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Title:	Program to find whether given string is palindrome or not
Date of Performance:	
Date of Submission:	
Marks:	
Sign of Faculty:	

Aim: Assembly Language Program to find given string is Palindrome or not.

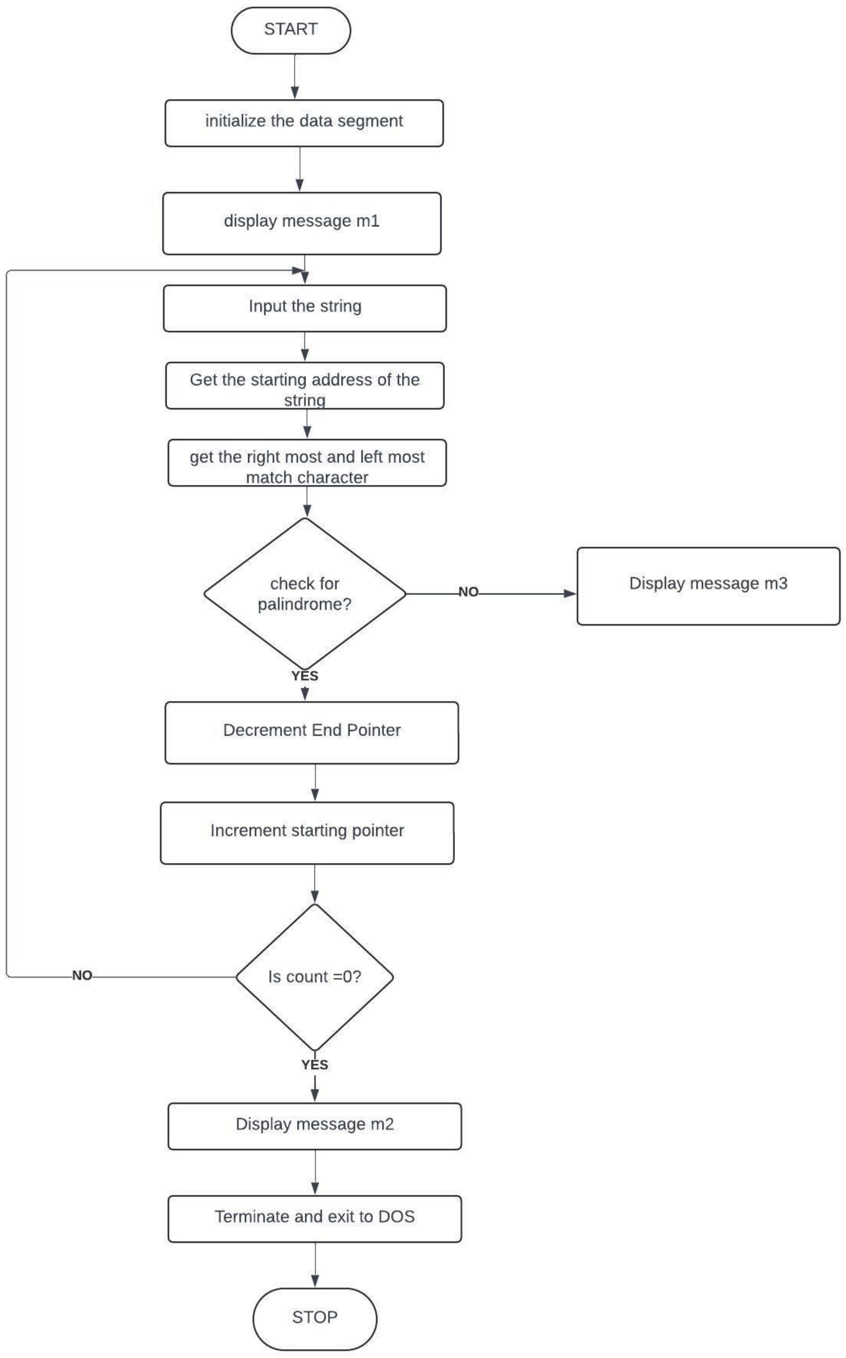
Theory:

A palindrome string is a string when read in a forward or backward direction remains the same. One of the approach to check this is iterate through the string till middle of the string and compare the character from back and forth.

Algorithm:

1. Initialize the data segment.
2. Display the message M1
3. Input the string
4. Get the string address of the string
5. Get the right most character
6. Get the left most character
7. Check for palindrome.
8. If not Goto step 14
9. Decrement the end pointer
10. Increment the starting pointer.
11. Decrement the counter
12. If count not equal to zero go to step 5
13. Display the message m2
14. Display the message m3
15. To terminate the program using DOS interrupt
    a. Initialize AH with 4ch
    b. Call interrupt INT 21h
16. Stop

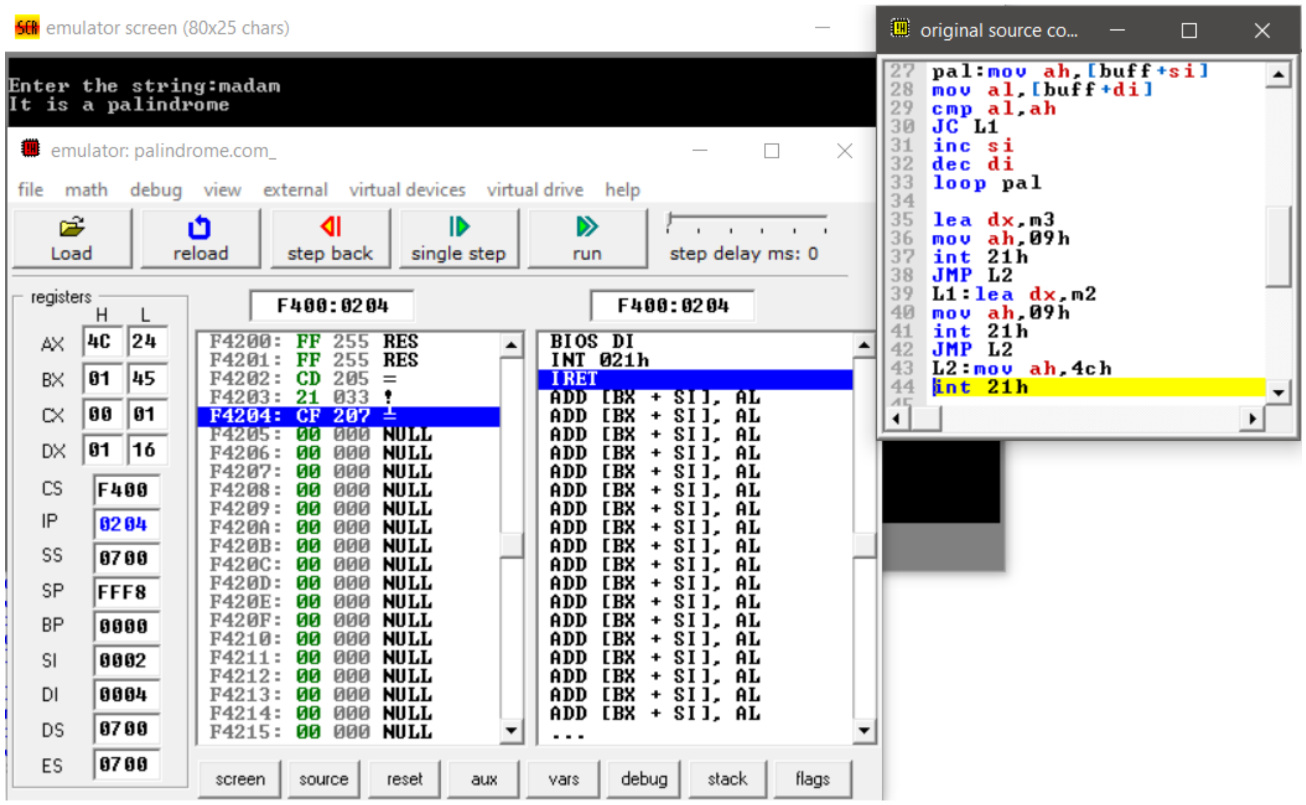
Flowchart:


START
initialize the data segment
display message m1
Input the string
Get the starting address of the string
get the right most and left most match character
check for palindrome?
NO
Display message m3
YES
Decrement End Pointer
Increment starting pointer
Is count =0?
NO
YES
Display message m2
Terminate and exit to DOS
STOP

Program:

```
      org 100h

.data
m1 db 10,13,'Enter the string:$'
m2 db 10,13,'It is a palindrome$'
m3 db 10,13,'It is not a palindrome$'
buff db 80

.code
lea dx,m1
mov ah, 09h
int 21h

lea dx,buff
mov ah,0ah
int 21h


lea bx, buff+1
mov si,01h

mov ch,00h
mov cl,[buff+1]
mov di,cx
sar cl,1

pal:mov ah,[buff+si]
    mov al,[buff+di]
    cmp al,ah
    JC L1
    inc si
    dec di
    loop pal

    lea dx,m3
    mov ah,09h
    int 21h
    JMP L2
  L1:lea dx,m2
     mov ah,09h
     int 21h
     JMP L2
  L2:mov ah,4ch
     int 21h
```

Output:


emulator screen (80x25 chars)
original source co...
emulator: palindrome.com_
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
screen source reset aux vars debug stack flags

```
Enter the string:madam
It is a palindrome
```

```
pal:mov ah,[buff+si]
mov al,[buff+di]
cmp al,ah
JC L1
inc si
dec di
loop pal

lea dx,m3
mov ah,09h
int 21h
JMP L2
L1:lea dx,m2
mov ah,09h
int 21h
JMP L2
L2:mov ah,4ch
int 21h
```

```
registers
     H   L
AX   4C  24
BX   01  45
CX   00  01
DX   01  16
CS   F400
IP   0204
SS   0700
SP   FFF8
BP   0000
SI   0002
DI   0004
DS   0700
ES   0700
```

```
F400:0204                     F400:0204

F4200:  FF 255 RES            BIOS DI
F4201:  FF 255 RES            INT 021h
F4202:  CD 205 =              IRET
F4203:  21 033 !              ADD [BX + SI], AL
F4204:  CF 207 ±              ADD [BX + SI], AL
F4205:  00 000 NULL           ADD [BX + SI], AL
F4206:  00 000 NULL           ADD [BX + SI], AL
F4207:  00 000 NULL           ADD [BX + SI], AL
F4208:  00 000 NULL           ADD [BX + SI], AL
F4209:  00 000 NULL           ADD [BX + SI], AL
F420A:  00 000 NULL           ADD [BX + SI], AL
F420B:  00 000 NULL           ADD [BX + SI], AL
F420C:  00 000 NULL           ADD [BX + SI], AL
F420D:  00 000 NULL           ADD [BX + SI], AL
F420E:  00 000 NULL           ADD [BX + SI], AL
F420F:  00 000 NULL           ADD [BX + SI], AL
F4210:  00 000 NULL           ADD [BX + SI], AL
F4211:  00 000 NULL           ADD [BX + SI], AL
F4212:  00 000 NULL           ADD [BX + SI], AL
F4213:  00 000 NULL           ADD [BX + SI], AL
F4214:  00 000 NULL           ADD [BX + SI], AL
F4215:  00 000 NULL           ...
```

Conclusion: We successfully implemented a program to determine whether a given string is a palindrome or not. The program accepts a string input from the user, then iterates through the characters of the string to compare the characters at corresponding positions from the beginning and end of the string. If all characters match, the program concludes that the string is a palindrome; otherwise, it identifies the string as not a palindrome.

1. Explain SAR INSTRUCTION

Ans. The SAR instruction in x86 assembly language stands for "Shift Arithmetic Right.

Purpose: SAR is used to perform a right shift operation on binary data, preserving the sign bit. It shifts the bits of the operand to the right by a specified number of positions.

Syntax: SAR destination, count

Operation: SAR shifts the bits of the destination operand to the right by the number of bit positions specified by the count operand. If the count is greater than 1, the vacated bits are filled with copies of the original sign bit (0 for positive numbers, 1 for negative numbers). If the count is 1, the original sign bit is shifted into the carry flag, and the destination operand is shifted right by one position.

Flags: The flags affected by SAR include CF (carry flag), OF (overflow flag), SF (sign flag), ZF (zero flag), and PF (parity flag). CF is set to the value of the last bit shifted out (the least significant bit before shifting). OF is set if the sign of the operand changes due to the shift (i.e., if the sign bit changes). SF is set according to the sign bit of the result. ZF is set if the result is zero. PF is set according to the parity of the result.

Usage: SAR is commonly used in various arithmetic and logical operations where right-shifting with sign extension is required, such as division by powers of two or signed integer division. It is also used in bit manipulation tasks and data encryption algorithms.

2. Explain DAA instruction.

Ans. The DAA instruction, which stands for "Decimal Adjust Accumulator," is used in x86 assembly language to adjust the result of an addition operation in binary-coded decimal (BCD) format to ensure it represents a valid BCD number. Here's a breakdown of its functionality:

Purpose:

- DAA is used specifically after addition operations involving BCD numbers.
- Its purpose is to adjust the result of the addition to ensure that it remains a valid BCD representation.

Operation:

- After an addition operation involving BCD numbers, DAA examines the content of the accumulator (AL register) to determine if any adjustment is necessary.
- If the low 4 bits of AL (bits 0-3) represent a value greater than 9 or if the Auxiliary Carry flag (AF) is set, DAA adds 6 to AL. This corrects any invalid BCD digits in the low nibble, ensuring they remain in the range of 0 to 9.
- If the high 4 bits of AL (bits 4-7) represent a value greater than 9, or if the Carry flag (CF) is set, DAA adds 96 to AL. This corrects any carry-over from the low nibble to the high nibble.
- The final result is a valid BCD representation in AL.

Flags:

- DAA affects the Carry flag (CF), Auxiliary Carry flag (AF), Sign flag (SF), Zero flag (ZF), and Parity flag (PF).
- CF is updated based on the carry-out from the addition.
- AF is set if a carry occurred from bit 3 to bit 4 during the addition.
- SF, ZF, and PF are updated based on the final value in AL after adjustment.

Usage:

- DAA is commonly used in programs that perform arithmetic operations on BCD numbers, such as financial applications or calculations involving quantities that are naturally represented in decimal format.
- It ensures that the result of BCD arithmetic remains valid and can be correctly interpreted when displayed or used in further calculation.