Project 4: Kernel Data Structures

In the module entry point, create a linked list containing four struct color elements.

- Part I – Inserting, Deleting Elements to/from the linked lists
  - Assignment:
    1. In the module entry point, create a linked list containing four struct color elements.
    2. Traverse the linked list and output its contents to the kernel log buffer.
    3. Invoke the dmesg command to ensure that the list is properly constructed once the kernel module has been loaded.
    4. In the module exit point, delete the elements from the linked list and return the free memory back to the kernel.
    5. Again, invoke the dmesg command to check that the list has been removed once the kernel module has been unloaded

✓ 首先，先進入 part1 資料夾編譯檔案

```
make
```

✓ 掛載模組

```
sudo insmod color.ko    //完成 1.2.
```

✓ 使用 sudo dmesg 指令查看 //完成 3.

```
[  255.510706] Color kernel module init
[  255.510707] color link list :
[  255.510708] {red:138 blue:43 green:226 white:100 }-> {red:120 blue:20 green:
216 white:80 }-> {red:10 blue:10 green:26 white:90 }-> NULL
```

✓ 卸載模組

```
sudo rmmod color.ko    //完成 4.
```

✓ 使用 sudo dmesg 指令查看 //完成 5.

```
[  997.174991] Free color_list and Check if the linked list is empty or not
[  997.174993] color_list is empty
[  997.174994] Color kernel module exit
```

- Part II – Parameter Passing
  - Assignment:
    1. Design a kernel module named collatz that is passed an initial value as a module parameter.
    2. Your module will then generate and store the sequence in a kernel linked list when the module is loaded.
    3. Once the sequence has been stored, your module will traverse the list and output its contents to the kernel log buffer.
    4. Use the dmesg command to ensure that the sequence is properly generated once the module has been loaded.
    5. In the module exit point, delete the contents of the list and return the free memory back to the kernel.
    6. Again, use dmesg to check that the list has been removed once the kernel module has been unloaded.

✓ 首先，先進入 part2 資料夾編譯檔案

```
make
```

✓ 掛載模組

```
sudo insmod collatz.ko start=11 //完成 1.2.3. , start 為參數，預設為 100
```

✓ 使用 sudo dmesg 指令查看 //完成 4.

```
[15545.440094] collatz kernel module init
[15545.440099] module patameter = 11
[15545.440100] collatz link list :
[15545.440100] 11->34->17->52->26->13->40->20->10->5->16->8->4->2->1->NULL
```

✓ 卸載模組

```
sudo rmmod collatz.ko   //完成 5.
```

✓ 使用 sudo dmesg 指令查看 //完成 6.

```
[  136.318968] Free Collatz_list and Check if the linked list is empty or not
[  136.318973] Collatz_list is empty
[  136.318973] collatz kernel module exit
nvidia@ubuntu:~/OS_P2$
```