

论文与报告

关于模糊PID控制器推理机维数的研究

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摘要

对一维(1D)至三维(3D)模糊PID控制器进行了系统的分析研究, 提出了四项系统功能特性指标来评价不同结构的控制器; 这包括控制分量合成, 耦合影响, 增益相关和规则增长. 通过对最常见的二维Mamdani模糊控制器进行分析研究, 发现该控制器存在功能缺陷. 为此, 提出了最优结构的一维模糊PID控制器. 该控制器采用了“1D-3D”映射关系的模糊推理机, 从而实现了三个控制分量可以独立不相关的调整功能. 通过与二维和三维控制器比较结果表明, 一维控制器具有最佳系统功能特性.

关键词 [模糊控制](#) [模糊PID控制器](#) [模糊推理机维数](#)

分类号

Study of Dimensionality of Fuzzy Inference for Fuzzy PID Controllers

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Abstract

A systematic study of one-, two- and three-input fuzzy inferences has been made for fuzzy PID controllers. We propose four criteria to evaluate the functional behaviors of the controllers, namely, control-action composition, coupling influence, gain dependency and rule growth. Based on a simple analysis, we conclude that the Mamdani's two-input fuzzy controller suffers from the difficulties according to the criteria. A novel one-input fuzzy controller is proposed which consists of a "1D-3D" fuzzy inference to generate three independent (proportional, integral and derivative) control actions. This system has shown the best inference structure with respect to the four functional criteria in comparison with two- and three-input fuzzy controllers.

Key words [Fuzzy control](#) [fuzzy PID controllers](#) [dimensionality of fuzzy inference](#)

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