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EXPERIMENT 9

AIM: To study and implement Macros and Dos Interrupt in Assembly Language Programming.

THEORY:

Macros:

A macro is a sequence of instructions, assigned by a name and could be used anywhere in the program. Macros are useful for the following purposes:

- To simplify and reduce the amount of repetitive coding
- To reduce errors caused by repetitive coding
- To make an assembly program more readable.

A macro consists of name, set of formal parameters and body of code. The use of macro name with set of actual parameters is replaced by some code generated by its body. This is called macro expansion.

Macros allow a programmer to define pseudo operations, typically operations that are generally desirable, are not implemented as part of the processor instruction, and can be implemented as a sequence of instructions. Each use of a macro generates new program instructions, the macro has the effect of automating writing of the program.

Macros can be defined used in many programming languages, like C, C++ etc. Example macro in C programming.Macros are commonly used in C to define small snippets of code. If the macro has parameters, they are substituted into the macro body during expansion; thus, a C macro can mimic a C function. The usual reason for doing this is to avoid the overhead of a function call in simple cases, where the code is lightweight enough that function call overhead has a significant impact on performance.

DOS Interrupts:

The interrupt types 20h-3Fh are serviced by DOS routines that provide high-level service to hardware as well as system resources such as files and directories. The most useful is INT 21H, which provides many functions for doing keyboard, video, and file operations.

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Function Number	Description
AH=01h	READ CHARACTER FROM STANDARD INPUT, WITH ECHO
AH=02h	WRITE CHARACTER TO STANDARD OUTPUT
AH=05h	WRITE CHARACTER TO PRINTER
AH=06h	DIRECT CONSOLE OUTPUT
AH=07h	DIRECT CHARACTER INPUT, WITHOUT ECHO
AH=08h	CHARACTER INPUT WITHOUT ECHO
AH=09h	WRITE STRING TO STANDARD OUTPUT
AH=0Ah	BUFFERED INPUT
AH=0Bh	GET STDIN STATUS
AH=0Ch	FLUSH BUFFER AND READ STANDARD INPUT
AH=0Dh	DISK RESET
AH=0Eh	SELECT DEFAULT DRIVE
AH=19h	GET CURRENT DEFAULT DRIVE
AH=25h	SET INTERRUPT VECTOR
AH=2Ah	GET SYSTEM DATE
AH=2Bh	SET SYSTEM DATE
AH=2Ch	GET SYSTEM TIME
AH=2Dh	SET SYSTEM TIME
AH=2Eh	SET VERIFY FLAG
AH=30h	GET DOS VERSION
AH=35h	GET INTERRUPT VECTOR
AH=36h	GET FREE DISK SPACE
AH=39h	"MKDIR" - CREATE SUBDIRECTORY
AH=3Ah	"RMDIR" - REMOVE SUBDIRECTORY
AH=3Bh	"CHDIR" - SET CURRENT DIRECTORY
AH=3Ch	CREATE OR TRUNCATE FILE
AH=3Dh	"OPEN" - OPEN EXISTING FILE
AH=3Eh	"CLOSE" - CLOSE FILE
AH=3Fh	"READ" - READ FROM FILE OR DEVICE
AH=40h	"WRITE" - WRITE TO FILE OR DEVICE
AH=41h	"UNLINK" - DELETE FILE
AH=42h	"LSEEK" - SET CURRENT FILE POSITION
AH=43h	GET FILE ATTRIBUTES
AH=47h	"CWD" - GET CURRENT DIRECTORY
AH=4Ch	"EXIT" - TERMINATE WITH RETURN CODE
AH=4Dh	GET RETURN CODE (ERRORLEVEL)
AH=54h	GET VERIFY FLAG
AH=56h	"RENAME" - RENAME FILE
AH=57h	GET/SET FILE'S DATE AND TIME, GET EXTENDED ATTRIBUTES FOR FILE

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CODE:

1) Program to calculate factorial using Macros.

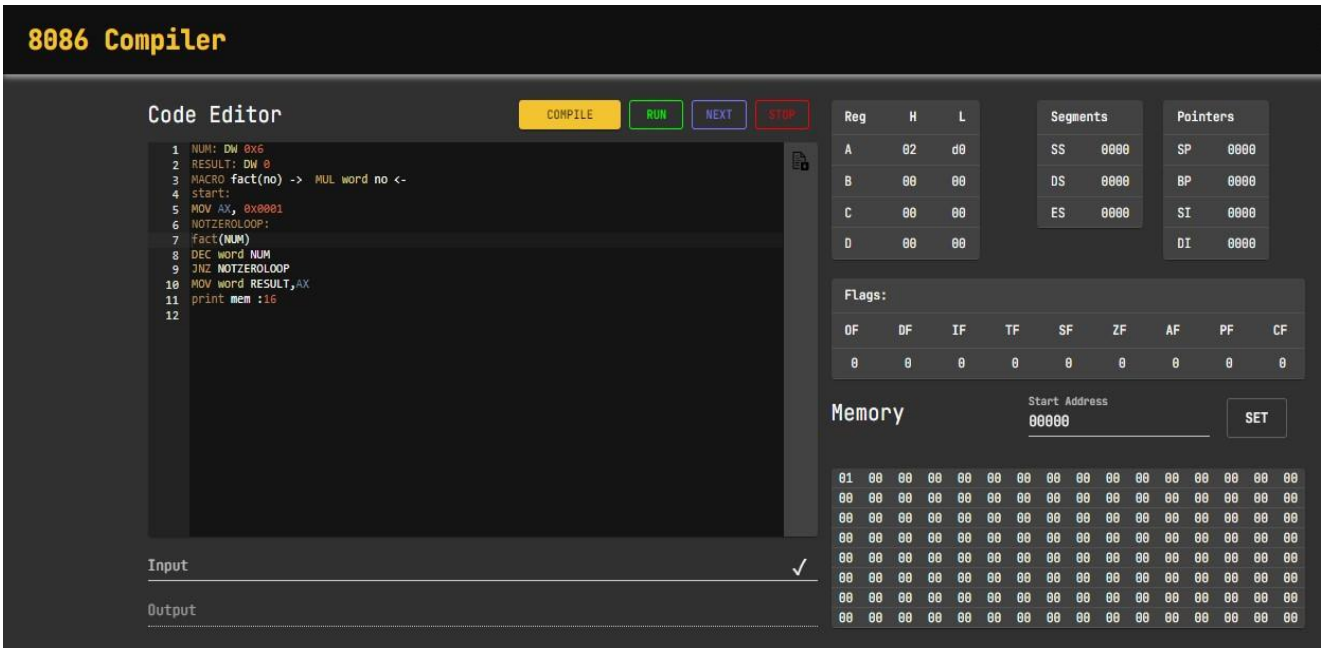
```
NUM: DW 0x6
RESULT: DW 0
MACRO fact(no) -> MUL word no <-

start:
MOV AX, 0x0001

NOTZEROLOOP:
fact(NUM)
DEC word NUM

JNZ NOTZEROLOOP
MOV word RESULT,AX
print mem :16
```

OUTPUT:



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2) Program to calculate the sum of 2 number using DOS Interrupts.

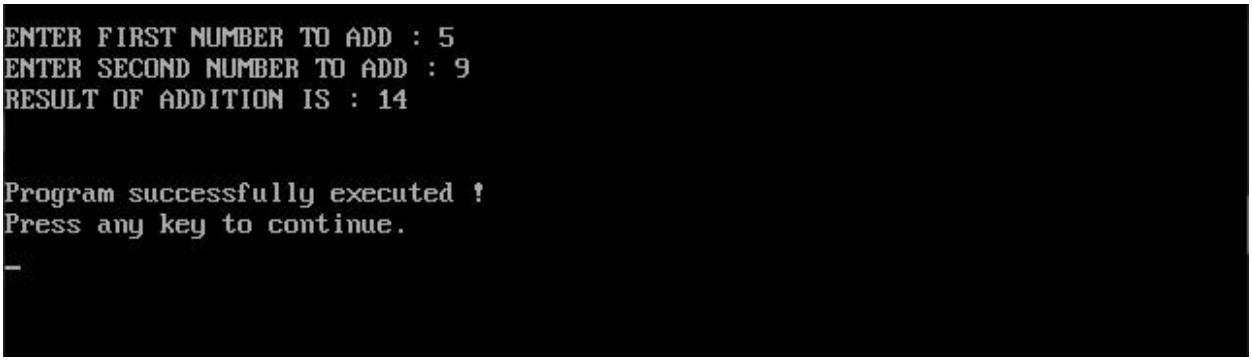
```
DATA SEGMENT
NUM1 DB ?
NUM2 DB ?
RESULT DB ?
MSG1 DB 10,13,"ENTER FIRST NUMBER TO ADD : $"
MSG2 DB 10,13,"ENTER SECOND NUMBER TO ADD : $"
MSG3 DB 10,13,"RESULT OF ADDITION IS : $"
ENDS

CODE SEGMENT

ASSUME DS:DATA, CS:CODE
START:
MOV AX,DATA
MOV DS,AX
LEA DX,MSG1
MOV AH,9
INT 21H
MOV AH,1
INT 21H
SUB AL,30H
MOV NUM1,AL
LEA DX,MSG2
MOV AH,9
INT 21H
MOV AH,1
INT 21H
SUB AL,30H
MOV NUM2,AL
ADD AL,NUM1
MOV RESULT,AL
MOV AH,0
AAA
ADD AH,30H ADD AL,30H
MOV BX,AX
LEA DX,MSG3
MOV AH,9
INT 21H
MOV AH,2
MOV DL,BH
INT 21H
```

```
MOV AH,2
MOV DL,BL
INT 21H
MOV AH,4CH
INT 21H
ENDS
END START
```

Output:



CONCLUSION:

In this experiment, I implemented Macros and Dos Interrupts in Assembly language Program. Firstly, I learnt about Macros and it's implementation in Assembly Level Language. Macros help reduce the code repetition and are typically faster than functions as they don't involve actual function call overhead. Secondly, I learnt about Dos Interrupt and how to implement them in Assembly Language program. Interrupts is a condition that halts the microprocessor temporarily to work on a different task and then return to its previous task. The most useful is INT 21H, which provides many functions for doing keyboard, video, and file operations.