GeeksQuiz

Computer science mock tests for geeks

ShellSort

ShellSort is mainly a variation of Insertion Sort. In insertion sort, we move elements only one position ahead. When an element has to be moved far ahead, many movements are involved. The idea of shellSort is to allow exchange of far items. In shellSort, we make the array h-sorted for a large value of h. We keep reducing the value of h until it becomes 1. An array is said to be h-sorted if all sublists of every h'th element is sorted.

Following is C++ implementation of ShellSort.

```
#include  <iostream>
using namespace std;

/* function to sort arr using shellSort */
int shellSort(int arr[], int n)
{
    // Start with a big gap, then reduce the gap
    for (int gap = n/2; gap > 0; gap /= 2)
    {
        // Do a gapped insertion sort for this gap size.
        // The first gap elements a[0..gap-1] are already in gapped order
        // keep adding one more element until the entire array is
        // gap sorted
        for (int i = gap; i < n; i += 1)
        {
            // add a[i] to the elements that have been gap sorted
            // save a[i] in temp and make a hole at position i
            int temp = arr[i];

            // shift earlier gap-sorted elements up until the correct
            // location for a[i] is found
            int j;
            for (j = i; j >= gap && arr[j - gap] > temp; j -= gap)
                arr[j] = arr[j - gap];

            //  put temp (the original a[i]) in its correct location
            arr[j] = temp;
        }
    }
    return 0;
}

void printArray(int arr[], int n)
{
    for (int i=0; i<n; i++)
```

```
        cout << arr[i] << " ";
}

int main()
{
    int arr[] = {12, 34, 54, 2, 3}, i;
    int n = sizeof(arr)/sizeof(arr[0]);

    cout << "Array before sorting: \n";
    printArray(arr, n);

    shellSort(arr, n);

    cout << "\nArray after sorting: \n";
    printArray(arr, n);

    return 0;
}
```

Output:

```
Array before sorting:
12 34 54 2 3
Array after sorting:
2 3 12 34 54
```

Time Complexity: Time complexity of above implementation of shellsort is $O(n^2)$. In the above implementation gap is reduce by half in every iteration. There are many other ways to reduce gap which lead to better time complexity. See this for more details.

References:

https://www.youtube.com/watch?v=pGhazjsFW28

http://en.wikipedia.org/wiki/Shellsort

Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above

Category: Searching and Sorting