Department of Computer Science and Engineering (Data Science)

Academic Year 2022-23 (Even)

Name of student: DIVYESH KHUNT_____   SAP ID:60009210116_____

Course : Design and Analysis of Algorithms Lab   Course Code:

Experimentno1

Aim:

Implementing min-max algorithm using Divide and Conquer approach.

Algorithm:

```c
#include<stdio.h>
int min = 0, max = 0 ;
void minmax (int a[], int b, int c) ;
void main() {
    int n ;
    printf("Enter no. of elements: ") ;
    scanf("%d", &n) ;
    int a[n] ;
    for(int i = 0 ; i < n ; i++) {
        printf("Enter  elements: ") ;
        scanf("%d", &a[i]) ;
    }
    min = a[0] ;
    minmax(a, 0, n-1) ;
    printf(" The min is %d ",min) ;
    printf(" The max is %d ",max) ;
}
```

```
18  void minmax (int a[], int b, int c) {
19      int mini, maxi, mid ;
20      if(b == c) {
21          maxi = a[b] ;
22          mini = a[b] ;
23          if(maxi > max) {
24              max = maxi ;
25          }
26          if(mini < min) {
27              min = mini ;
28          }
29          return ;
30      } else if(c-b == 1) {
31          if(a[b] > a[c]) {
32              maxi = a[b] ;
33              mini = a[c] ;
34          } else {
35              maxi = a[c] ;
36              mini = a[b] ;
37          }
38          if(maxi > max) {
39              max = maxi ;
40          }
41          if(mini < min) {
42              min = mini ;
43          }
44          return ;
45      } else {
46          mid = (b+c)/2 ;
47          divide(a, b, mid) ;
48          divide(a, mid+1, c) ;
49      }
50  }
```
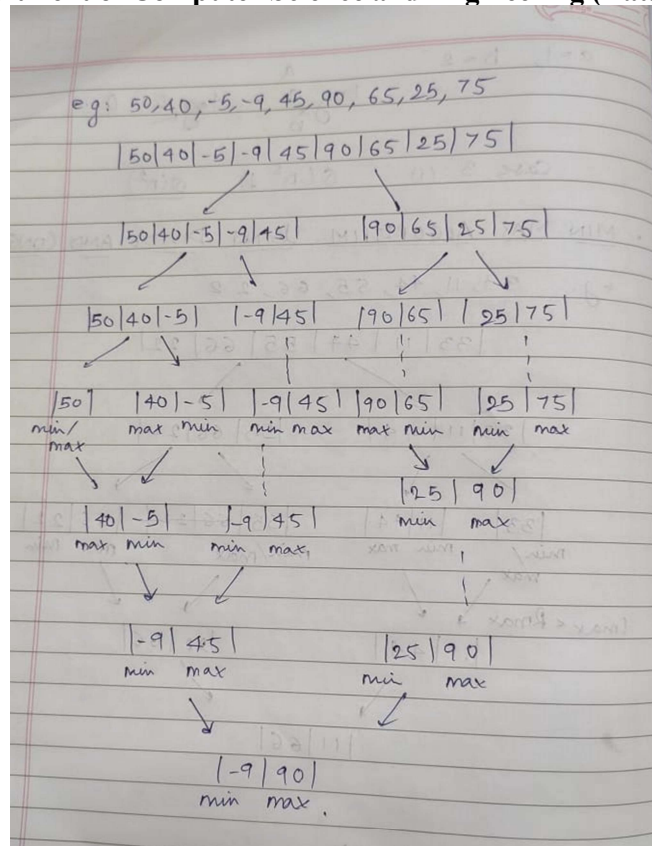
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Example:

```
Enter no. of elements: 5
Enter  elements: 2
Enter  elements: 19
Enter  elements: 12
Enter  elements: 10
Enter  elements: 6
 The min is 2  The max is 19
---------------------------------
Process exited after 10.94 seconds with return value 15
Press any key to continue . . .
```
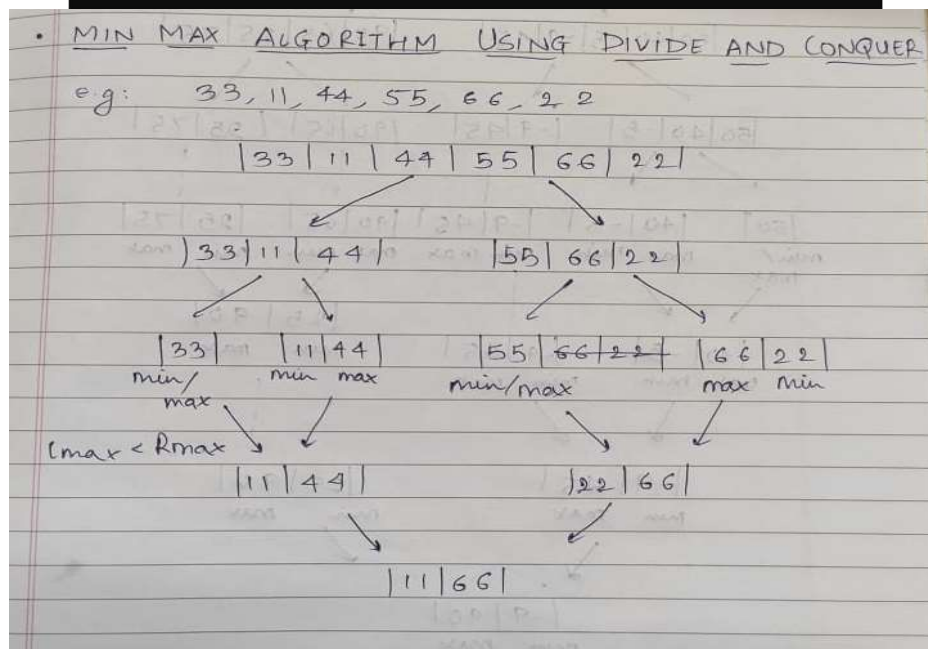
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Complexity :

This algo takes 2(n-1) comparisons in worst , best and average case. Each problems here are of size n/2.

$$T(n) = 0 \quad \text{if } n=1$$
$$= 1 \quad \text{if } n=2$$
$$= 2T(n/2)+2 \quad \text{if } n>2$$

Conclusion:

Thus the code of min max algorithm was implemented successfully using divide and conquer approach