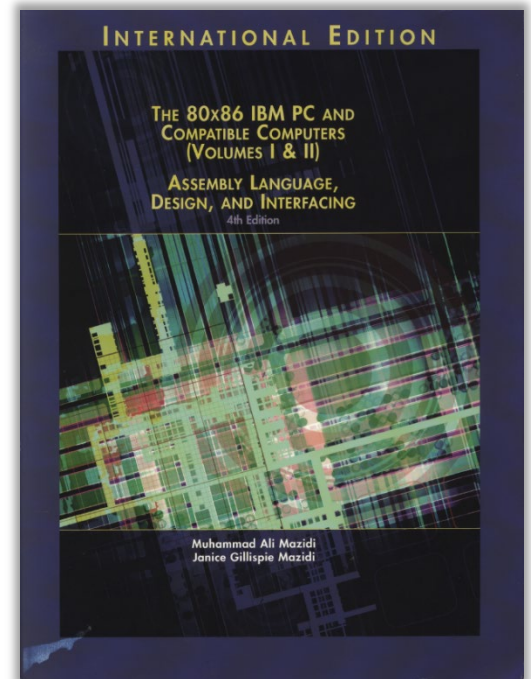# Lecture 10: BIOS and DOS Programming

Reference Book:

The 80x86 IBM PC and Compatible Computers

Chapter 4

BOIS and DOS Programming in Assembly and C

BIOS and DOS Interrupts

- You can use those useful subroutines within BIOS and DOS to implement your applications

- You can "CALL" those subroutines by explicitly embedding BIOS and DOS interrupt instructions in your program

- **We study: INT 10h (BIOS interrupt) and INT 21h (DOS interrupt)**

  - Each one can perform many functions
  - See Appendices D and E for the complete function lists

BIOS INT 10H Programming

- INT 10H subroutines are burned into the ROM BIOS (in 80x86-based IBM PCs)
- Used to communicate with the computer's screen video
  - E.g., changing the color of characters or background color, cleaning the screen, changing the location of the cursor, drawing lines on the screen
  - By setting AH with different values, you can "call" those functions

Scrolling Window

- Scroll window up
  - AH=06h

- Scroll window down
  - AH=07h

Additional Call Registers
AL = number of lines to scroll
BH = display attribute
CH = y coordinate of top left
CL = x coordinate of top left
DH = y coordinate of lower right
DL = x coordinate of lower right

Additional Call Registers
AL = number of lines to scroll
BH = display attribute
CH = y coordinate of top left
CL = x coordinate of top left
DH = y coordinate of lower right
DL = x coordinate of lower right

Note: If AL = 0, the entire window is blank.

- Code example: clear the screen

```
MOV     AX,0600H      ;scroll entire screen
MOV     BH,07         ;normal attribute
MOV     CX,0000       ;start at 00,00
MOV     DX,184FH      ;end at 24,79 (hex = 18,4F)
INT     10H           ;invoke the interrupt
```

Set cursor position

AH=02h

Additional Call Registers
BH = page number
DH = row
DL = column

Example 4-1

Write the code to set the cursor position to row = 15 = 0FH and column = 25 = 19H.

Solution:

```
MOV     AH,02           ;set cursor option
MOV     BH,00           ;page 0
MOV     DL,25           ;column position
MOV     DH,15           ;row position
INT     10H             ;invoke interrupt 10H
```

Set Video Mode

- **AH=00h**
  - In text mode, the screen is viewed as a matrix of rows and columns of characters
    - E.g., AL = 03h: VGA 80x25 chars, 16 colors
  - In graphics mode, the screen is viewed as a matrix of horizontal and vertical pixels
    - Each pixel can have different color
    - The size of video memory decides the number of pixels and colors
    - E.g., AL = 13H: VGA 320x200 pixels, 256 colors

Draw Pixel

☐ AH=0CH

Additional Call Registers
BH = page number
DH = row
DL = column

Example 4-5

Write a program to:
    (a) Clear the screen.

    (b) Set the mode to VGA of 320x200 resolution
    (c) Draw a horizontal line starting at column = 100, row = 50, and ending at column 200, row 50.

Solution:

```
          MOV    AX,0600H      ;SCROLL THE SCREEN
          MOV    BH,07         ;NORMAL ATTRIBUTE
          MOV    CX,0000       ;FROM ROW=00,COLUMN=00
          MOV    DX;184FH      ;TO ROW=18H,COLUMN=4FH
          INT    10H           ;INVOKE INTERRUPT TO CLEAR SCREEN
          MOV    AH,00         ;SET MODE
          MOV    AL,13H        ;MODE =13H(VGA HIGH RESOLUTION)
          INT    10H           ;INVOKE INTERRUPT TO CHANGE MODE
          MOV    CX,100        ;START LINE AT COLUMN =100 AND
          MOV    DX,50         ;ROW = 50
BACK:     MOV    AH,0CH        ;AH=0CH TO DRAW A LINE
          MOV    AL,01         ;PIXELS = WHITE
          INT    10H           ;INVOKE INTERRUPT TO DRAW LINE
          INC    CX            ;INCREMENT HORIZONTAL POSITION
          CMP    CX,200        ;DRAW LINE UNTIL COLUMN = 200
          JNZ    BACK
```

DOS Interrupt 21H

❑ Provided by MS-DOS
  ❑ Based on BIOS-ROM
  ❑ After the DOS is loaded into the memory, you can invoke INT 21H to perform some extremely useful functions
  ❑ E.g., input from keyboard, display results on screen
  ❑ By setting AH with different values, you can invoke those functions

Output String on Screen

□ AH=09H

□ Can be used to send a set of ASCII data to the monitor

□ DX is set to the offset address of the ASCII string to be displayed (DS is assumed to be the data segment)

□ All characters will be displayed until it encounters the dollar sign "$"

```
DATA_ASC DB 'The earth is but one country','$'

        MOV     AH,09               ;Option 09 to display string of data
        MOV     DX,OFFSET DATA_ASC  ;DX= offset address of data
        INT     21H                 ;invoke the interrupt
```

Exit to DOS

- AH=4CH
  - AL=00H

```
MOV AX, 4C00H
INT 21H
```