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基于多模型方法的全包络鲁棒飞行控制器设计

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Design of Full Envelope Robust Flight Controller Based on Multiple Model Method

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摘要

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摘要 利用新一代歼击机不同平衡点的多个非线性子模型对其机动飞行的全包络模型进行逼近。对于每一个子模型,设计相应的动态逆控制器,应用模糊神经网络产生控制器切换决策,实现不同飞行状态下不同模型控制器之间的相互切换。同时为了提高多模型飞行控制效果,对各模型控制器的输入及输出采样并作为神经网络的学习样本,形成一个全包络内的多模型统一神经网络控制器。最后通过歼击机的大迎角机动仿真来验证所设计的基于多模型的统一神经网络控制器的有效性,仿真结果表明所设计的统一神经网络控制器是有效的。

关键词: 新一代歼击机 动态逆控制 多模型控制 鲁棒飞行控制

Abstract: A discussion is devoted to the multiple model control method for the new generation fighter in this paper. The full supermaneuverable flight envelope of the new generation fighter is approximated by the multi-nonlinear models at the different equilibrium points. The dynamic inversion controller is designed for every nonlinear sub-model. The switching rule of the controllers is given by the fuzzy neural network. Meanwhile, the inputs and outputs of these dynamic inversion controllers are used to train the neural network. Finally, a uniform neural network controller is given for the full supermaneuverable flight envelope. To demonstrate the availability of the designed robust flight control system the high angle attack flight simulation is carried out. The simulation results suggest that the uniform neural network controller is valid.

Keywords: new generation fighter dynamic inversion control multiple model control robust flight control

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