Mathematical Physics II

Bubble Sort using Python

- **Bubble Sort Process:**

  Here we shall explain this process pictorially with an example. Let we have a set of 6 numbers in random order and we want to arrange them in ascending order. The given set of number is:

40	100	20	5	3	-1

  In bubble sort method, one starts with first two elements in the given set, which has been marked in red and blue colour here. These two elements are compared and their positions are interchanged as per the requirement of ordering. If they already satisfy the condition then their positions will remain same. After that, the numbers in the 2nd and 3rd positions are compared and properly arranged in the same manner. This process continues till the selected pair reaches the last two elements of the set, which completes a single sweep. At the end of the first sweep the largest number in case of ascending order (and the smallest number in case of descending order) is placed at the right most position. In the next sweep the same process starts from the left most pair but ends just before the last element, while the last place is already occupied by the largest number in the previous sweep. In this way the length of each consecuitive sweep is reduced by one single position, while the rest of the elements are already arranged in order by the previous sweeps. If this process continues, finally we get an ordered number set satisfying the requirement.

  In the following example the first sweep for a set of unsorted numbers is depicted:

- **Step1:**

initial	40	100	20	5	3	-1
final	40	100	20	5	3	-1

No Change

- **Step2:**

initial	40	100	20	5	3	-1
final	40	20	100	5	3	-1

Position of 20 and 100 has been interchanged

- **Step3:**

initial	40	20	100	5	3	-1
final	40	20	5	100	3	-1

Position of 100 and 5 has been interchanged

- **Step4:**

initial	40	20	5	100	3	-1
final	40	20	5	3	100	-1

Position of 100 and 3 has been interchanged

- **Step5:**

initial	40	20	5	3	100	-1
final	40	20	5	3	-1	100

100 is placed at the right most position

From the above pictorial presentation it is clear how numbers are arranged by comparing the value of two numbers located in adjacent position in bubble sort method. In each successive step the larger number (in case of ascending order) shifts towards right and hence finally the largest number is filtered and stored at the rightmost position. In this way we get an ordered number set as per our requirement.

Sample python program for the above example and the output is shown in the next page.

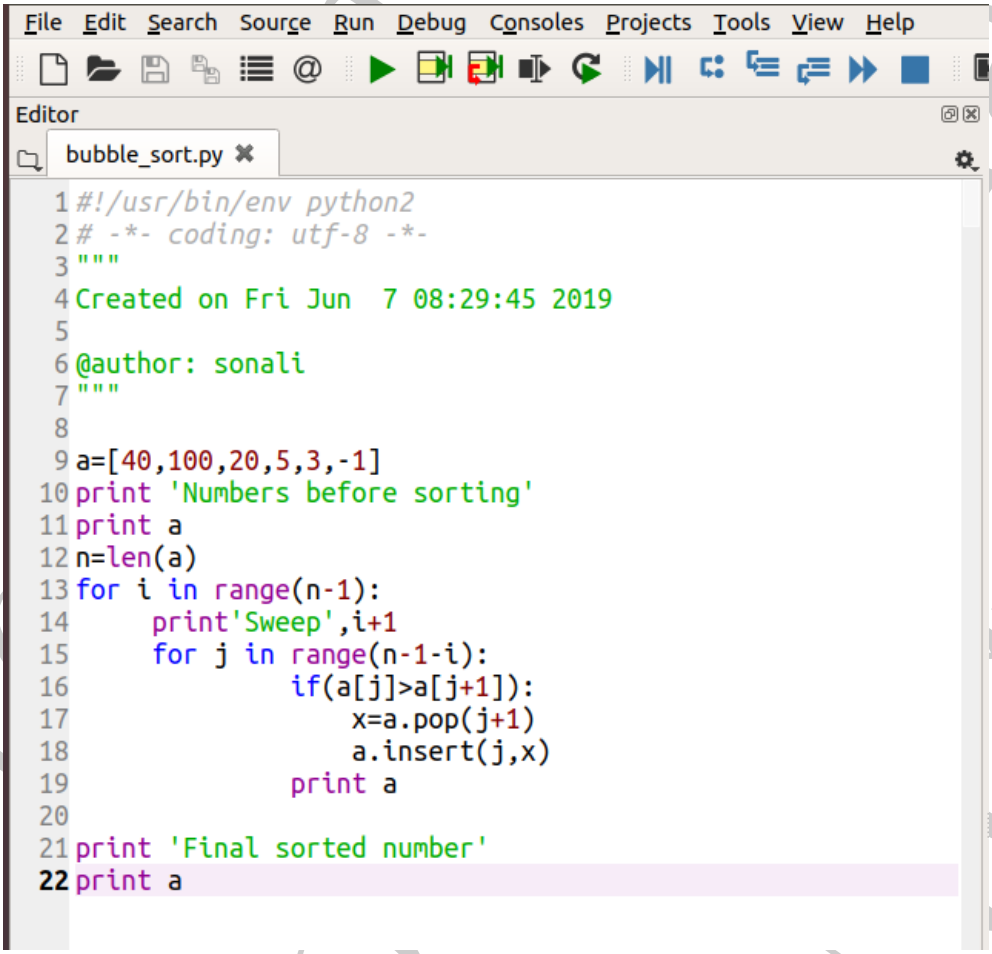

Figure 1: Python program for bubble sort.

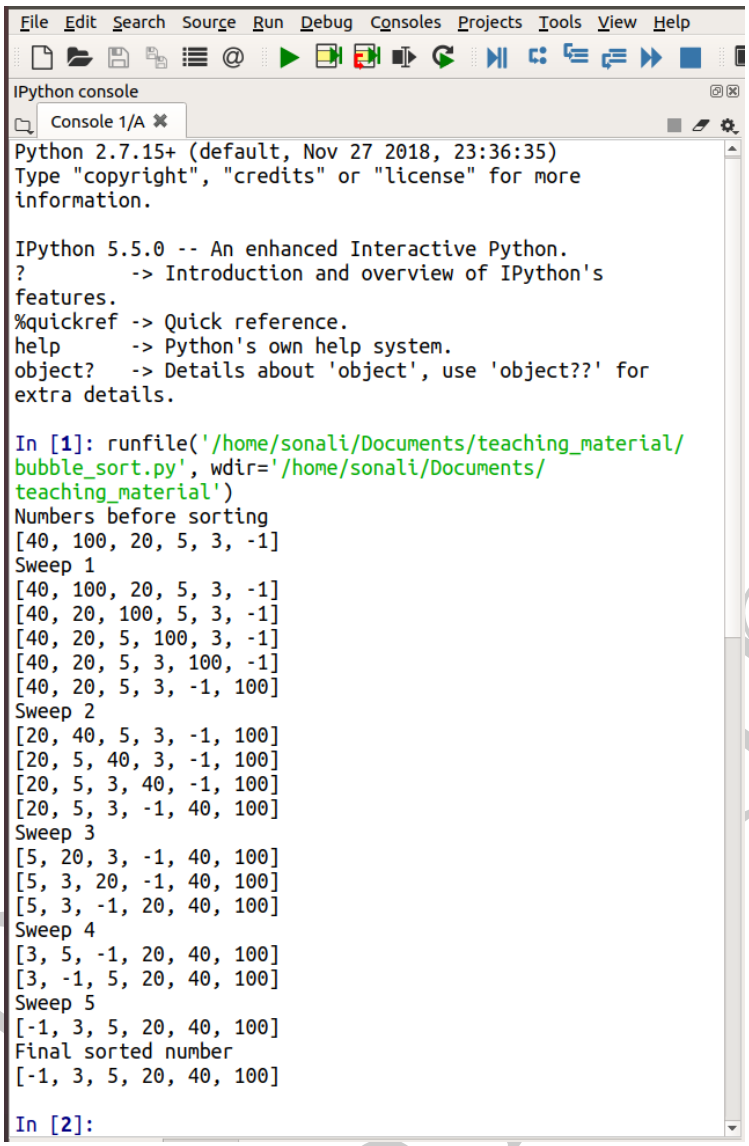

Figure 2: Output of the Python code for bubble sort displaying outcome of each sweep for each step.