空动力学报,2009,24(5): 1061-1065.Zhu D M,Zhu Z L.Application of pattern recognition with statistics for engine fault diagnosis[J].Journal of Aerospace Power,2009,24(5): 1061-1065.
- [9] 郭阳明,姜红梅,翟正军.基于灰色理论的自适应多参数预测模型[J].航空学报,2009,30(5):925-931.Guo Y M,Jiang H M,Zhai Z J.Adaptive multi-parameter prediction model based on grey theory[J].Acta Aeronautica et Astronautica,2009,30(5): 925-931.
- [10] Yang X L,Rogers W,Mannan M.Uncertainty reduction for improved mishap probability prediction: Application to level control of distillation unit[J].Journal of Loss Prevention in the Process Industries,2010,23(1): 149-156. 
- [11] 蒋希文.钻井事故与复杂问题[M].北京:石油工业出版社,2002.Jiang X W.Drilling Accidents and Complex Issues[M].Beijing: Petroleum Industry Press,2002.
- [12] 孙红梅,高齐圣,朴营国.关于事故树分析中几种典型重要度的研究[J].可靠性与环境适应性理论研究,2007,25(2): 39-42.Sun H M,Gao Q S,Piao Y G.On several typical importances in fault tree analysis[J].Electronic Product Reliability and Environmental Testing,2007,25(2): 39-42.
- [13] Ruxandra S,Dumitrescu D,Preuss M.Evolutionary support vector regression machines[C]// Proceedings of the 8th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing,2006.
- [14] Box G E P,Tiao G C.Bayesian Inference in Statistical Analysis[M].New York: Addison-Wesley,1973.
- [15] 张鹏,陈代树.钻井安全作业人员可靠性分析[J].石油工业技术监督,2008,24(12): 35-41.Zhang P,Chen D S.Drilling safety working people reliability analysis[J].Technology Supervision in Petroleum Industry,2008,24(12): 35-41.
- [16] 鲁峰,黄金泉.基于ESVR信息融合的航空发动机故障诊断研究[J].应用基础与科学工程学报,2010,18(6): 982-989.Lu F,Huang J Q.Research on fault diagnosis for aero-engine based on ESVR information fusion[J].Journal of Basic Science and Engineering,2010,18(6): 982-989.
- [1] 高学东,谷淑娟,白尘,武森.考虑物流配送路网结构及配送量约束的客户聚类算法[J].系统工程理论与实践,2012,32(1): 173-181.
- [2] 祝帅,郑小林,陈德人.论坛中的意见领袖自动发现算法研究[J].系统工程理论与实践,2011,31(增刊2): 7-12.
- [3] 武森,冯小东,吴庆海.基于稀疏指数排序的高维数据并行聚类算法[J].系统工程理论与实践,2011,31(增刊2): 13-18.
- [4] 胡玉平,尹华,王瑜坤.基于相似图像搜索的网络推广平台的设计[J].系统工程理论与实践,2011,31(增刊2): 129-134.
- [5] 谭庆,何清,赵卫中,史忠植.基于进化规划的FCMBP模糊聚类改进方法[J].系统工程理论与实践,2011,31(7): 1363-1371.
- [6] 唐跃;王东浩;陈暮紫;陈敏;杨晓光.中国不良贷款回收率地区差异的原因分析[J].系统工程理论与实践,2011,31(3): 438-449.
- [7] 汪勇;金菲;张瑞军.引导函数支配的进化模糊聚类算法[J].系统工程理论与实践,2011,31(2): 302-307.
- [8] 梁小珍,杨丰梅,部慧,车欣薇,王拴红.基于城市金融竞争力评价的我国多层次金融中心体系[J].系统工程理论与实践,2011,31(10): 1847-1857.
- [9] 郭崇慧,苏木亚.基于独立成分分析的时间序列谱聚类方法[J].系统工程理论与实践,2011,31(10): 1921-1931.
- [10] 杨锋;夏琼;梁樑.同时考虑决策单元竞争与合作关系的DEA交叉效率评价方法[J].系统工程理论与实践,2011,31(1): 92-98.
- [11] 宋媚;张朋柱;薛耀文;刘璇.反洗钱跨组织多层次监测体系构建及其仿真验证[J].系统工程理论与实践,2011,31(1): 1-7.
- [12] 杜冰;陈华平;邵浩;许瑞;李小林.具有不同到达时间的差异工件批调度问题的蚁群聚类算法[J].系统工程理论与实践,2010,30(9): 1701-1709.
- [13] 王飞;徐肖豪;张静.基于航班模糊聚类的时隙分配均衡模型[J].系统工程理论与实践,2010,30(8): 1530-1536.
- [14] 张可;刘思峰.灰色关联聚类在面板数据中的扩展及应用[J].系统工程理论与实践,2010,30(7): 1253-1259.
- [15] 郭昆;张岐山.基于灰关联分析的谱聚类[J].系统工程理论与实践,2010,30(7): 1260-1265.

