

系統程式 HW9
資工系 41071102H 徐敏皓

程式碼

```
#include <stdio.h>
#include <fcntl.h>
#include <sys/types.h>
#include <sys/stat.h>

#define ERR (-1)
#define READ 0
#define WRITE 1
#define STDIN 0
#define STDOUT 1

int main()
{
    int pid1, pid2, pid3, pfd1[2], pfd2[2];

    if (pipe(pfd1) == ERR)
    {
        perror("pipe1");
        exit(ERR);
    }

    if ( (pid1 = fork()) == ERR )
    {
        perror("fork1");
        exit(ERR);
    }

    if (pid1 == 0)
    {
        close(STDOUT);
        dup(pfd1[WRITE]);
        close(pfd1[READ]);
        close(pfd1[WRITE]);

        execlp("ps", "ps", "aux", NULL);
    }
}
```

程式碼

```
if (pipe(pfd2) == ERR)
{
    perror("pipe2");
    exit(ERR);
}

if ( (pid2 = fork()) == ERR )
{
    perror("fork2");
    exit(ERR);
}

if (pid2 == 0)
{
    close(STDIN);
    dup(pfd1[READ]);
    close(STDOUT);
    dup(pfd2[WRITE]);
    close(pfd1[READ]);
    close(pfd1[WRITE]);
    close(pfd2[READ]);
    close(pfd2[WRITE]);

    execlp("grep", "grep", "41071102H", NULL);
}

close(pfd1[READ]);
close(pfd1[WRITE]);

if ( (pid3 = fork()) == ERR )
{
    perror("fork3");
    exit(ERR);
}
```

程式碼

```
if (pid3 == 0)
{
    close(STDIN);
    dup(pfd2[READ]);

    int fd = open("the_result", O_WRONLY | O_CREAT | O_TRUNC, S_IREAD | S_IWRITE);
    if (fd == ERR)
    {
        perror("open");
        exit(ERR);
    }
    close(STDOUT);
    dup(fd);
    close(fd);

    close(pfd2[READ]);
    close(pfd2[WRITE]);

    execlp("wc", "wc", NULL);
}

close(pfd2[READ]);
close(pfd2[WRITE]);

wait((int *) 0);
wait((int *) 0);
wait((int *) 0);

exit(0);
}
```

執行結果

從程式碼寫出來的結果和在shell上直接打指令後的結果不同，其原因是在“grep”的部分。我是直接執行“grep 41071102H”，但在shell上同樣的輸入會被系統自動加上參數“--color=auto”。仔細細算可以發現剛好多了1個word和13個字元。

```
41071102H@telnet:~/Homework9$ gcc homework.c
homework.c: In function 'main':
homework.c:20:3: warning: incompatible implicit declaration of built-in function 'exit'
homework.c:26:3: warning: incompatible implicit declaration of built-in function 'exit'
homework.c:36:3: warning: incompatible implicit declaration of built-in function 'execlp'
homework.c:43:3: warning: incompatible implicit declaration of built-in function 'exit'
homework.c:49:3: warning: incompatible implicit declaration of built-in function 'exit'
homework.c:63:3: warning: incompatible implicit declaration of built-in function 'execlp'
homework.c:74:3: warning: incompatible implicit declaration of built-in function 'exit'
homework.c:86:4: warning: incompatible implicit declaration of built-in function 'exit'
homework.c:96:3: warning: incompatible implicit declaration of built-in function 'execlp'
homework.c:106:2: warning: incompatible implicit declaration of built-in function 'exit'
41071102H@telnet:~/Homework9$ ./a.out
41071102H@telnet:~/Homework9$ ls
a.out homework.c the_result
41071102H@telnet:~/Homework9$ more the_result
      3      37      255
41071102H@telnet:~/Homework9$ ps aux|grep 41071102H|wc
      3      38      268
41071102H@telnet:~/Homework9$ ps aux|grep 41071102H
root      18714  0.0  0.0  10720  3456 ?        Ss   Dec11   0:00 sshd: 41071102H [priv]
2659      18935  0.0  0.0  10720  1836 ?        S    Dec11   0:00 sshd: 41071102H@pts/5
2659      22706  0.0  0.0    4180   876 pts/5    S+   00:11   0:00 grep --color=auto 41071102H
```