Embedding System HW1 Report

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Part 1

1. Hello_world.c

```c
#include <linux/init.h>
#include <linux/module.h>

MODULE_DESCRIPTION("hello_world");
MODULE_LICENSE("GPL");

static int hello_init(void){
    printk(KERN_INFO "Hello world !\n");
    return 0;
}

static void hello_exit(void){
    printk(KERN_INFO "Bye !\n");
}

module_init(hello_init);
module_exit(hello_exit);
```

2. Makefile

```makefile
PWD := $(shell pwd)
KVERSION := $(shell uname -r)
KERNEL_DIR = /usr/src/linux-headers-$(KVERSION)/

MODULE_NAME = hello_world
obj-m := $(MODULE_NAME).o

all:
    make -C $(KERNEL_DIR) M=$(PWD) modules
clean:
    make -C $(KERNEL_DIR) M=$(PWD) clean
```

3. lsmod

```
liao@liao:~/Desktop/Github/111-1-Embedding-System/homework1/Helloworld$ make
make -C /usr/src/linux-headers-5.15.0-50-generic/ M=/home/liao/Desktop/Github/111-1-Embedding-System/homework1/Helloworld modules
make[1]: Entering directory '/usr/src/linux-headers-5.15.0-50-generic'
make[1]: Leaving directory '/usr/src/linux-headers-5.15.0-50-generic'
liao@liao:~/Desktop/Github/111-1-Embedding-System/homework1/Helloworld$ sudo insmod hello_world.ko
liao@liao:~/Desktop/Github/111-1-Embedding-System/homework1/Helloworld$ sudo lsmod | grep hello_world
hello_world            16384  0
```

4. dmesg

```
[ 2036.835513] Hello world !
[ 2053.449001] Bye !
liao@liao:~/Desktop/Github/111-1-Embedding-System/homework1/Helloworld$
```

Part2

1. fileIO.c

```c
void reverse(char *str){
    int i,j;
    char temp;
    j = strlen(str) - 1;
    for (i=0; i<j; i++){
        temp = str[i];
        str[i] = str[j];
        str[j] = temp;
        j--;
    }
}

static int fileIO_init(void)
{
    struct file *io;
    char tmp_char[BUFFER_SIZE];
    void* buf;
    ssize_t rx;
    ssize_t tx;
    size_t count;
    size_t writeCount;
    loff_t pos = 0;
    memset(tmp_char, 0, sizeof(tmp_char));
    io = filp_open("input.txt", O_RDONLY, 0);
    if (IS_ERR(io)){
        printk("open file error/n");
        return -1;
    }
    count = sizeof(tmp_char);
    buf = (void*)tmp_char;
    rx = kernel_read(io, tmp_char, count, &pos);
    printk("read result= %s\n", tmp_char);
    reverse(tmp_char);
    printk("reverse result= %s\n", tmp_char);
    filp_close(io, NULL);
    pos = 0;
    io = filp_open("output.txt", O_CREAT | O_RDWR, 0664);
    if (IS_ERR(io)){
        printk("open file error/n");
        return -1;
    }
    buf = (void *)tmp_char;
    writeCount = strlen(tmp_char) + 1;
    tx = kernel_write(io, buf, writeCount, &pos);
    filp_close(io, NULL);
    return 0;
}

static void fileIO_exit(void)
{
    printk("remove successfully\n");
}
module_init(fileIO_init);
module_exit(fileIO_exit);
```

2. output

```
[   37.643864] read result= abcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdef
ghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmn
opqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuvwxyzabcdefghijklmnopqrstuv
wxyzabcdefghijklmnopqrstuvwxyz
[   37.643866] reverse result= zyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyx
wvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqp
onmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjih
gfedcbazyxwvutsrqponmlkjihgfedcba

[   37.654705] remove successfully
liao@liao:~/Desktop/Github/111-1-Embedding-System/homework1/fileIO$ cat output.txt
zyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvuts
rqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlk
jihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedcbazyxwvutsrqponmlkjihgfedc
ba
```