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Gnome sort

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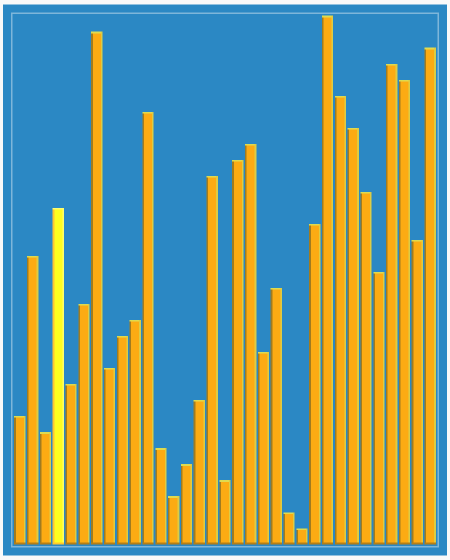
Gnome sort



Visualisation of Gnome sort.

Class	Sorting algorithm
Data structure	Array
Worst case performance	$O(n^2)$
Best case performance	$\Omega(n)$
Average case performance	$O(n^2)$
Worst case space complexity	$O(1)$ auxiliary

Gnome sort (or **Stupid sort**) is a sorting algorithm originally proposed by Dr. Hamid Sarbazi-Azad (Professor of Computer Engineering at Sharif University of Technology) in 2000 and called "stupid sort"[1] (not to be confused with bogosort), and then later on described by Dick Grune and named "gnome sort" from the observation that it is "how a gnome sorts a line of flower pots."[2] It is a sorting algorithm which is similar to insertion sort, except that moving an element to its proper place is accomplished by a series of swaps, as in bubble sort. It is conceptually simple, requiring no nested loops. The average, or expected, running time is $O(n^2)$, but tends towards $O(n)$ if the list is initially almost sorted.[3] In practice the algorithm can run as fast as insertion sort.[*citation needed*]

The algorithm always finds the first place where two adjacent elements are in the wrong order, and swaps them. It takes advantage of the fact that performing a swap can introduce a new out-of-order adjacent pair only next to the two swapped elements. It does not assume that elements forward of the current position are sorted, so it only needs to check the position directly previous to the swapped elements.

Contents [hide]

Description [edit]

Here is pseudocode for the gnome sort using a zero-based array:

```
procedure gnomeSort(a[])
    pos := 1
    while pos < length(a)
        if (a[pos] >= a[pos-1])
            pos := pos + 1
        else
            swap a[pos] and a[pos-1]
            if (pos > 1)
                pos := pos - 1
            end if
        end if
    end while
end procedure
```

Example [edit]

Given an unsorted array, a = [5, 3, 2, 4], the gnome sort would take the following steps during the while loop.

The "current position" is highlighted in **bold**:

Current array	Action to take
[5, **3**, 2, 4]	a[pos] < a[pos-1], swap:
[3, **5**, 2, 4]	a[pos] >= a[pos-1], increment pos:
[3, 5, **2**, 4]	a[pos] < a[pos-1], swap and pos > 1, decrement pos:
[3, **2**, 5, 4]	a[pos] < a[pos-1], swap and pos <= 1, increment pos:
[2, 3, **5**, 4]	a[pos] >= a[pos-1], increment pos:
[2, 3, 5, **4**]	a[pos] < a[pos-1], swap and pos > 1, decrement pos:
[2, 3, **4**, 5]	a[pos] >= a[pos-1], increment pos:
[2, 3, 4, **5**]	a[pos] >= a[pos-1], increment pos:
[2, 3, 4, 5]	pos == length(a), finished.

Optimization [edit]

The gnome sort may be optimized by introducing a variable to store the position before traversing back toward the beginning of the list. This would allow the "gnome" to teleport back to his previous position after moving a flower pot. With this optimization, the gnome sort would become a variant of the insertion sort. The animation in the introduction to this topic takes advantage of this optimization.

Here is pseudocode for an optimized gnome sort using a zero-based array:

```
procedure optimizedGnomeSort(a[])
    pos := 1
    last := 0
    while pos < length(a)
        if (a[pos] >= a[pos-1])
            if (last != 0)
                pos := last
                last := 0
            end if
            pos := pos + 1
        else
            swap a[pos] and a[pos-1]
            if (pos > 1)
                if (last == 0)
                    last := pos
                end if
                pos := pos - 1
            else
                pos := pos + 1
            end if
        end if
    end while
end procedure
```

References [edit]

1. ^ Sarbazi-Azad, Hamid (2 October 2000). "Stupid Sort: A new sorting algorithm" (PDF). *Newsletter* (Computing Science Department, Univ. of Glasgow) (599): 4. Retrieved 25 November 2014.
2. ^ http://www.dickgrune.com/Programs/gnomesort.html
3. ^ Paul E. Black. "gnome sort". *Dictionary of Algorithms and Data Structures*. U.S. National Institute of Standards and Technology. Retrieved 2011-08-20.

External links [edit]

- Gnome sort

The Wikibook *Algorithm implementation* has a page on the topic of: ***Gnome sort***

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