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论文与报告

基于状态距离的量子控制策略

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摘要
基于Bures距离，选择一个表征量子系统期望态和实际态间距离的Lyapunov函数.考虑到初始态与期望态分别正交和不正交的情况，提出一类带有状态反馈的控制策略，它可以保证闭环控制系统的稳定性.特别详细地分析、推导和证明了系统的渐进稳定性.最后，在一个自旋1/2粒子系统上进行了仿真实验，分析了不同参数情况下系统的状态演化时间和控制值间的关系.研究结果对于量子系统的控制具有一般理论意义.

关键词 量子系统 反馈控制 李雅普诺夫函数 稳定性

分类号

Quantum Control Strategy Based on State Distance

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Abstract
Abstract Based on Bures distance, a Lyapunov function that represents the distance between a desired state and the actual state of a quantum system is selected. Considering the cases that an initial state is and is not orthogonal to the desired state respectively, we propose a class of control strategies with state feedback that ensures the stability of the closed-loop control system. Especially, the asymptotic stability of the control system is analyzed, deduced and proved in detail. Finally, a simulation experiment on a spin-1/2 particle system is done and the relation between the system state evolution time and control value is analyzed with different parameters . Research results have general theoretical meaning for control of quantum systems.

Key words Quantum system feedback control Lyapunov function stability

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