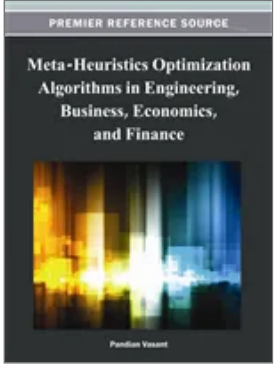

The Use of Soft Computing for Optimization in Business, Economics, and Finance

Petr Dostál

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Abstract

Optimization methods have had successful applications in business, economics, and finance. Nowadays the new theories of soft computing are used for these purposes. The applications in business, economics, and finance have specific features in comparison with others. The processes are focused on private corporate attempts at money making or decreasing expenses; therefore the details of applications, successful or not, are not published very often. The optimization methods help in decentralization of decision-making processes to be standardized, reproduced, and documented. The optimization plays very important roles especially in business because it helps to reduce costs that can lead to higher profits and to success in the competitive fight.

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1. Introduction

There are various optimization methods appropriate to use in business and economics: classical ones and methods using soft computing such as fuzzy logic, neural networks, genetic algorithms, and the theory of chaos.

Soft computing differs from conventional (hard) computing in that, unlike hard computing, it is tolerant of imprecision, uncertainty, partial truth, and approximation. In effect, the role model for soft computing is the human mind. The guiding principle of soft computing is: Exploit the tolerance for imprecision, uncertainty, partial truth, and approximation to achieve tractability, robustness and low solution cost. The basic ideas underlying soft computing in its current incarnation have links to many earlier influences, among them Zadeh's 1965 paper on fuzzy sets. The inclusion of neural computing and genetic computing in soft computing came at a later point.

At this juncture, the principal constituents of Soft Computing (SC) are Fuzzy Logic (FL), Neural Computing (NC), Evolutionary Computation (EC) Machine Learning (ML) and Probabilistic Reasoning (PR), with the latter subsuming belief networks, chaos theory and parts of learning theory. What is important to note is that soft computing is not a melange. Rather, it is a partnership in which each of the partners contributes a distinct methodology for addressing problems in its domain. In this perspective, the principal constituent methodologies in SC are complementary rather than competitive. Furthermore, soft computing may be viewed as a foundation component for the emerging field of conceptual intelligence.

The mentioned applications in this chapter are as follows:

- Risk investment
- Risk management (loans, mortgages, direct mailing)
- Optimization of number of objects (devices, stock)
- Prediction of time series
- Journey optimization
- Description of economic phenomena (stock market).

The program MATLAB® with Fuzzy Logic, Neural Network, and Global Optimization Toolbox is used. The fields of applications of optimization methods in business, economics, and finance cover a wide area of applications.

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