Assembly : Recursion

Author	
Date Created	@March 23, 2021 2:34 PM
Tag	CSE315 Microprocessors Microcontrollers and Embedded Systems

Steps

- push parameters before calling

```
MOV AX,4 ; N = 4
PUSH AX  ; pushing N to stack
CALL FIBONACCI ; when this is called , address of next line is pushed into the stack
```

- initialize BP

```
PUSH BP
MOV BP,SP
```

- retrieve arguments using $[BP+x]$

```
CMP WORD PTR[BP+4],1 ; N = 1 ? : as we stored in AX(WORD) we need to explicitly mention that when using PTR
```

- handle base case

```
CMP WORD PTR[BP+4],1 ; N = 1 ? : as we stored in AX(WORD) we need to explicitly mention that when using PTR
JG END_IF
MOV AX,[BP+4]    ;BASE CASE : if( n<=1 ) return n
JMP RETURN

END_IF:
```

- for multiple recursive calls , push the former values and retrieve them

```
END_IF:
; COMPUTE F(N-1)
    MOV CX, [BP+4]  ; get N
    DEC CX          ; N = N - 1
    PUSH CX         ; save N - 1

    CALL FIBONACCI  ; RES1 in AX

    PUSH AX         ; save RES1

; COMPUTE F(N-2)
    MOV CX, [BP+4]  ; get N
    DEC CX          ; N = N - 1
    DEC CX          ; N = N - 2
    PUSH CX         ; save N - 2

    CALL FIBONACCI

    POP BX
    ADD AX,BX
```

- say there are n parameters , the return statement would be

```
return:
  POP BP
  RET val ; val will be 2*n , if every parameter is of word type , 1 word = 2 byte
```

- `full code` : fibonacci

```
FIBONACCI PROC NEAR

    PUSH BP
    MOV BP,SP ; BP now points to the top of the stack
    CMP WORD PTR[BP+4],1 ; N = 1 ? : as we stored in AX(WORD) we need to explicitly mention that when using PTR

    JG END_IF

    MOV AX,[BP+4]    ;BASE CASE : if( n<=1 ) return n
    JMP RETURN

END_IF:
; COMPUTE F(N-1)
    MOV CX, [BP+4]  ; get N
    DEC CX          ; N = N - 1
    PUSH CX         ; save N - 1

    CALL FIBONACCI  ; RES1 in AX

    PUSH AX         ; save RES1

; COMPUTE F(N-2)
    MOV CX, [BP+4]  ; get N
    DEC CX          ; N = N - 1
    DEC CX          ; N = N - 2
    PUSH CX         ; save N - 2

    CALL FIBONACCI

    POP BX
    ADD AX,BX

RETURN:
    POP BP
    RET 2

FIBONACCI ENDP
```