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A CONTRIBUTION TO THE THEORY AND DESIGN OF SELF-LEARNING CONTROLLERS

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8. SUMMARY.

In this thesis, it was the author's objective to present a systematic approach to the design of self-learning controllers, starting from abstract considerations concerning the notion of learning in general and self-learning control in particular (Chapter 2), stressing the importance of approximation methods for real functions in several variables (Chapter 3), reviewing some of the usual approximation methods (Chapters 4 and 5), proposing a novel approach to self-learning control by direct identification of the performance criterion using the stochastic approximation method (Chapter 6) and finally verifying the theoretical results in on-line experiments with a real-world controlled plant (Chapter 7).

In the course of theoretical treatment, several new concepts of special concern to self-learning controllers, such as the method of the best local correction and the orthogonalization of measurements, were introduced, and necessary conditions for an easy computational implemementation were derived. Most theorems, in particular those concerning convergence of the learning algorithms, were proven.

Practical experiments have confirmed that it is viable to design self-learning controllers using today's microprocessor technology, even if their price would still be higher than that of conventional controllers due to higher memory requirements and increased computing power. Nonetheless, in view of the results presented in this thesis it is felt that the aim set out at the beginning of this work has been reached.