**Experiment 06: String Operations Part-II**

**Learning Objective**: Student should be able to apply string operations such as:

(i) Accept

(ii) Display

(iii) Reverse

(iv) Palindrome in ALP.

**Tools:** TASM/MASM

**Theory:**

**String Instruction:**

1. **REP (repeat):**

* This is an instruction prefix, which can be used in string instructions.
* It can be used along with any of the above string instructions only.
* It causes the instruction to be repeated CX number of times.
* After each execution, the SI and DI register are incremented/ decremented based on the DF (Direction flag) in the flag register and CX is decremented. i.e. DF = 1; SI,DI decrements.
* Thus it is important that before we use the REP instruction prefix the following steps must be carried out:
* CX must be initialized to the count value.
* If auto decrementing is required, DF must be cleared using CLD instruction else set using STD instruction.
* Eg:      MOV CX, 0023H
  + CLD

REP MOVSB

.

. .

The above section of a program will cause the following string operation.

MOVSB;ES:[DI]🡨 DS:[SI], CX🡨CX – 1, SI🡨SI + 1, DI🡨DI + 1

To be executed 23H times (as CX = 23H) in auto incrementing mode (as DF is cleared).

1. **REPZ/ REPE (repeat on Zero/ Equal):**

* It is a conditional repeat instruction prefix.
* It behaves the same as a REP instruction provided the Zero Flag is set

(i.e. ZF = 1).

1. **REPNZ/ REPNE (repeat on No Zero/ Not Equal):**

* It is a conditional repeat instruction prefix.
* It behave the same as a REP instruction provided the Zero Flag is reset (i.e. ZF = 0).

**Explanation :**

Using Macro display the Menu for entering string, calculate length, reverse, palindrome and exit. Accept the choice from user using INT 21H function 01H.

If choice = 1, call procedure for accepting string. Using interrupt INT 21H, function 0AH accept the string and end procedure. Return back to display Menu.

If choice = 2, call procedure to display string and return back to display Menu. (Repeat the process to enter second string)

If choice = 3, call procedure to reverse the string. Display the reversed string and return back to display Menu.

If choice = 4, call procedure to find palindrome of string. If string is palindrome, display palindrome otherwise display String is not palindrome.

If choice = 5, terminate the program. If any other key is pressed display invalid choice.

**5. Procedure/Algorithm:**

**Algorithm:**

Step I: Initialize the data and stack memory.

Step II: Using Macro display Menu.

1. Accept 2. Display 3. Reverse 4. Palindrome 5. Exit.

Step III: Accept choice from user using INT 21H, function 01H.

Step IV: IS choice = 1 jump to step XI else goto step V.

Step V: IS choice = 2 jump to step XIV else goto step VI.

Step VI: IS choice = 3 jump to step XVII else goto step VII.

Step VII: IS choice = 4 jump to step XX else goto step VIII.

Step VIII: IS choice = 5 jump to step XXIII else goto step IX.

Step IX: Display Wrong choice.

Step X: Jump to step II.

Step XI: Call procedure accept.

Step XII: Accept string using INT 21H, function 0AH.

Step XIII: Return to main program and goto step II.

Step XIV: Call procedure display.

Step XV: display string using INT 21H, function 02H.

Step XVI: Return back to main program and jump to step II.

Step XVII: Call procedure Reverse.

Step XVIII: Reverse the string and display.

Step XIX: Return back to main program and jump to step II.

Step XX: Call procedure Palindrome.

Step XXI: Check if string is palindrome. If yes display string is palindrome otherwise are string is not palindrome.

Step XXII: Return back to main program and jump to step II.

Step XXIII: Terminate the program and stop.

**Application:** Use of string operations in the Assembly Language programming to write modular program.

**Design:**

**Result and Discussion:**

**Code:**

.MODEL SMALL

.STACK

.DATA

M1 DB 10,13,"STRING ACCEPT: $"

M2 DB 10,13,"STRING LENGTH: $"

M3 DB 10,13,"STRING DISPLAY: $"

M4 DB 10,13,"STRING REVERSE: $"

M5 DB 10,13,"STRING PALINDROME $"

M6 DB 10,13,"STRING NOT PALINDROME $"

STR DB 50,?,50 DUP(?)

STR1 DB 50,?,50 DUP(?)

LEN DB ?

.CODE

DISP MACRO XX

MOV AH,09

LEA DX,XX

INT 21H

ENDM

.STARTUP

DISP M1

MOV AH,0AH ;ENTER STRING

LEA DX,STR

INT 21H

DISP M2

LEA SI,STR+1 ;LENGTH

MOV CL,[SI]

MOV LEN,CL

MOV DL,CL ;

ADD DL,30H

MOV AH,02

INT 21H

DISP M3

MOV CL,LEN

LEA SI,STR+2

BACK:

MOV DL,[SI]

MOV AH,02

INT 21H

INC SI

DEC CL

JNZ BACK

MOV CL,LEN

MOV CH,CL

LEA SI,STR+2

LEA DI,STR1+2

BACK1:

INC SI

DEC CL

JNZ BACK1

DEC SI

DISP M4

BACK2:

MOV DL,[SI]

MOV [DI],DL

MOV AH,02 ;DISPLAY

INT 21H

DEC SI

INC DI

DEC CH

JNZ BACK2

MOV CL,LEN

LEA SI,STR+2

LEA DI,STR1+2

BACK3:

MOV DL,[SI]

CMP DL,[DI]

JNZ AA

INC SI

INC DI

DEC CL

JNZ BACK3

DISP M5 ;PALINDROME

JMP LAST

AA:

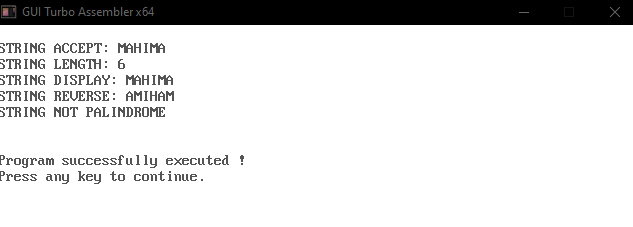
DISP M6 ;NOT PALINDROME

LAST:

.EXIT

END

**Output:**

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**Learning Outcomes:** The student should have the ability to

LO1: List the string instructions

LO2: Describe the string addressing mode.

LO3: Use of string instructions in the program to perform different string operations.

**Course Outcomes**: Upon completion of the course students will be able to make use of instructions of 8086 to build assembly and Mixed language programs.

**Conclusion:**

**Viva Questions:**

1. Which function is used to accept a string?
2. Explain the procedure to reverse a string
3. Explain the procedure to check whether a string is palindrome or not.

For Faculty Use

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