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基于故障建模的双余度舵机故障诊断技术

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Fault detection of dual redundant actuation system based on the fault modeling

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摘要 针对双余度舵机系统结构复杂、故障诊断困难的问题,提出了根据故障模型反向推理的故障诊断方法.在充分考虑各元件失效机理的基础上,将故障注入闭环系统建立典型故障模型.故障模型仿真了不同元件故障如何导致系统性能下降甚至完全失效.基于故障模型的仿真结果,对可观测到的异常状况进行分类和逆向推理归纳出故障诊断方法,并利用数学公式对一些故障量化评估.该诊断方法涵盖系统各元件,可快速定位故障元件,判断失效原因并进行定量分析,而且算法简单易于工程实现.

关键词: 余度舵机 故障仿真 AMESim

Abstract: In order to solve the problem of fault diagnosis of dual redundant actuation system characterized by complicated structure, a fault diagnosis method based on reverse-reasoning of fault models was proposed. With all the failure mechanism of different components considered, the typical fault models of close-loop system were established through fault injection. It was revealed that how these faults led to degradation of system performance or even total failure. According to the simulation results, the fault diagnosis method was established through classifying and reverse-reasoning of observed abnormalities and some faults were evaluated quantitatively using mathematical formulas. This fault diagnosis method covers all the components of the system. Moreover, it can not only locate the failure part of system rapidly, but also can identify and quantify the faults. Furthermore, the algorithm is easy to realize in project.

Keywords: redundant actuation system fault simulation AMESim

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