Assignment No. 2

Title : Parallel Bubble Sort and Merge Sort.

Objective : To implement Parallel Bubble sort and Merge sort using Open MP.

Problem Statement :
Write a program to implement Parallel Bubble Sort and Merge Sort using Open MP. Use existing algorithms and measure the performance of sequential and parallel algorithms.

Hardware and Software Requirement :

Theory :
Bubble sort and Merge sort are two commonly used sorting algorithms. In this program , we will implement parallel versions of these algorithms using OpenMP and compare their performance in their sequential counterparts.

Parallel bubble sort is a parallel implementation of the Clossic Bubble sort algorithm. The concept of parallelism Involves executing a set of instructions / code simultaneously instead of line by line sequentially.

a) Parallel Bubble Sort : Parallelizing sorting algo , such as Bubble sort , involves dividing the data into multiple segments that can be sorted independently and then merging or exchanging information between segments.

b) Parallel Merge Sort: It is an algorithm that parallizes the class in merge sort algorithm to take advantage of multiple processers or threads. The merge sort algo naturally leppls itself to parallelization because it involves dividing the array into halves, sorting each half and then merging the sorted halves.

Algorithm:

a) Bubble Sort:

```
    void parallel BubbleSort (int arr[], int size) {
        int i, j;
        # pragma omp parallel for private(j) shared (arr)
        for (i=0; i<size-1; i++) {
                # pragma omp parallel for shared (arr) schedule
                for(j=0; j<size-1-i ; j++) {
                    if (arr[j] > arr[j+1]) {
                        int temp = arr[j];
                        arr[j] = arr [j+1];
                        arr[j+1] = temp;
                    }
                }
        }
    }
```

b) Merge Sort :

```
void   parallelMergeSort (int arr[], int left, int right){
        if (left < right) {
                int middle = left + (right - left) /2;
                # pragma   omp parallel
                # pragma   omp single   nowait
                {
                      # pragma omp task
                        parallel mergeSort (arr, left , middle);
                      # pragma omp task
                        parallel Merge Sort (arr, middle +1, right);
                }
                merge (arr, left , right);
        }
    }
```

Conclusion :

We have successfully implemented the parallel Bubble sort and parallel Merge sort.