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基于自适应滤波的电控旋翼桨距控制试验

Experiment on blade pitch control of electrically controlled rotor based on adaptive filter control algorithm

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中文关键词： 电控旋翼 襟翼 桨距 自适应滤波 桨距控制试验

英文关键词:electrically controlled rotor(ECR) servo flap blade pitch adaptive filter blade pitch control experiment

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中文摘要：

提出了基于自适应滤波的电控旋翼桨距控制方法,并基于此开发了双闭环电控旋翼桨距控制系统,利用模型电控旋翼试验台进行了悬停状态下的桨距控制试验.试验结果表明:所研制的双闭环电控旋翼桨距控制系统能够有效、可靠地实现襟翼操纵和桨距控制.基于自适应滤波的桨距控制律可以很好地实现电控旋翼的总距、周期变距以及总距耦合周期变距操纵;桨距响应幅值满足要求,相位滞后约在10°～15°之间;从襟翼偏转到桨叶变距响应的滞后约20°～30°.不同桨叶/襟翼自身的结构及气动特性差异,会一定程度的影响桨距控制的实际效果.

英文摘要：

A new control algorithm based on the adaptive filter in time domain was brought forward. Based on this, the control system of electrically controlled rotor (ECR) blade pitch with double closed-loop was developed. Then, utilizing the test rig of model ECR, the pitch control experiments were performed in hover state. The experiments show that the developed control system of ECR blade pitch can work reliably through the tests. The control law based on the adaptive filter is successful in ECR collective pitch control, cyclic pitch control and collective pitch mixing with cyclic pitch control. The amplitude of the blade pitch was fitted well with the expected value, and the phase lag was about 10°～15°. The phase lag between the servo flap deflection and the response of blade pitch was about 20°～30°. Because of the structural and aerodynamic differences among different blades and servo flaps, the effect of blade pitch control will be reduced to some extent.

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