Preface

Control systems are becoming more important every day. At the beginning, the industry used sequential controls for solving a lot of industrial applications in control systems, and then the linear systems gave us a huge increase in applying automatic linear control on industrial application. One of the most recent methods for controlling industrial applications is intelligent control, which is based on human behavior or concerning natural process.

Nowadays, the topic of intelligent control systems has become more than a research subject to the industry. The number of industrial applications is growing every day, faster and faster. Thus, new software and hardware platforms are required in order to design and develop intelligent control systems. The challenge for these types of systems is to have a novel platform, which allows designing, testing and implementing an intelligent controller system in a short period of time. For the industry and academy, LabVIEW™ is one of the most important software platforms for developing engineering applications and could be connected with different hardware systems, as well as running standalone programs for simulating the controller's performance (validating the controller by simulation then implementing it). In addition, LabVIEW is a graphical program that is very easy to learn.

Taking into account these advantages, the software platform described in this book is LabVIEW from National Instruments™. The book is divided into 7 chapters and gives all the information required for designing and implementing an intelligent controller.

Chapter 1 provides an introduction to basic intelligent control concepts and concludes by applying LabVIEW for implementing control systems. Chapter 2 covers in deep detail the fuzzy logic theory and implementation. This chapter starts with fundamental fuzzy logic theory for supporting the most important fuzzy logic controllers implemented using LabVIEW.

Chapter 3 deals with artificial neural networks. In this chapter a complete set of tools for implementing artificial neural networks is presented. Basic examples of neural networks, such as perceptron, allow the students to understand the most important topologies in artificial neural networks for modeling and controlling systems. In Chap. 4 the reader can find neuro-fuzzy controllers, which combine the

fuzzy inference systems with an artificial neural network topology. Thus, the neuro-fuzzy controllers are an interesting option for modeling and controlling industrial applications. Chapter 5 discusses genetic algorithms, which are representations of the natural selection process. This chapter also examines how generic algorithms can be used as optimization methods. Genetic programming is also explained in detail.

Chapters 6 and 7 show different algorithms for optimizing and predicting that could be combined with the conventional intelligent system methodologies presented in the previous chapters such as fuzzy logic, artificial neural networks and neuro-fuzzy systems. The methods presented in Chaps. 6 and 7 are: simulated annealing, fuzzy clustering means, partition coefficients, tabu search and predictors.

Supplemental materials supporting the book are available in the companion DVD. The DVD includes all the LabVIEW programs (VIs) presented inside the book for intelligent control systems.

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ITESM-CCM *Dr. Pedro Ponce-Cruz*
México City

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Ponce-Cruz, P.; Ramírez-Figueroa, F.D.

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