| | |
|---|---|
| **NAME:** | VIJESH HINGU |
| **UID:** | 2021300042 |
| **BATCH** | C |
| **SUBJECT** | DAA |
| **EXPERIMENT NO :** | 2 |
| **DATE OF PERFORMANCE** | 13-02-2023 |
| **DATE OF SUBMISSION** | 20-02-2023 |
| **AIM:** | To find the running time of merge sort and quick sort. |
| **ALGORITHM** | Merge sort –<br>1. Start<br>2. declare array and l, r and m.<br>3. Perform merge function.<br>4. if l > r<br>        return<br>    mid= 1+(r-l)/2<br>    mergesort(array, l, m)<br>    mergesort(array, m+1, r)<br>    merge(array, l, m, r)<br>Quick sort –<br>1. Start<br>2. declare array and l, r and m.<br>3. Perform partition function.<br>4. If (low < high)<br>    int pi = partition(arr, low, high); |

```
        quickSort(arr, low, pi - 1);
        quickSort(arr, pi + 1, high);
```

**PROGRAM**

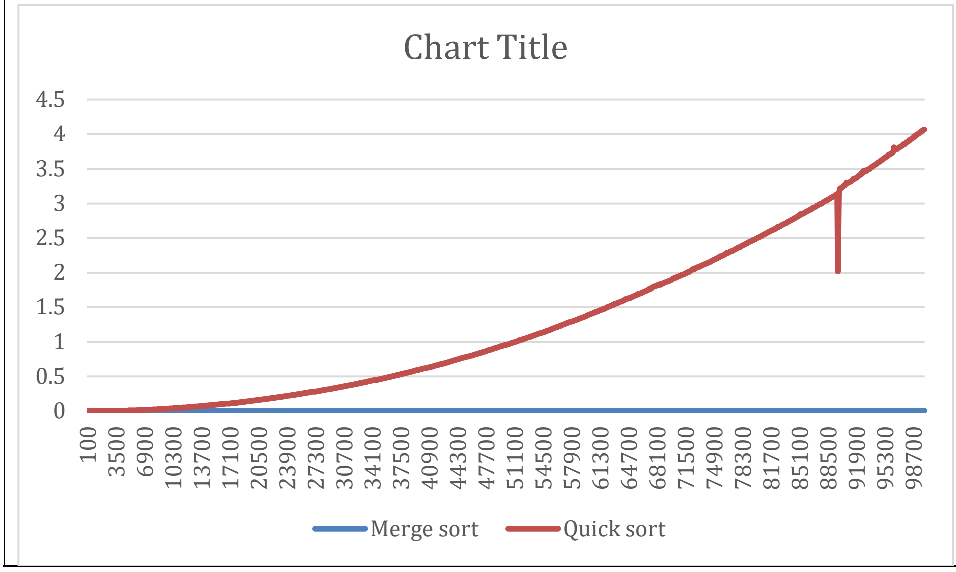
```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
const int limit = 100000;
const int block = 100;
void merge (int arr[], int l, int m, int r)
{

    int i = 0, j = 0, k = l;
    int n1 = m - l + 1;
    int n2 = r - m;
    int L[n1], R[n2];
    for (i = 0; i < n1; i++)
        L[i] = arr[l + i];
    for (j = 0; j < n2; j++)
        R[j] = arr[m + 1 + j];
    while (i < n1  && j < n2)
    {
        if (L[i] <= R[j])
        {
            arr[k] = L[i];
            i++;
        }
        else
        {
            arr[k] = R[j];
            j++;
        }
        k++;
    }
    while (i < n1)
    {
        arr[k] = L[i];
        i++;
        k++;
    }
    while (j < n2)
    {
        arr[k] = R[j];
        j++;
        k++;
    }
}
void mergeSort (int arr[], int l, int r)
{
    if (l<r) {
        int m = l+(r-l)/2;
        mergeSort(arr, l, m);
        mergeSort(arr, m + 1, r);
        merge(arr, l, m, r);
    }
}
void merge_sort (FILE *f)
{
          printf("Block Size\tTime Taken\n");
          int size = 0;
          for (int times = 0; times<limit/block; times++)
          {
                    size+=block;
                    int arr [size];
                    for (int i = 0; i<size; ++i)
                              fscanf(f,"%d",&arr[i]);
                    clock_t t;
                    t = clock();
                    mergeSort(arr, 0, size-1);
                    t = clock()-t;
```

```
                double time_taken = ((double)t)/CLOCKS_PER_SEC;
                printf("%d\t%lf\n",size,time_taken);
        }
}
int partition (int arr[], int low, int high)
{
   int pivot = arr[high];
   int i = low-1;
   for (int j = low; j <= high - 1; j++)
   {
      if (arr[j] < pivot)
      {
         i++;
         int temp = arr[i];
         arr[i] = arr[j];
         arr[j] = temp;
      }
   }
   int temp = arr[i+1];
   arr[high] = arr[i+1];
   arr[i+1] = temp;
   return i+1;
}
void quickSort (int arr[], int low, int high)
{
   if (low < high) {
      int pi = partition(arr, low, high);
      quickSort(arr, low, pi - 1);
      quickSort(arr, pi + 1, high);
   }
}
void quick_sort (FILE *f)
{
        printf("Block Size\tTime Taken\n");
        int size = 0;
        for (int times = 0; times<limit/block; times++) {
                size+=block;
                int arr [size];
                for (int i = 0; i<size; ++i)
                        fscanf(f,"%d",&arr[i]);
                clock_t t;
                t = clock();
                quickSort(arr, 0, size-1);
                t = clock()-t;
                double time_taken = ((double)t)/CLOCKS_PER_SEC;
                printf("%d\t%lf\n",size,time_taken);
        }
}
int main ()
{
        FILE *f;
        f = fopen("daa_2_random_integers.txt", "w");
        for (int i = 0; i<limit; ++i)
                fprintf(f,"%d\n",rand());
        merge_sort(f);
        quick_sort(f);
        fclose(f);
        return 0;
}
```

## RESULT ( SNAPSHOT):

Chart comparing merge and quick sort –



## CONCLUSION :

With the help of this experiment, I was able to understand and implement merge sort and quick sort. I was able to differentiate between the runtimes of bot the algorithms for different number of input values.