

CS 2422: Assembly Language and System Programming

Fall 2008

Assignment 4

Release on: December 12, 2008

DUE: 23:59 December 26, 2008

Goal:

- To familiarize with the concept of interrupt.
- To produce a program that handles some keyboard events and records the keyboard input.

Requirement:

- At the beginning of your program, please **create a log file** studentID_rec.log (e.g., 9600000_rec.log) using some appropriate interrupt call.
- Then the program proceeds to get input keys (in the range of A-Z, a-z, 0-9, and <ENTER>) from keyboard and then **display them directly** on the screen using interrupt calls. This routine works in the way that when one key is pressed on the keyboard, the corresponding character is shown on the screen immediately. The characters are displayed on the same line until the <ENTER> key is pressed. Note that each string line you typed should not be longer than 20 characters.
- When the key <ENTER> is pressed, you should **start a new line** on your screen for future input under the existing lines. Moreover, you need to first convert the characters of the whole typed string in the previous line to become **capital letters**, and then append this capitalized string into your log file as a new line.
- When the key “Ctrl+f” is pressed, the accumulated string will **be flushed** and the screen will **be cleared**.
- When “Ctrl+z” is pressed, your program should **exit**.
- Please refer to the Appendix for some helpful hints for this assignment and for some helpful reference materials of interrupt calls.

- Example:

Input:

> A23qc <ENTER>

(in you log file)

A23QC

>A23qc

>patZ45<ENTER>

(in you log file)

```
A23QC
PATZ45
```

>A23qc

>patZ45

>AbCd23<ENTER>

(in you log file)

```
A23QC
PATZ45
ABCD23
```

Grading:

- (60%) A completely working program is finished.
The code should be complete or almost done (meaning the basic structure of the code is correct but the code may still have bugs), and can be assembled correctly.
- (30%) The program produces correct results.
- (5%) Read me file.
- (5%) Readability (including comments in your program).
- Late Penalty: All assignments are due at midnight (i.e., 23:59) on the due date. The late penalty is 20% for each day (or fraction) past due.
- Early Bonus: For programming assignments, there is an early bonus of 2% per day for up to 4% total.

Bonus (10%):

- When the key "F1" is pressed, read your source code studentID_hw4.asm (e.g., 9600000_hw4.asm) and copy the contents to studentID_rec_1.log file (e.g., 9600000_rec_1.log).

Submit your assignment:

- Use ftp to enter <ftp://cs2422:cs2422@140.144.79.26:2527/> under "hw4".
- Create a directory and name it with your student ID (e.g., 9600000).

The directory should contain the following two files:

1. The source code file: Please name this .asm file as "student ID_hw4.asm" (e.g., 9600000_hw4.asm).
 2. The "Read me" file: It should include: (1) the program's flow path, and (2) how to execute the program. Please name this .txt file as "student ID_hw4.txt" (e.g., 9600000_hw4.txt).
- Deadline: 12/26 23:59

Honor Code:

Any cheating will be handled seriously in compliance with the university rules. Discussion of assignments is encouraged, but copying is prohibited and considered as cheating.

Appendix:

(1) Following web sites would be helpful for this homework

<http://www.uv.tietgen.dk/staff/mlha/PC/Prog/ASM/INT/21/index.htm>

http://heim.ifi.uio.no/~stanisls/helppc/int_21.html

(2) Below are some helpful reference materials about interrupt calls.

INT 16H:

Function 00: Read a key from the keyboard

Input: AH = 00

Output:

For standard ASCII,

AH = Standard keyboard scan code

AL = ASCII code

For extended ASCII,

AH = Extended ASCII code

AL = 00

Note: It does not return until a character is read.

Function 01: Check if a key is ready to be read

Input: AH = 01

Output: ZF (Zero flag) = 0 if buffer is not empty

ZF = 1 if buffer is empty

For standard ASCII,

AH = Standard keyboard scan code

AL = ASCII code

For extended ASCII,

AH = Extended ASCII code

AL = 00

Note: It returns immediately.

INT 21H:

Function 01: Keyboard input

Input: AH = 01

Output: AL = ASCII code of struck key

Note: Any key pressed is echoed to the display screen.

Function 02: Character output on screen

Input: AH = 02

DL = ASCII character

Function 09: Print string

Input: AH = 09

DS:DX = The address of the string that ends with '\$'

Function 25H: Set interrupt vector

Input: AH = 25H

AL = Interrupt number

DS:DX = New address of interrupt handler

Function 35H: Get interrupt vector

Input: AH = 35H

AL = Interrupt number

Output: ES:BX = Interrupt vector for the interrupt specified in AL

Function 4CH: Exit

Input: AH = 4CH

AL = Binary return code