Part I

Distributed Graph Algorithms

This first part of the book is on distributed graph algorithms. These algorithms consider the distributed system as a connected graph whose vertices are the processes (nodes) and whose edges are the communication channels. It is made up of five chapters.

After having introduced base definitions, Chap. 1 addresses network traversals. It presents distributed algorithms that realize parallel, depth-first, and breadth-first network traversals. Chapter 2 is on distributed algorithms solving classical graph problems such as shortest paths, vertex coloring, maximal independent set, and knot detection. This chapter shows that the distributed techniques to solve graph problems are not obtained by a simple extension of their sequential counterparts.

Chapter 3 presents a general technique to compute a global function on a process graph, each process providing its own input parameter, and obtaining its own output (which depends on the whole set of inputs). Chapter 4 is on the leader election problems with a strong emphasis on uni/bidirectional rings. Finally, the last chapter of this part, Chap. 5, presents several algorithms that allow a mobile object to navigate a network.

In addition to the presentation of distributed graph algorithms, which can be used in distributed applications, an aim of this part of the book is to allow readers to have a better intuition of the term distributed when comparing distributed algorithms and sequential algorithms.