Student ID: 406410035
Name: 秦紫頤
E-mail: chinjoyce30@gmail.com

Lab Title: Linux Driver II

Lab Purpose:

Learn how to use shell script and file operation to control GPIO. Also write a C program to do the same thing too!

Lab Procedure:

1. Connect LED with Raspberry Pi via solderless breadboard and two wires
2. Power on Raspberry Pi
3. Using shell command to control the LED
    a. Go into the gpio directory: cd /sys/class/gpio
    b. Generate a new directory called gpio4, there are configuration files for I/O operations: echo 4 > export
    c. Setting up the GPIO I/O operation direction: echo “out” > /sys/class/gpio/gpio4/direction
    d. Setting the output voltage for GPIO: echo “1” > /sys/class/gpio/gpio4/value
    e. Close GPIO: echo “4” > /sys/class/gpio/unexport
4. Write a C program to let the LED light keep flashing
    a. Write gpio.c to do the job
    b. Use cross compiler to compile gpio.c
    c. Copy the executable file to SD card
    d. Power on Raspberry Pi and execute the program
    e. Eventually, the LED light will keep flashing

```c
#include <stdio.h>
#include <unistd.h>
int main(void) {
    FILE *p = NULL;
    int i=0;
    p = fopen("/sys/class/gpio/export", "w");
    fprintf(p, "4"); // open gpio 4
    fclose(p);
    p = fopen("/sys/class/gpio/gpio4/direction", "w");
    fprintf(p, "out");
    fclose(p);
    while(1){
        usleep(200000);
        p = fopen("/sys/class/gpio/gpio4/value", "w");
        fprintf(p, "1");
        fclose(p);
        usleep(200000);
        p = fopen("/sys/class/gpio/gpio4/value", "w");
        fprintf(p, "0");
        fclose(p);
    }
    p = fopen("/sys/class/gpio/unexport", "w");
    fprintf(p, "4");
    fclose(p);
    p = NULL;
    return 0;
}
```

Problems and Discussions

From previous labs, we need to use TTL cable to remote login our Pi. So when the experiment handout says we need to connect the ground wire in the spot where TTL cable is plugged in, at first, I’m a bit confused that if this experiment can be doing or not. The first solution for this problem is to re-install the Linux system in Pi by buildroot, but this wastes a lot of time. The second solution is I found out that there are many spots on Pi labeled GND, so I think it is ok to change the ground wire plug-in spot. And it works.