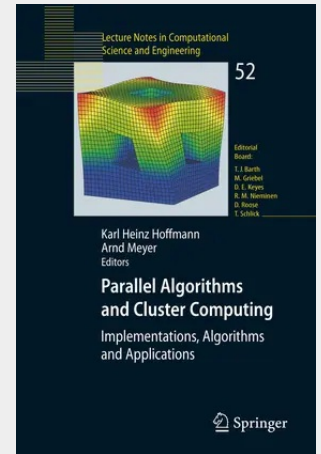


Parallel Algorithms and Cluster Computing

Implementations, Algorithms and Applications

High performance computing has changed the way in which science progresses. During the last 20 years the increase in computing power, the development of effective algorithms, and the application of these tools in the area of physics and engineering has been decisive in the advancement of our technological world. These abilities have allowed to treat problems with a complexity which had been out of reach for analytical approaches. While the increase in performance of single processes has been immense the increase of massive parallel computing as well as the advent of cluster computers has opened up the possibilities to study realistic systems. This book presents major advances in high performance computing as well as major advances due to high performance computing. The progress made during the last decade rests on the achievements in three distinct science areas. Open and pressing problems in physics and mechanical engineering are the driving force behind the development of new tools and new approaches in these science areas. The treatment of complex physical systems with frustration and disorder, the analysis of the elastic and non-elastic movement of solids as well as the analysis of coupled fluid systems, pose problems which are open to a numerical analysis only with state of the art computing power and algorithms. The desire of scientific accuracy and quantitative precision leads to an enormous demand in computing power. Asking the right questions in these areas lead to new insights which have not been available due to other means like experimental measurements. These two areas which are decisive for effective high performance computing is a realm of effective algorithms.

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