**Experiment Name:**

Write a procedure BUBBLE to sort a byte array by the bubble sort algorithm. The procedure receives the offset address of the array in the SI and the number of elements in the BX. Write a program that lets the user type a list of single digit numbers, with one blank between numbers, calls BUBBLE to sort them and prints the sorted list on the next line.

**Theory:**

The objective of this program is to sorting the a list of single digit numbers using bubble sort algorithm where BUBBLE named procedure will be used. Stack and Array are needed to perform the I/O operation. For this program in assembly, While loop, CMP, Stack, XCHG, BUBBLE procedure were used as well as the required instructions and some registers to execute the solution.

**Code:**

.MODEL SMALL

.STACK 100H

.DATA

P1 DB 'Enter the time in seconds (0 to 65535) = $'

P2 DB 0DH,0AH,'Time in hh:mm:ss format= $'

COLON DB ' : $'

.CODE

.MODEL SMALL

.STACK 100H

.DATA

PROMPT\_1 DB 'Enter single digit numbers: $'

PROMPT\_2 DB 0DH,0AH,'After BUBBLE sorting : $'

ARRAY DB 100 DUB (0)

.CODE

MAIN PROC

MOV AX, @DATA

MOV DS, AX

LEA DX, PROMPT\_1

MOV AH, 9

INT 21H

XOR CX,CX

MOV AH,1

INT 21H

XOR SI,SI

C:

CMP AL,0DH

JE END\_WHILE

MOV ARRAY[SI],AL

INC SI

INC CX

MOV AH,2

MOV DL,' '

INT 21H

MOV AH,1

INT 21H

JMP C

END\_WHILE:

MOV AH,2

MOV DL,0DH

INT 21H

MOV DL,0AH

INT 21H

JCXZ EXIT

LEA SI,ARRAY

MOV BX,CX

CALL BUBBLE

MOV AH,9

LEA DX,PROMPT\_2

INT 21H

XOR SI,SI

TOP:

MOV AH,2

MOV DL,ARRAY[SI]

INT 21H

MOV DL,' '

INT 21H

INC SI

LOOP TOP

EXIT:

MOV AH,4CH

INT 21H

MAIN ENDP

BUBBLE PROC

PUSH AX

PUSH BX

PUSH CX

PUSH DX

PUSH DI

MOV AX, SI

MOV CX, BX

DEC CX

@OUTER\_LOOP:

MOV BX, CX

MOV SI, AX

MOV DI, AX

INC DI

@INNER\_LOOP:

MOV DL, [SI]

CMP DL, [DI]

JNG @SKIP\_EXCHANGE

XCHG DL, [DI]

MOV [SI], DL

@SKIP\_EXCHANGE:

INC SI

INC DI

DEC BX

JNZ @INNER\_LOOP

LOOP @OUTER\_LOOP

POP DI

POP DX

POP CX

POP BX

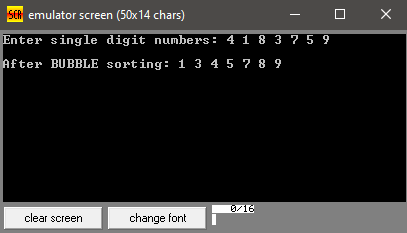
POP AX

RET

BUBBLE ENDP

END MAIN

**Output:**

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**Discussion:**

In the above program, a list of single digit numbers was taken as input from the user and then in C loop block an ARRAY[] was used to take the list of numbers from the user until the user hits the ENTER and SI was used for indexing. Then the procedure BUBBLE was called. In the BUBBLE procedure, AX,BX,CX,DX,DI these registers were pushed into the stack, Then SI and BX were moved into AX,CX respectively and CX was decremented by 1. Then after moving CX,AX into BX,SI respectively in a @OUTER\_LOOP , AX was again moved into DI and DI was incremented by 1. Then in a @INNER\_LOOP, it was compared in between two consecutive numbers whether the left one is greater than the right one, if so then XCHG was used to swap them otherwise not swapped. At the end of BUBBLE procedure, DI,DX,DX,CX,BX,AX was popped from the stack and RET was used to return the stack into the main program. Then using DL proper output of bubble sorted array was printed. Thus the program was successfully executed.