Operating System Project 1

Project goal:

在 Linux 上學習如何建立 kernel module 並在 kernel module 中動態管理記憶體

Requirement:

- 使用 Makefile 來編譯 kernel module (10%)
- 能夠成功安裝 kernel module: **insmod** (10%)
- 能夠成功移除 kernel module: **rmmod** (10%)
- **insmod** 時
    - 利用 **kmalloc** 配置記憶體 (10%)
    - 利用 **struct list_head** 這個資料結構來建立 linked-list (15%)
        - linked-list 中請放入五個 struct birthday

```
struct birthday{
    int day;
    int month;
    int year;
    struct list_head list;
};
```

    - 利用 **list_for_each_entry** 這個巨集將配置好的記憶體內容顯示出來 (10%)
- **rmmod** 時
    - 利用 **kfree** 收回記憶體 (20%)
    - 利用 **list_for_each_entry** 這個巨集確定記憶體都已經正常回收 (15%)

Hint:

1. 可參考課本第 94 頁
2. struct list_head:
    a. LIST_HEAD
    b. INIT_LIST_HEAD
    c. list_add_tail
    d. list_del
3. Traversing linked-list
    a. list_for_each_entry
    b. list_for_each_entry_safe
4. 可以使用 dmesg 來清空或檢查 kernel 訊息

Example:

Project tree:

project1/

Makefile

your_module.c

Commands:

```
$ cd project1
$ make clean && make
$ sudo dmesg -c
$ sudo insmod your_module.ko
$ dmesg
[2082477.439788] Loading Module
[2082477.439790] Add element 1
[2082477.439791] Add element 2
[2082477.439791] Add element 3
[2082477.439791] Add element 4
```

```
[2082477.439792] Add element 5
[2082477.439792] Birth: 2000/1/6
[2082477.439793] Birth: 2001/2/12
[2082477.439793] Birth: 2002/3/18
[2082477.439793] Birth: 2003/4/24
[2082477.439794] Birth: 2004/5/30
$ sudo rmmod your_module
$ dmesg
[2082477.439788] Loading Module
[2082477.439790] Add element 1
[2082477.439791] Add element 2
[2082477.439791] Add element 3
[2082477.439791] Add element 4
[2082477.439792] Add element 5
[2082477.439792] Birth: 2000/1/6
[2082477.439793] Birth: 2001/2/12
[2082477.439793] Birth: 2002/3/18
[2082477.439793] Birth: 2003/4/24
[2082477.439794] Birth: 2004/5/30
[2082535.115983] Removing Module
[2082535.115985] Delete element 1
[2082535.115986] Delete element 2
[2082535.115987] Delete element 3
[2082535.115987] Delete element 4
[2082535.115987] Delete element 5
```