Abstract

This paper addresses the problem of static load balancing in heterogeneous distributed computing systems taking into account both memory and communication capacity constraints. The load balancing problem is first modeled as an optimization problem. Then, a heuristic approach, called Adaptive Genetic Algorithm (AGA), is proposed to solve the problem. The
performance of the proposed algorithm is evaluated by simulation studies on randomly
generated instances and the results are compared with that obtained by applying both the
Genetic Algorithm (GA) and the Simulated Annealing (SA). Also, the qualities of the results are
compared with the optimal solutions that obtained by applying the Brach-and-Bound (BB)
algorithm.

Reference

- C.-C. Hui and S. T. Chanson, “Allocating Task Interaction Graph to Processors in
  Heterogeneous Networks,” IEEE Transactions on Parallel and Distributed Systems, Vol. 8, No.
- M. Kafi and I. Ahmed “Optimal Task Assignment in Heterogeneous Distributed
- A. Tom and C. S. R. Murthy “Optimal task allocation in distributed systems by graph
  matching and state space search,” J. of Systems and Software, Vol. 46, No. 1, pp. 59–75, April
  1999.
- Nirmeen A. Bahnasawy, Gamal M. Attiya, Mervat Mosa and Magdy A. Koutb, "A Modified
  A* Algorithm for Allocating Tasks in Heterogeneous Distributed Computing Systems”
- G. Attiya and Y. Hamam “Static Task Assignment in Distributed Computing Systems,” A
  book chapter in "Information processing: Recent Mathematical Advances in Optimization and
  Computers using minimax Criterion,” International Network Optimization Conference (INOC'03),
- P. Bouvry, J. Chassin, M. dobruck, L.Hluch , E. Luque, and T. Margalef, “Mapping and
  Load Balancing on Distributed Memory Systems,” Proceedings of the Eight Symposium on
- L. Wang, H. J. Siegel, V. P. Roychowdhury, and A. A. Maciejewski, “Task Matching and
  Scheduling in Heterogeneous Computing Environments Using a Genetic-Algorithm-Based
- J. Aguilar and E. Gelenbe, “Task Assignment and Transac-tion Clustering Heuristics for
  Balancing,” Proceedings ECIT2004 - Third European Conference on Intelligent Systems and
- Bibhudatta Sahoo, Sudipta Mohapatra, and Sanjay Kumar Jena, "A Genetic Algorithm
  Based Dynamic Load Balancing Scheme for Heterogeneous Distributed Systems" Proceedings
  of the International Conference on Parallel and Distributed Processing Techniques and

Index Terms

Computer Science

Distributed Systems

Key words

Load Balancing

Simulated Annealing

Genetic Algorithm

Heuristics

Mapping
Static Workload Distribution of Parallel Applications in Heterogeneous Distributed Computing Systems with Memory and Communication Capacity Constraints