CS401 – Computer Architecture and Assembly Language Programming

Lab Exercise – Week 10

Problem:

Write a program to make an asterisks travel the border of the screen, from upper left to upper right to lower right to lower left and back to upper left indefinitely, making each movement after one second.

Solution:

```
; program to move astericks
[org 0x0100]
jmp start
seconds: dw 0
timerflag: dw 0
oldkb: dd 0

; keyboard interrupt service routine
kbisr: push ax
in al, 0x60 ; read char from keyboard port
cmp al, 0x2a ; has the left shift pressed
jne nextcmp ; no, try next comparison
cmp word [cs:timerflag], 1; is the flag already set
je exit ; yes, leave the ISR
mov word [cs:timerflag], 1; set flag to start printing
jmp exit ; leave the ISR
nextcmp: cmp al, 0xaa ; has the left shift released
jne nomatch ; no, chain to old ISR
mov word [cs:timerflag], 0; reset flag to stop printing
jmp exit ; leave the interrupt routine
nomatch: pop ax
jmp far [cs:oldkb] ; call original ISR
exit: mov al, 0x20
out 0x20, al ; send EOI to PIC
pop ax
iret ; return from interrupt

; timer interrupt service routine
timer: push ax
cmp word [cs:timerflag], 1 ; is the printing flag set
```

```
jne skipall ; no, leave the ISR
inc word [cs:seconds] ; increment tick count
push word [cs:seconds]
call printnum ; print tick count
skipall: mov al, 0x20
out 0x20, al ; send EOI to PIC
pop ax
iret ; return from interrupt
start: xor ax, ax
mov es, ax ; point es to IVT base
mov ax, [es:9*4]
mov [oldkb], ax ; save offset of old routine
mov ax, [es:9*4+2]
mov [oldkb+2], ax ; save segment of old routine
cli ; disable interrupts
mov word [es:9*4], kbisr ; store offset at n*4
mov [es:9*4+2], cs ; store segment at n*4+2
mov word [es:8*4], timer ; store offset at n*4
mov [es:8*4+2], cs ; store segment at n*4+
sti ; enable interrupts
mov dx, start ; end of resident portion
add dx, 15 ; round up to next para
mov cl, 4
shr dx, cl ; number of paras
mov ax, 0x3100 ; terminate and stay resident
int 0x21
```

Mechanism to Conduct Lab:

Students and teacher communicate through Skype/Adobe Connect. Students will write code using Notepad or Programmer's Notepad and will share code and screen output.

Nasm: https://vulms.vu.edu.pk/Courses/CS401/Downloads/AssmSoft.zip

DosBOX: http://sourceforge.net/projects/dosbox/files/dosbox/0.74-2/DOSBox0.74-2-win32-installer.exe/download

Programmers Notepad: https://github.com/simonsteele/pn/releases/download/v2.4.2/portable-pn2421440.zip