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### 多变量飞控系统的稳定裕度分析

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### STABILITY MARGIN ANALYSIS OF THE MULTILoop FLIGHT CONTROL SYSTEMS

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摘要

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**摘要** 根据系统回差阵最小奇异值及通用相角-幅值裕度估算图, 给出了在系统的输入和输出端所有通道的相角和幅值同时变化时系统的稳定裕度, 它不仅可作为评价不同控制律鲁棒性优劣的指标之一, 也是对古典单通道量测MIMO系统稳定裕度的补充。同时为了克服所得结果的保守性, 采用了两种改进方法, 并对某型飞机的侧向运动系统进行了稳定裕度的分析、比较。

**关键词:** 多变量飞控系统 稳定裕度 回差阵最小奇异值 通用相角-幅值估算图

**Abstract:** For the method of classical single channel measure of MIMO systems stability margin is not applicable to evaluate the stability margin when gain and phase change simultaneously in every loop. So in the paper a new method for stability margin analysis of multiloop flight control systems is presented. In terms of the minimum singular value of the system return difference matrix and the universal diagram of the multiloop gain phase margin evaluation, the simultaneous gain and phase changes in all loops of a multiloop system can be obtained. The method provides an index of robustness evaluation and remedies the defect of classical single channel measure of MIMO systems stability margin; then in order to decrease conservation, two improving methods are adopted and an illustrative example of a two input/two output flight lateral control system is given.

**Keywords:** multiloop flight control system stability margin the minimum singular value of return difference matrix universal diagram of gain-phase margin evaluation

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