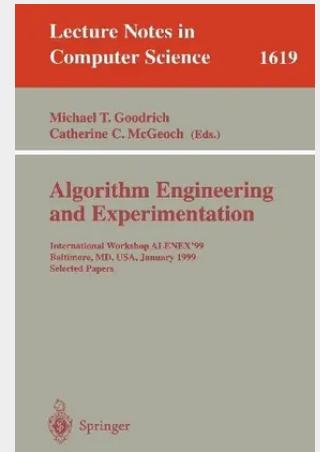


Algorithm Engineering and Experimentation

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Symmetric multiprocessors (SMPs) dominate the high-end server market and are currently the primary candidate for constructing large scale multiprocessor systems. Yet, the design of efficient parallel algorithms for this platform currently poses several challenges. The reason for this is that the rapid progress in microprocessor speed has left main memory access as the primary limitation to SMP performance. Since memory is the bottleneck, simply increasing the number of processors will not necessarily yield better performance. Indeed, memory bus limitations typically limit the size of SMPs to 16 processors. This has at least two implications for the algorithm designer. First, since there are relatively few processors available on an SMP, any parallel algorithm must be competitive with its sequential counterpart with as little as one processor in order to be relevant. Second, for the parallel algorithm to scale with the number of processors, it must be designed with careful attention to minimizing the number and type of main memory accesses. In this paper, we present a computational model for designing efficient algorithms for symmetric multiprocessors. We then use this model to create efficient solutions to two widely different types of problems - linked list permutations and generalized sorting. Both problems are memory intensive, but in different ways. Whereas generalized sorting algorithms typically require a large number of memory accesses, they are usually to contiguous memory locations. By contrast, permutation algorithms typically require a more modest quantity of memory accesses, but they are usually to non-contiguous memory locations.

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