控制科学与工程

非线性系统线性化综述(英文)

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摘要：

非线性系统的线性化是设计非线性系统控制的强有力工具.这一方法已经在飞行器控制、电力系统的安全控制、化学反应器控制、经济系统、生物学系统和机器人控制等领域得到广泛应用.本文阐述了非线性系统线性化的发展历史以及有深刻意义的结果.首先回顾从非线性系统的近似线性化到精确线性化的发展.主要内容包括Poincare线性化、系统能通过状态反馈线性化的充要条件和算法.然后介绍各种不同的线性化方法：动态反馈线性化，近似线性化，Carleman线性化等.本文主要目的是对非线性系统线性化的历史，现状和一些重要问题进行一个较完整全面的介绍，从而提供从事线性化理论与应用研究的基础.

关键词： 线性化 Poincare定理 状态反馈 非正则 部分线性化

A survey on linearization of nonlinear systems

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Abstract：

Linearization is one of the most powerful tools in control of nonlinear systems. It has obtained various applications in aircraft pilot control, safety control of power systems,

chemical reactor control, economical system, biological system, robot control etc. This survey outlines the long history and the recent development of linearization, including different techniques and useful results. We first recall the development of the linearization from approximated one to exact one. Poincare's linearization is reviewed. The necessary and sufficient conditions and algorithms of the state feedback linearization are mentioned. Then various kinds of linearizations are surveyed, which includes the global linearization, full linearization, input output linearization, non regular feedback linearization. Partial linearization and its relationship with relative degrees are sequentially discussed. Some other linearization techniques such as dynamic feedback linearization, approximate linearization, Carleman Linearization etc. are also briefly introduced. The paper is expected to provide a complete picture of linearization: its past, present and key issues for further investigation.

Keywords: linearization Poincare's theorem state feedback non regular partial linearization

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