Exp-2.3

Title:

Optimized Bubble Sort with Early Stop

Aim:

To implement a Bubble Sort algorithm that detects if the list is already sorted during any pass and stops early to improve efficiency.

Procedure:

1. Take input size n and the array.
2. Perform Bubble Sort with a flag to monitor swaps during each pass.
3. For each pass, compare adjacent elements and swap if needed.
4. If no swaps occur during a pass, it means the list is sorted, so stop early.
5. Print the sorted array.

Algorithm:

1. Start
2. For each pass from 0 to n-1:
    - Set a flag swapped to False.
    - For each adjacent pair in unsorted part of the array:
        - Swap if the order is wrong.
        - Set swapped to True.
    - If swapped is False after the pass, break early (list is sorted).
3. End with sorted array.

Input:

```
6
5 1 4 2 8 0
```

Output:

```
0 1 2 4 5 8
```

Program:

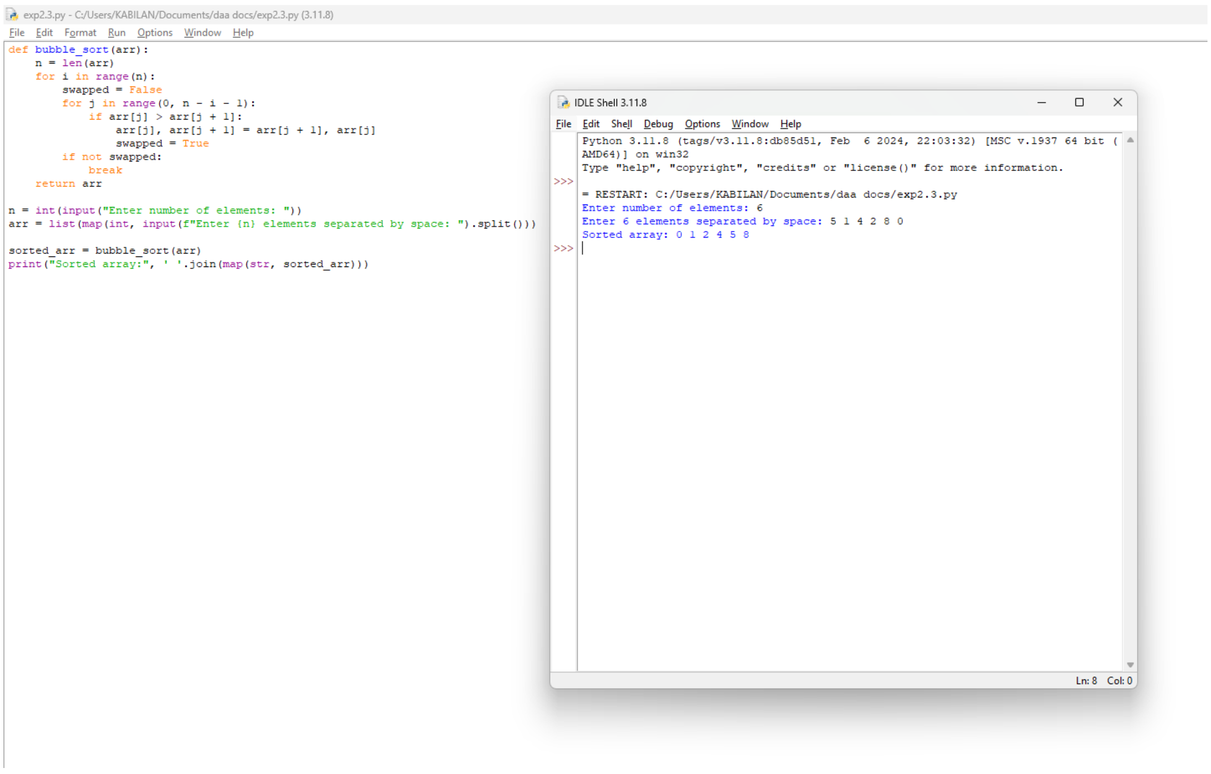
```
def bubble_sort(arr):
    n = len(arr)
    for i in range(n):
        swapped = False
        for j in range(0, n - i - 1):
            if arr[j] > arr[j + 1]:
                arr[j], arr[j + 1] = arr[j + 1], arr[j]
                swapped = True
        # If no two elements were swapped in the inner loop, break
        if not swapped:
            break
    return arr
n = int(input("Enter number of elements: "))
arr = list(map(int, input(f"Enter {n} elements separated by space: ").split()))

sorted_arr = bubble_sort(arr)
print("Sorted array:", ' '.join(map(str, sorted_arr)))
```

Performance Analysis:

Time Complexity: O(n). Best cases , O(n^2) worst cases

Space Complexity: O(1)

Program Output:


exp2.3.py - C:/Users/KABILAN/Documents/daa docs/exp2.3.py (3.11.8)
File Edit Format Run Options Window Help
IDLE Shell 3.11.8
File Edit Shell Debug Options Window Help
Ln: 8 Col: 0

```python
def bubble_sort(arr):
    n = len(arr)
    for i in range(n):
        swapped = False
        for j in range(0, n - i - 1):
            if arr[j] > arr[j + 1]:
                arr[j], arr[j + 1] = arr[j + 1], arr[j]
                swapped = True
        if not swapped:
            break
    return arr

n = int(input("Enter number of elements: "))
arr = list(map(int, input(f"Enter {n} elements separated by space: ").split()))

sorted_arr = bubble_sort(arr)
print("Sorted array:", ' '.join(map(str, sorted_arr)))
```

```
Python 3.11.8 (tags/v3.11.8:db85d51, Feb  6 2024, 22:03:32) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:/Users/KABILAN/Documents/daa docs/exp2.3.py
Enter number of elements: 6
Enter 6 elements separated by space: 5 1 4 2 8 0
Sorted array: 0 1 2 4 5 8
>>>
```

Result:

Thus the given program Optimized Bubble Sort is executed and got output successfully.