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Question: In this project you are asked to investigate a sorting algorithm...

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Birla Institute of Tec...

37



Vandan P.
Birla Institute of Tec...

2



Rwitika C.
Indian Institute of S...

88

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In this project you are asked to investigate a sorting algorithm, called "slowsort". Write a research report, which addresses all points below.

Implement the following sorting algorithm:

```
slowsort(a,left,right);
/* sorts sub-vector a[left,right] */
{
    if (left < right)
    {
        center = (left+right) / 2;
        slowsort(a,left,center);
        slowsort(a,center+1,right);
        if (a[center] > a[right]) exchange(a[center],a[right]);
        slowsort(a,left,right-1)
    }
}
```

1. Explain why the algorithm successfully sorts. You should use an inductive argument.
2. Now run the algorithm for different n , where the vector a is defined as follows:

```
for (int i = 0 ; i < a.size(); i++)
    a[i] = 1 + (int) (1000 * (sin (1.2 * i) * sin (1.2 * i)) )
```

3. For $n = 10$ (n is the size of the vector) modify the code to report all the exchanges taking place; in the form:

```
0|868|456|195|992|78|629|730|30|962|
now exchanging element 1 and 2
0|456|868|195|992|78|629|730|30|962|
```

...

4. Now take out all write statements, add a counter to count the number of comparisons between vector elements made for $n = 20, 40, 60, \dots, 200$ and tabulate the results.
5. Now take out the counter, measure the running time for $n = 20, 40, 60, \dots, 200$, and tabulate the running time results (in seconds). (How to measure time is described on the announcement page.)

6. It can be shown that the number of comparisons $t(n) \approx A n^{(B \log_2 n)}$ for suitable constants A and B . Find values A and B that match as best as possible what you found in item 4.

[Show transcribed image text](#)

Expert Answer



Anonymous answered this
18 answers

Was this answer helpful?

2

0

```
1 #include<bits/stdc++.h>
2 using namespace std;
3
4 int slowsort(int a[], int left, int right)
5 {
6     int comp = 0;
7     if (left < right) {
8         int center = (left + right) / 2;
9         int comp1 = slowsort(a, left, center);
10        int comp2 = slowsort(a, center + 1, right);
11
12        if (a[center] > a[right]) {
13            int temp = a[center];
14            a[center] = a[right];
15            a[right] = temp;
16        }
17        int comp3 = slowsort(a, left, right-1);
18        comp = 1 + comp1 + comp2 + comp3;
19    }
20    return comp;
21 }
22
23 /* Driver program to test above functions */
24 int main()
25 {
26     int n = 20;
27     while (n <= 200) {
28         for (int i = 0; i < n; i++) {
29             a[i] = 1 + (int)(1000 * (sin(1.2 * i) * sin(1.2 * i)));
30         }
31         int comp = slowsort(a, 0, n - 1);
32         cout << "n = " << n << " comp = " << comp << endl;
33         n = n * 2;
34     }
35     return 0;
36 }
```

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```

17     cout << "passed by value : ";
18     f(1, a[1], 1);
19     cout << " : " << a[1] << " " << a[2];
20     return 0;
21 }

Compiler: Resources: Compile Log: Debug: Find Results: Close
Alert Compiler
Shorten compiler path:
Compilation results...
Errors: 0
Warnings: 0
Output Filename: C:\Users\akanksha\Documents\chegg1.exe
Output Size: 1.83244323730469 MiB
Compilation Time: 0.42s

Line: 17 Col: 29 Sel: 0 Lines: 21 Length: 588 Insert Done parsing in 0.015 seconds

C:\Users\akanksha\Documents\chegg_slowsort.cpp - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
((gicbaizi))
Project: Classes: Debug
chegg1.cpp: chegg_pokemon.cpp: [?] Untitled3: chegg_slowsort.cpp
16         a[center] = a[right];
17         a[right] = temp;
18         //now the largest value of the set from right to left is in 'a[right]'
19         //Again slowsort is called to sort the array from 'left' to 'right-1'
20         slowsort(a, left, right-1);
21     }
22 }
23
24 void printArray(int a[], int size)
25 {
26     for (int i=0; i < size; i++)
27         cout << a[i] << " ";
28     cout << endl;
29 }
30
31 /* Driver program to test above functions */
32 int main()
33 {
34     int a[20];
35     for(int i = 0; i < 20; ++i) {
36         a[i] = 1 + (int)(1000 * ( sin(1.28*i) + sin(1.2*i) ));
37     }
38     printf("Given array is \n");
39     printArray(a, 20);
40
41     slowsort(a, 0, 20 - 1);
42
43     printf("\nsorted array is \n");
44     printArray(a, 20);
45     return 0;
46 }
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Line: 15 Col: 34 Sel: 0 Lines: 78 Length: 1268 Insert Done parsing in 0.012 seconds

C:\Users\akanksha\Documents\chegg_slowsort.exe
Given array is :
1 893 372 288 915 -31 782 384 127 858 -123 592 330 -85 732 -250 343 230 -329 526
Sorted array is :
-329 -250 -123 -85 -31 1 127 230 288 330 343 372 384 526 592 732 782 858 893 915
Process exited after 0.00000 seconds with return value 0
Press any key to continue . . .

C:\Users\akanksha\Documents\chegg_slowsort.cpp - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
((gicbaizi))
Project: Classes: Debug
chegg1.cpp: chegg_pokemon.cpp: [?] Untitled3: chegg_slowsort.cpp
1 #include<iostream>
2 using namespace std;
3
4 void slowsort(int a[], int left, int right)
5 {
6     if(left < right) {
7         int center = (left + right)/2;
8         //array is divided into 2 parts (left to center, center+1 to right)
9         slowsort(a, left, center); //sorts left to center
10        slowsort(a, center + 1, right); //sorts center+1 to right
11
12        //comparing the largest value of 2 subarray
13        if(a[center] > a[right]){
14            int temp = a[center];
15            a[center] = a[right];
16            a[right] = temp;
17            cout << "Exchange : " << endl;
18            for(int i = 0; i < 10; i++) {
19                cout << a[i] << " ";
20            }
21            cout << endl;
22        }
23        //now the largest value of the set from right to left is in 'a[right]'
24        //Again slowsort is called to sort the array from 'left' to 'right-1'
25        slowsort(a, left, right-1);
26    }
27 }
28
29 void printArray(int a[], int size)
30 {
31     for (int i=0; i < size; i++)
32         cout << a[i] << " ";
33     cout << endl;
34 }
35
36 /* Driver program to test above functions */
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Line: 10 Col: 36 Sel: 0 Lines: 83 Length: 1384 Insert Done parsing in 0.015 seconds

C:\Users\akanksha\Documents\chegg_slowsort.cpp - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help

```

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```

37  /* Driver program to test above functions */
38  int main()
39  {
40      int a[10];
41      for(int i = 0; i < 10; ++i) {
42          a[i] = 1 + (int)(1000 * ( sin(1.28*i) * sin(1.2*i) ));
43      }
44      printf("Given array is \n");
45      printArray(a, 10);
46      slowsort(a, 0, 10 - 1);
47
48      printf("\nSorted array is \n");
49      printArray(a, 10);
50      return 0;
51  }
52
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```

Complex Resources Compile Log Debug Find Results

Line: 10 Col: 36 Set: 0 Lines: 83 Length: 1284 Done parsing in 0.015 seconds

Type here to search

C:\Users\akanksha\Documents\chegg_downloads

```

Given array is :
1 893 372 285 935 -11 782 384 127 850
Exchange : 1 372 893 285 935 -11 782 384 127 850
Exchange : 1 372 285 893 935 -11 782 384 127 850
Exchange : 1 285 372 893 935 -11 782 384 127 850
Exchange : 1 285 372 893 935 -11 384 127 782 850
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Exchange : 1 127 -11 285 372 384 782 850 893 935
Exchange : 1 -11 127 285 372 384 782 850 893 935
Sorted array is :
-11 3 372 285 372 384 782 850 893 935
-----
Process exited after 0.0047 seconds with return value 0
Press any key to continue . . .

```

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Questions viewed by other students

Q: What is the logical bit layout of the number-12.5 in IEEE single- precision format (float)? Separate the 3 parts by a space for readability. What is ulps(20.30) in IEEE single precision?. What number is represented by the following IEEE single-precision value? 1 10000100 101100000000000000000000 The number 20 can be expressed in binary as 1.01 times 2^4 , and 11 as 1.011times 2^3 ...

A: [See answer](#) 100% (1 rating)

Q: Assume that n is a power of two. Consider the following sorting algorithm: SLOWSORT(A[1..n]) 1: if n > 1 then 2: SLOWSORT(A[1 .. n/2]) 3: SLOWSORT(A[n/2 + 1 .. n]) 4: GATHER(A[1 .. n]) 5: end if GATHER(A[1 .. n]) 1: if n = 2 then 2: if A[1]>A[2] then 3: swap A[1] ↔ A[2] 4: end if 5: else 6: for i ← 1 to n/4 do 7: swap A[i + n/4] ↔ A[i + n/2] 8: end for 9: GATHER(A[1 .. n/2]) 1...

A: [See answer](#) 100% (1 rating)

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