可靠性

随机因素作用下动态系统性能可靠性分析方法

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摘要：

动态系统的性能可靠性受噪声、干扰等短周期因素和磨损、结构参数退化等长周期因素的综合影响，并且这些影响因素大都是具有随机性的动态过程。首先阐述了动态系统及影响其性能可靠性的随机因素的描述方法；然后分别介绍了短周期因素和长周期因素作用下的性能可靠性分析方法；并综合这两种方法的优点，提出一种综合考虑长短周期随机因素影响的动态系统性能可靠性分析方法。该方法综合考虑了长短周期随机因素的动态特性，提出的仿真分析方法合理地实现了模型中的动态不确定因素，具有更高的精度和仿真效率。最后，通过舵机案例对提出的方法进行了验证。

关键词： 动态系统　性能可靠性　随机因素　长周期　短周期　仿真

Performance reliability analysis method of dynamic systems under stochastic processes

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Abstract:

Performance reliability of dynamic systems is influenced by both the long term factors and short term factors, and most of which are dynamic processes with stochastic characteristics. This paper presents a performance reliability analysis method of dynamic systems considering all kinds of random factors. Firstly, the expressing method of the dynamic system and random factors is introduced, then the performance reliability analysis methods under the influence of short term and long term factors are described respectively. Integrating the advantages of the two methods, a performance reliability evaluation method based on the simulation model is developed. Comparing with the traditional theory, the presented method takes the dynamic characteristics of the uncertainties into account, and treats them as the stochastic processes and not the random variables, which delivers much more practicability for this method. Furthermore, the simulation based method gives a reasonable description of uncertainties for the dynamic system, and has a higher efficiency and precision. Finally, a typical dynamic system, flight actuator system, is selected as the study case, results show that this method is feasible.

Keywords: dynamic system　performance reliability　stochastic characteristic　long term　short term simulation

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