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Towards Automatic Load Balancing for Programming Parallel Fuzzy Expert Systems in Heterogeneous Clusters

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Abstract

FuzzyCLIPS is a rule-based language designed especially for developing fuzzy expert systems. A FuzzyCLIPS programmer has no need to write an algorithm to solve a problem. Instead, he only needs to list the rules for dealing with various conditions. However, due to the characteristics of rule-based languages, the execution of an expert system is always more time-consuming than any one of the conventional algorithmic languages. To cope with this problem, we propose to execute a FuzzyCLIPS application in parallel on the emerging heterogeneous cluster system. Furthermore, to maximize the speedup of the parallel execution and to minimize the burden of programmers, we have implemented built-in selfscheduling schemes in the FuzzyCLIPS interpreter for better load balancing. Programmers only need to use our proposed directives to specify where the parallelisms are, no explicit and complicated send and receive routines have to be invoked in their parallel programs. According to the specified directives, the master process will automatically assign the tasks and transmit the required data to slave processes by calling MPI routines. Experimental results show that the built-in load balancing schemes can improve the system performance significantly.

Key words: Expert System; Cluster System; FuzzyCLIPS;
Load Balancing; Self Scheduling