Chapter 6
Conclusions

Abstract This section summarizes what we have done in this book.

For many decades, there has been a continuous progress in science and engineering applications. A large part of this progress comes from the new knowledge that researchers acquire, propagate, and use. This new knowledge has revolutionized many aspects of our life, from driving to communications to shopping.

However, there is one area of human activity which is the least impacted by the modern technological progress: the very processes of acquiring, processing, and propagating information. When we decide where to place sensors, which algorithm to use for processing the data—we rely mostly on our own intuition and on the opinion of the experts. As a result, knowledge-related methods that we select are often far from optimal. To make effective recommendations, it is necessary to build realistic models of the corresponding processes, and then use these models to find optimal ways of controlling these processes.

The need for such models is well understood. There are many numerical models of knowledge acquisition, processing, and propagations. Some of these models have been successfully used to enhance the corresponding processes. However, these applications are limited by the fact that most of these models are based on detailed numerical simulation of the corresponding processes, which make the resulting models very time-consuming to use. This is especially important in situations of *big data*, when the amount of data is so huge that the traditional numerical methods are not applicable. It is therefore necessary to develop *analytical* models for the corresponding knowledge-related processes, models that would allow easier optimization and application.

In this book, we have developed analytical models for all the knowledge-related processes, from knowledge acquisition to knowledge processing and knowledge propagation. We hope that our recommendations will be useful, especially for big data applications.