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# Indirect Adaptive Fuzzy Control of Multivariable Nonlinear Systems Class with Unknown Parameters

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**Abstract:** This paper develops an adaptive fuzzy control of nonlinear system class. In this method, we investigated the possibilities offered by the fuzzy systems of Takagi-Sugeno type in terms of approximation capacity of the continuous nonlinear functions and we exploited the Lyapunov theory to establish a parametric adaptation law, ensuring the total stability of the system. Finally, simulation results are presented to show the effectiveness of this kind of controller.

**Keywords:** *fuzzy systems; fuzzy adaptive law; permanent magnet synchronous motors; current controlled inverter.*

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## 1 Introduction

The vast majority of conventional control techniques have been devised for linear time-invariant systems that are assumed to be completely known and well understood. In most practical instances, however, the systems to be controlled are nonlinear, time-varying and the basic physical processes in them are not completely known a priori. These types of model uncertainties are extremely difficult to manage, even with the conventional techniques. For these systems, the linear control exhibits generally poor performances and the recourse to a nonlinear adaptive control can be a judicious solution. Besides, the theory of fuzzy logic has also been applied successfully for the control of nonlinear systems. In general the control strategy used for fuzzy logic controller is based on expert knowledge, so the fuzzy logic controller has the ability to emulate the human strategies control [1–5] and [6]. Moreover, it would be necessary that the control strategy can perform the control objectives even if the parameters of the system evolve or are badly

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