Aayush Shah
19BCE245
17 August 2021

Design and Analysis of Algorithms

Practical 3

- **Code :**

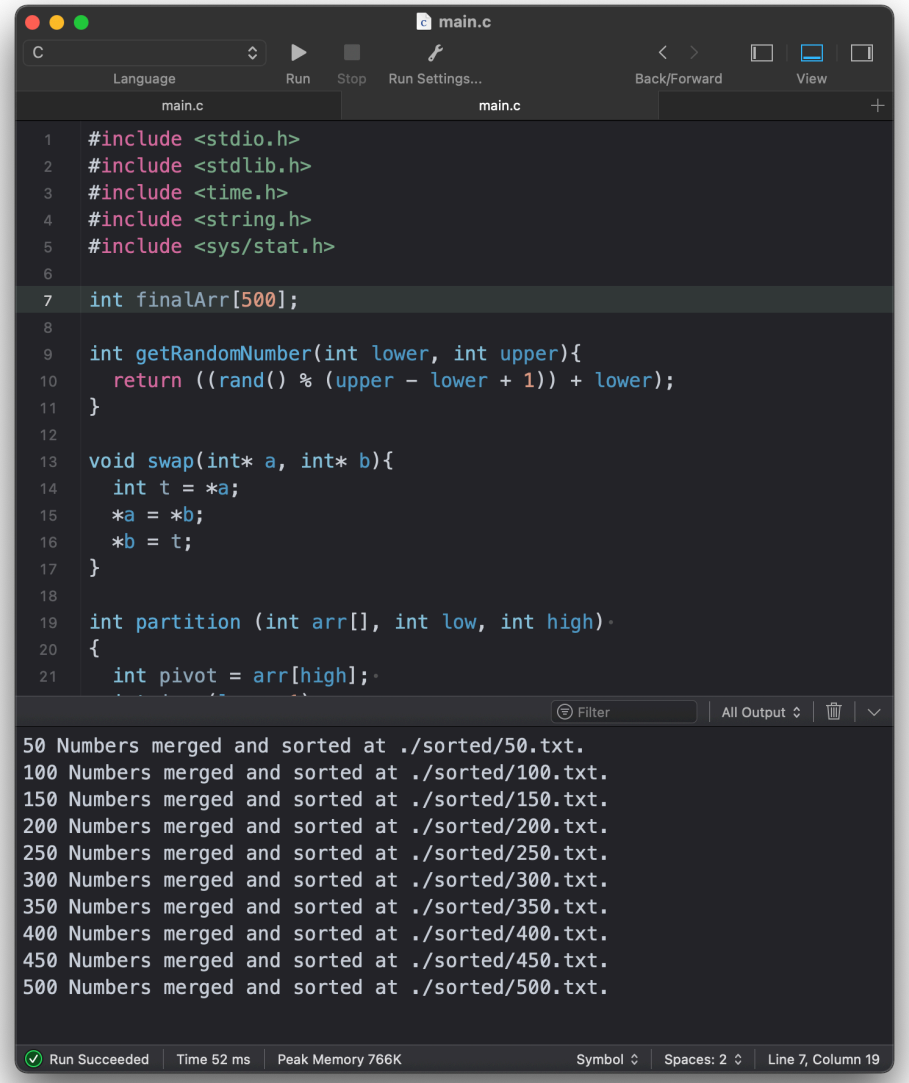
```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
#include <string.h>
#include <sys/stat.h>

int finalArr[500];

int getRandomNumber(int lower, int upper){
  return ((rand() % (upper - lower + 1)) + lower);
}

void swap(int* a, int* b){
  int t = *a;
  *a = *b;
  *b = t;
}

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++;
      swap(&arr[i], &arr[j]);
    }
  }
  swap(&arr[i + 1], &arr[high]);
  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 printArray(int A[], int size){
  int i;
  for (i = 0; i < size; i++)
    printf("%d ", A[i]);
  printf("\n");
}

void merge(int arr1[], int arr2[], int n1, int n2start, int
n2end){

  int i, j, k=0;
  int n2 = 50;
  int arr3[500];

  int L[n1], R[50];

  for (i = 0; i < n1; i++)
    L[i] = arr1[i];
  for (j = n2start; j < n2+n2start; j++)
    R[k++] = arr2[j];

  i = 0;
  j = 0;
  k = 0;
  while (i < n1 && j < 50) {
    if (L[i] <= R[j]) {
      arr3[k] = L[i];
      i++;
    }
    else {
      arr3[k] = R[j];
      j++;
    }
```

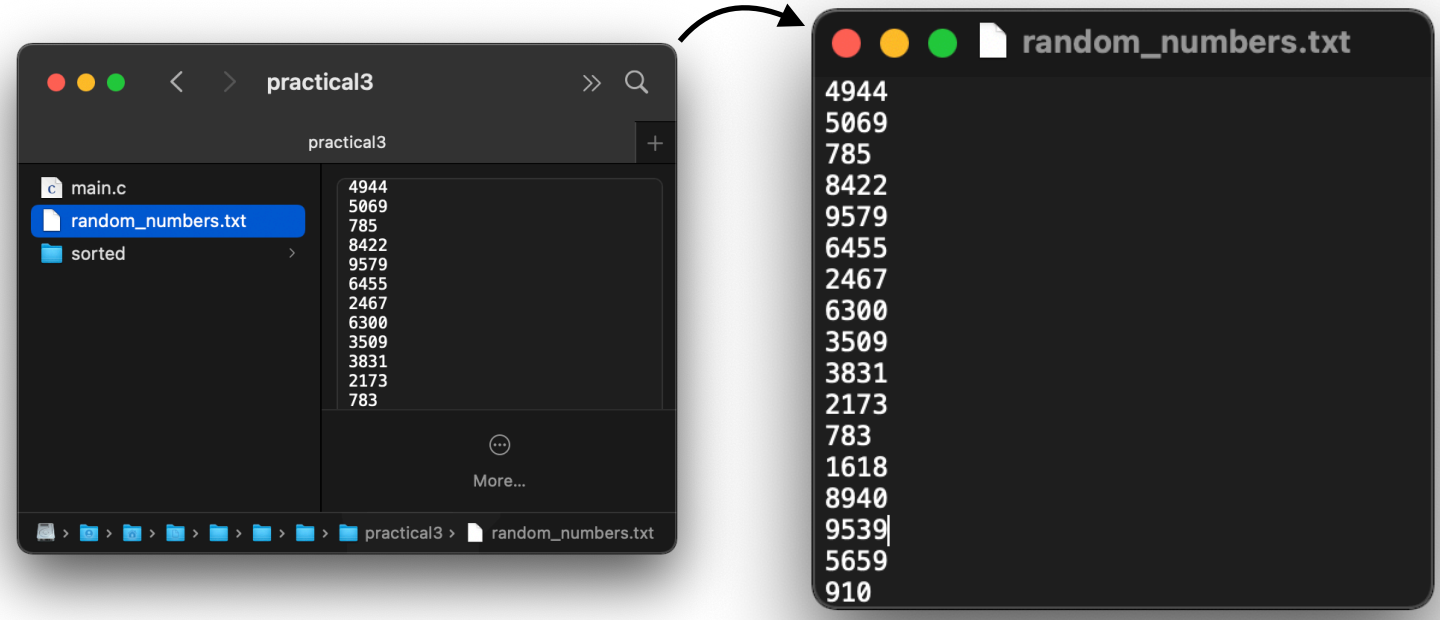
```
    k++;
  }

  while (i < n1) {
    arr3[k] = L[i];
    i++;
    k++;
  }

  while (j < 50) {
    arr3[k] = R[j];
    j++;
    k++;
  }

  char fileName[100];
  sprintf(fileName, "./sorted/%d.txt", n2end);
  printf("%d Numbers merged and sorted at %s.
\n",n2end,fileName);
  FILE* filePointer = fopen(fileName, "w");

  char str[40];
  for (int z=0; z<k; z++) {
    finalArr[z] = arr3[z];
    sprintf(str, "%d\n", arr3[z]);
    fputs(str,filePointer);
  }
  fclose(filePointer);
}


int main(){
  int lower = 1, upper = 10000, count = 500;
  srand(time(0));
  int tempInt;
  char str[12];
  int extractedNumbers[count];
  char *line = NULL;
  size_t len = 0;
  ssize_t read;

  FILE *filePointer ;
  filePointer = fopen("random_numbers.txt", "w");
```

```
//  Generating random numbers and adding in file
  for (int i=0; i<count; i++) {
    tempInt = getRandomNumber(lower, upper);
    sprintf(str, "%d\n", tempInt);
    fputs(str,filePointer);
  }

  fseek(filePointer, 0, SEEK_SET);

  //Extracting the numbers
  filePointer = fopen("random_numbers.txt", "r");

  if(filePointer==NULL){
    printf("File doesn't exists.");
  }
  else {
    int counter = 0;
    while ((read = getline(&line, &len, filePointer)) != -1) {
      extractedNumbers[counter++] = atoi(line);
    }
  }
  fclose(filePointer);

  mkdir("sorted",0777); //created directory named sorted

  int size;
  int counter = 0;

  for (int i=0; i<count/50; i++) {

    quickSort(extractedNumbers, i*50, (i+1)*50-1);

    merge(finalArr, extractedNumbers, counter, i*50,
(i+1)*50);

    counter+=50;
  }

  fclose(filePointer);

  return 0;
}
```

• **Output** :



Random numbers generated file :



Sorted numbers' individual files generated in 'sorted' folder :