Parallel Implementations of Evolutionary Algorithms
Implementation of Standard Genetic Algorithm
on MIMD Machines *

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Abstract. Genetic Algorithms (GAs) have been implemented on a number of multiprocessor machines. In many cases the GA has been adapted to the hardware structure of the system. This paper describes the implementation of a standard genetic algorithm on several MIMD multiprocessor systems. It discusses the data dependencies of the different parts of the algorithm and the changes necessary to adapt the serial version to the parallel versions. Timing measurements and speedups are given for a common problem implemented on all machines.

1 Introduction

In this paper we describe the implementation of a standard Genetic Algorithm [1,2] on a number of different multiprocessor machines. After the discussion of the data dependencies in a straightforward implementation of a GA, the parallelization strategy on each machine is discussed and speedup measurements are presented. No attempt is made to optimize the algorithm for each specific architecture, instead we tried to stay as closely as possible to the original and parallelize in a way which seems natural for an application programmer on such a machine. This includes the use of standard libraries like Pthreads if available and e.g. recommended by the vendor as the preferred method of parallelization.

2 Genetic Algorithms

In this section we shortly outline the GA we have implemented on the different machines.

Selection The fitness of each individual in the population is evaluated. The fitness of each individual relative to the mean value of all other individuals gives the probability with which this individual is reproduced in the next generation. Therefore the frequency $h_i$ of an individual in the next generation is given by

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