

[Hide Expanded Menus](#)

胡宇, 张世英, 杨月诚, 朱杰堂, 杨正伟. 基于超球体平方根无迹Kalman滤波算法的涡扇发动机气路部件故障诊断[J]. 航空动力学报, 2014, 29(3): 689~695

## 基于超球体平方根无迹Kalman滤波算法的涡扇发动机气路部件故障诊断

## Fault diagnosis of gas path components of turbofan engine based on spherical square root unscented Kalman filter algorithm

投稿时间: 2013-05-09

DOI: 10.13224/j.cnki.jasp.2014.03.029

中文关键词: [涡扇发动机](#) [无迹Kalman滤波](#) [健康参数](#) [超球体单形采样](#) [气路部件](#)英文关键词: [turbofan engine](#) [unscented Kalman filter](#) [health parameter](#) [spherical simplex sampling](#) [gas path component](#)

基金项目: 陕西省自然科学基金 (2010JQ8018)

作者	单位
<a href="#">胡宇</a>	<a href="#">第二炮兵工程大学 动力工程系, 西安 710025</a>
<a href="#">张世英</a>	<a href="#">第二炮兵工程大学 动力工程系, 西安 710025</a>
<a href="#">杨月诚</a>	<a href="#">第二炮兵工程大学 动力工程系, 西安 710025</a>
<a href="#">朱杰堂</a>	<a href="#">第二炮兵工程大学 动力工程系, 西安 710025</a>
<a href="#">杨正伟</a>	<a href="#">第二炮兵工程大学 动力工程系, 西安 710025</a>

摘要点击次数: 51

全文下载次数: 56

中文摘要:

研究了一种超球体平方根无迹Kalman滤波算法用来有效跟踪涡扇发动机气路部件发生渐变性和突变性故障的健康参数. 该算法通过超球体单形采样来降低算法的计算量, 采用测量残差协方差阵的平方根代替方差阵进行递推运算, 提高了算法的计算效率和数值稳定性. 分别采用扩展Kalman滤波算法、无迹Kalman滤波算法和超球体平方根无迹Kalman滤波算法对某型涡扇发动机进行仿真, 结果表明: 超球体平方根无迹Kalman滤波算法的滤波时间减少50%左右, 能够实现渐变性和突变性故障中健康参数的准确估计, 是一种有效的涡扇发动机气路部件参数估计和故障诊断方法.

英文摘要:

A spherical square root unscented Kalman filter algorithm was investigated to effectively track the health parameters of the gas path components of turbofan engine with the gradual and rapid faults. In this algorithm, a spherical simplex sampling was exploited to decrease the computational complexity. And the square root of measurement residuals covariance matrix was used instead of variance matrix during recursive arithmetic to improve the calculation efficiency and numerical stability of algorithm. Then, the simulation of a turbofan engine was conducted by extended Kalman filter, unscented Kalman filter and spherical square root unscented Kalman filter algorithms. The results show that filter time consumption by spherical square root unscented Kalman filter algorithm is cut by about 50%, with accurate estimation of health parameters in gradual and rapid faults, thus adapting to the parameters estimation and fault diagnosis of gas path components of turbofan engine.