Date: 27-01-2021 Exp. 3 Sorting in Ascending and Descending Order

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Aim:

To write an assembly language program to arrange numbers in ascending and descending order and hence print the largest and smallest in the array using bubble sort.

Tool Used:

Assembler - MASM 611

Algorithm:

Step 1: Start

Step 2: Store the Fifteen numbers in an array

Step 3: Compare each number with their adjacent numbers and swap according to the requirement of getting ascending or descending respectively.

Step 4: Observe the output and verify the results

Step 5: End

Repeat this procedure for complete series (n-1) times. After n-1 iterations you will get the largest number at the end of the series and smallest at the beginning of the series.

Program:

```
ASSUME CS: CODE, DS:DATA

DATA SEGMENT

ARRAY1 DB 54H, 67H, 47H, 11H, 51H, 61H, 45H, 76H, 74H, 12H, 15H, 16H, 20H,
11H, 97H

MIN DB 00H

ARRAY2 DB 54H, 67H, 47H, 11H, 51H, 61H, 45H, 76H, 74H, 12H, 15H, 16H, 20H,
11H, 97H

MAX DB 00H

DATA ENDS

CODE SEGMENT

START:

        MOV AX, DATA

        MOV DS, AX

        XOR AX, AX

        MOV CH, 0EH

L1:     MOV CL, 0EH

        LEA SI, ARRAY1

L2:     MOV AL, [SI]

        MOV BL, [SI+1]

        CMP AL, BL

        JC DOWN

        MOV DL, [SI+1]

        XCHG [SI], DL
```

```
        MOV[SI+1], DL
        DOWN: INC SI
        DEC CL
        JNZ L2
        DEC CH
        JNZ L1
        LEA SI, ARRAY1
        MOV AL, [SI]
        MOV MIN, AL
L3:     MOV CL, 0EH
        LEA SI, ARRAY2
L4:     MOV AL, [SI]
        MOV BL, [SI+1]
        CMP AL, BL
        JNC UP
        MOV DL, [SI+1]
        XCHG [SI], DL
        MOV [SI+1], DL
        UP: INC SI
        DEC CL
        JNZ L4
        DEC CH
        JNZ L3
```

```
        LEA SI, ARRAY2
        MOV AL, [SI]
        MOV MAX, AL
HLT

CODE ENDS
END START
```

Sample Input:

54,67,47,11,51,61,45,76,74,12,15,16,20,11,97

Sample Output:

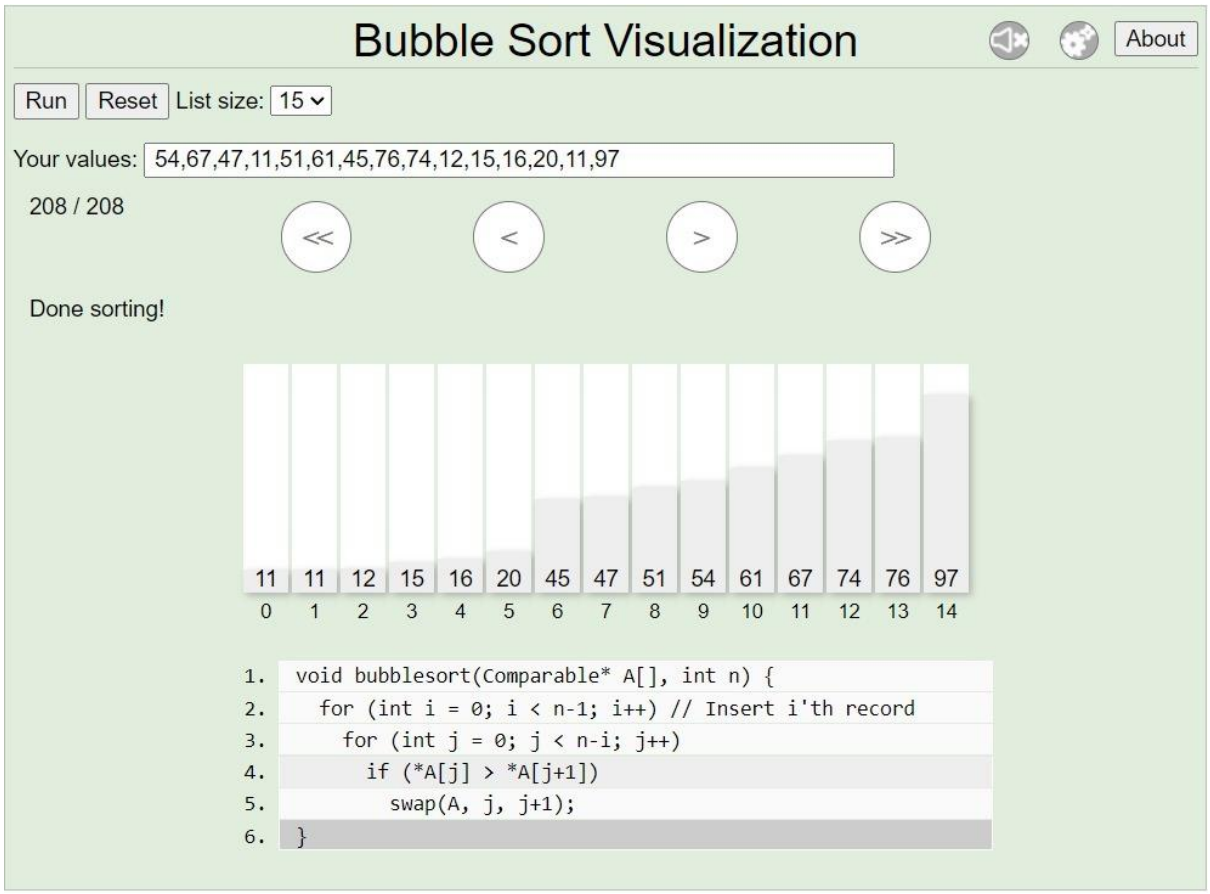
Ascending: 11,11,12,15,16,20,45,47,51,54,61,67,74,76,97

Descending: 97,76,74,67,61,54,51,47,45,20,16,15,12,11,11

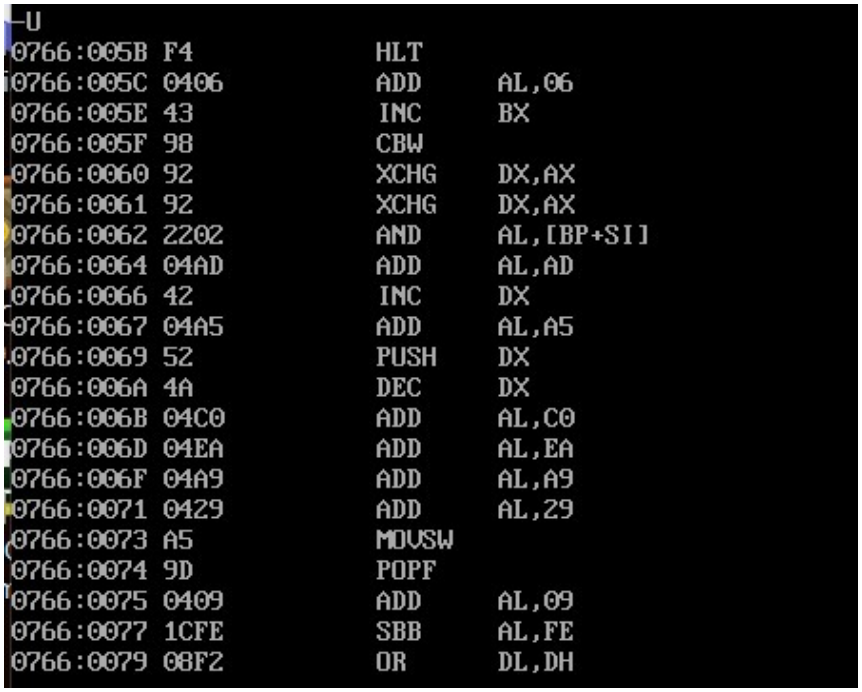
Minimum element: 11

Maximum element: 97

Manual Verification:



Register/ Memory Contents for I/O:



Snapshot of the Output:

```
-g 005B

AX=0097  BX=0011  CX=0000  DX=0076  SP=0000  BP=0000  SI=0010  DI=0000
DS=0764  ES=0754  SS=0763  CS=0766  IP=005B   NV UP EI PL ZR NA PE NC
0766:005B F4            HLT
-D 0764:0000 001F
0764:0000  11 11 12 15 16 20 45 47-51 54 61 67 74 76 97 11   ..... EGQTagtv..
0764:0010  97 76 74 67 61 54 51 47-45 20 16 15 12 11 11 97   .vtgaTQGE ......
-
```

Result:

The elements in the respective arrays were arranged in ascending and descending order using bubble sort and smallest and largest numbers were printed.