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شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

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جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

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**TANTA UNIVERSITY
FACULTY OF ENGINEERING**

Fuzzy Logic and Genetic Algorithms Applied to Intelligent Control System Design

**Thesis submitted to
The Computers and Automatic Control Department**

Master of Science

By

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2002

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2002

پیش لفظ
پ. د. محمد محمد علی
محمد علی

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَمَا أَوْفَيْتُمْ مِنَ الْعِلْمِ

إِلَّا قَلِيلًا

ظُرُّوا لِلَّهِ الْعَظِيمِ

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Dedication

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Ahmed A. Ramadan

Abstract

The design methods of fuzzy logic controllers (FLCs) using the genetic algorithms (GAs) are appearing as systematic methods. These methods easily provide an optimized design and form the framework for further progress. This thesis describes the optimal design of P-, PI-, PD-, PID-like FLCs based on theoretical fuzzy concepts and genetic-based optimizations. In the case of PI-like FLC, the most important feature of the proposed controller is its simple structure consisting of three gain factors and a FLC with each of the two inputs and the output has only three membership functions. Through GAs, the optimal values for the gain factors associated with each of the inputs and the output of the FLC is achieved without changing the membership functions or the rule-base of the FLC itself.

The proposed method is applied to the problem of designing an optimal PI-like fuzzy logic speed controller for an induction motor [Kao & Liu 92] , one time without limiting the output of the controller and another time with limiting the output of the controller. The performance of the compensated system is judged compared to that of conventional PI and genetic-based PI controllers. Good simulation results were obtained using the proposed method, which produced superior control performance in handling plant parameter changes and in speeding up the response.

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