Searching on a random sequence in parallel

Dr.N.Sairam & Dr.R.Seethalakshmi
School of Computing,
SASTRA Univeristy,
Thanjavur-613401.

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1. Searching on a random sequence in parallel

In the information age, the huge amount of information and data available and exchanged, require a fast and efficient searching mechanisms for effective use of this information. Generally, to find an item in an unordered array of size n, it's used one of the following approaches: Scans all the values that require O (n) time. Using a sorting algorithm like Quicksort, Bubble sort, Binary Tree sort that varies in complexity from O (n log n) in the best case to O (n^2) in the worst case. Moreover, the memory usage for searching these items varies from O (1) to O (log n).

Using Heapsort that performs better than Quicksort or other sorting algorithms, it takes O (n log n) in the worst and best case, a searching mechanism is used subsequently to find the location of the searched item. Searching algorithms are techniques used to make the searching of an information in any field fast and more efficient. Searching problem is defined as follow: given an input x determines whether there exists a y such that f (x, y) is true.

Binary search is an algorithm for locating the position of an element x in a sorted list. It starts by dividing the array into subarrays L, R. Then, a comparison between the value of x and the values of the first elements in each subarray is done and to define in which subarray the searching process must start. This procedure (splitting and comparing) continues until finding the requested item (this procedure continue at most log n time). The idea on which the binary search algorithm based on is to reduce the searching space each time by a factor of two, the worst case performance of binary searching is log n for an input array of size n.

Parallel search or multithread search (SMP) is a way to increase search speed by using additional processors. Utilizing these additional processors is an interesting domain of research. SMP algorithms are classified by their scalability (that means the behavior of the algorithm as the number of processors become large) and their speed up. The speed up is defined as the ratio of the running time of the sequential execution to the running time of the parallel execution. It is mostly used as an indicator for a parallel program's performance.

Sequential Parallel Search Algorithm

Input:- An unsorted array S and the search element y.

Ouput:- The position of y

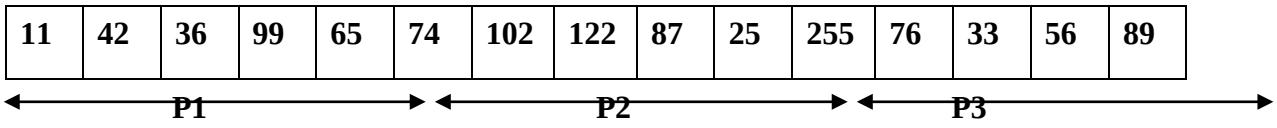
The unsorted array is first decomposed into n/p subarrays. If the array is uneventhe last processor is assigned the remaining elements.

Each processor starts searching its array for the element y. The processor which finds the element tell the master and the procedure gets over.

If there are redundant elements in the array the first processor which detects it will inform the master.

Thus this algorithm is the sequential search by p processors in parallel.

Example:



n=15

p=3

y=25

y is detected by P2.

Thus the algorithm works.