KAIST U-City Program Book Series

Soft Computing Techniques for Engineering Design

Beta Edition

Hyun Myung, Ph.D.
Seungmok Lee
Donghwa Lee
Haemin Jeon
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Preface

This book was provided to teach soft computing techniques for U(Ubiquitous)-City Program graduate students. Since the most of the U-City Program students are majored in civil, environmental, and architectural engineering, I thought that it would be beneficial for them to learn about the state of the art signal processing, pattern recognition, data handling, optimization techniques, and for that purpose the introduction to the soft computing or computational intelligence (CI) would be the best choice.

The most of the content was excerpted and summarized from the book *Computational Intelligence: Concepts to Implementations* co-authored by R. Eberhart and Y. Shi (Morgan Kaufman, 2007), and some part of the content were from *Soft Computing and Intelligent Systems Design: Theory, Tools and Applications* co-authored by F. Karray and C. Silva (Addision-Wesley, 2004), and some examples were taken from *Numerical Optimization Techniques for Engineering Design* written by G. N. Vanderplaats (McGraw-Hill Book Company, 1984).

In Chapters 1 and 2, the overview of soft computing is discussed, and the Chapter 3 through 5 deals with fundamental three components of CI: evolutionary computation (EC) in Chapter 3, neural networks (NN) in Chapter 4, and fuzzy logic (FL) in Chapter 5, respectively. In Chapter 6, applications of CI to U-City such as structural control, urban and transport planning, architectural design will be discussed using the up to date literature survey. Chapter 7 will deal with two hands-on experiments using CI. These experiments were actually performed in the spring semester class in 2010. In the first experiment, a line tracing robot installed with a microprocessor is built and CI algorithms are implemented and run on-board. In the other experiment, TSP (traveling salesperson problem) is solved

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1 Overview
2 Review of Computational Intelligence
3 Evolutionary Computation
4 Artificial Neural Networks
5 Fuzzy Systems
6 Applications of CI to U-City
7 Experiments of CI

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