电子科技大学

计算机科学与工程学院

标 准 实 验 报 告

（实验）课程名称 Unix 操作系统

电子科技大学教务处制表

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实 验 报 告

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实验时间：2022/5/22

一、实验室名称：计算机学院实验中心

二、实验项目名称：Shell 编程

三、实验学时：4 学时

四、实验原理：shell 编程、正则表达式

五、实验目的：

实现 shell 编程，可以编写程序；理解正则表达式，使用 grep 命令；

六、实验内容：

1. 正则表达式 grep 命令
2. 图书馆

七、实验器材（设备、元器件）：

PC 微机一台；

八、实验步骤：

1.下载 VMware 虚拟机；
2.在虚拟机上安装 Ubuntu 服务器版本，进行环境配置；
3.执行实验要求的各项操作，完成 shell 编程；

九、实验数据及结果分析：

1.grep 命令：

在一个文件或一系列文件中查找特定的样式；使用正则表达式进行匹配（BRE）；

查找不满足只有一个大写字符的行；

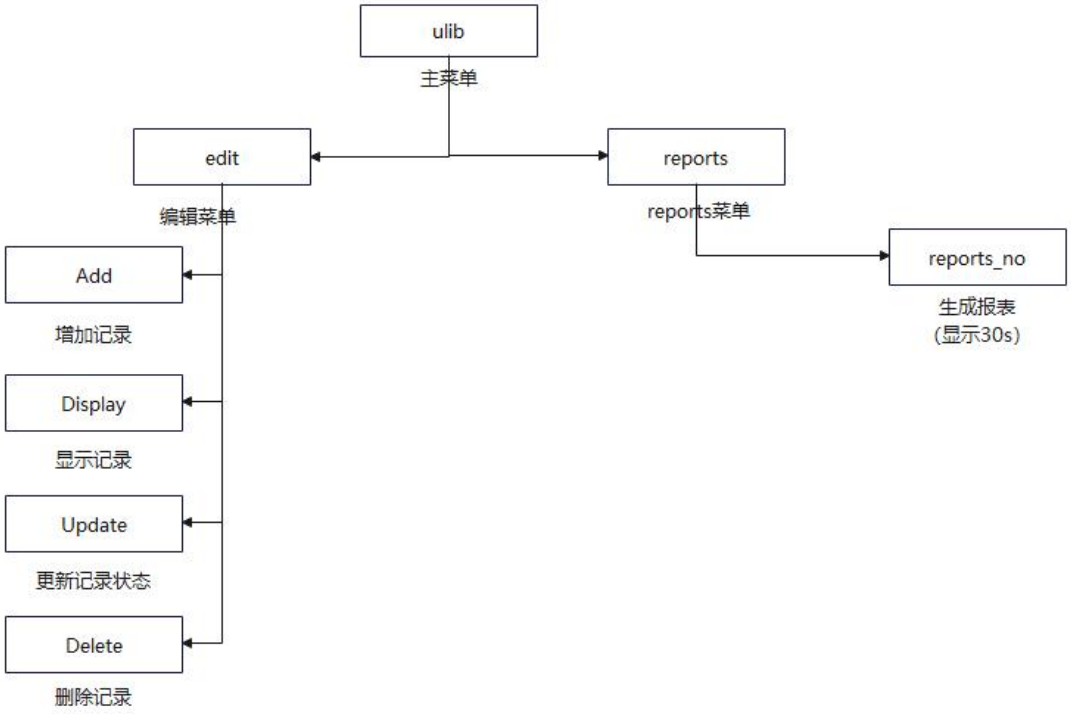
```
unix@unix:~$ grep -vn "^[[:upper:]]$" hello
1:THis is the first file
2:this
3:THIS
4:that
```

查找不满足由两个大写字母开头的行；

```
unix@unix:~$ grep -vn "^[[:upper:]]\{2\}.*$" hello
2:this
4:that
```

2.图书馆程序：

程序的基本功能设计



初始化的页面：

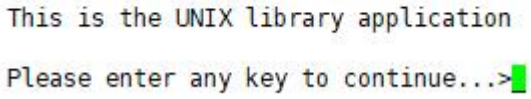
```
#set two variable
BOLD=$(tput smso)
NORMAL=$(tput rmso)

#init
tput clear
tput cup 5 15
echo "${BOLD}Super Duper UNIX Library"
tput cup 12 10
echo "${NORMAL}This is the UNIX library application"
tput cup 14 10
echo "Please enter any key to continue...>_\b\c"
read ANSWER

#main
ERROR=0
while true
do
        if [ $ERROR = 0 ]; then
                tput clear
                tput cup 5 10
                echo "UNIX library-${BOLD}Main Menu${NORMAL}"
                tput cup 7 20
                echo "0: ${BOLD}Exit${NORMAL} this program"
                tput cup 9 20
                echo "1: ${BOLD}Edit${NORMAL} Menu"
                tput cup 11 20
                echo "2: ${BOLD}Reports${NORMAL} Menu"
                ERROR=0
        fi
        tput cup 13 10
        echo "Enter you choice>_\b\c"
        read CHOICE

        #choose one function
        case "$CHOICE" in
                0)tput clear; exit 0;;
                1)edit;;                #编辑菜单
                2)reports;;             #生成报表菜单
                *)errors 20 10          #错误执行
                tput cup 20 1;tput ed
                ERROR=1;
        esac

done
```



```
UNIX library-Main Menu

          0: Exit this program

          1: Edit Menu

          2: Reports Menu

Enter you choice>
```

错误提示：

```
          Wrong Input. Try again
Press any key to continue...>1^H
```

Edit 菜单函数：

```
#edit
edit(){
        ERROR_1=0
        while true;do
                if [ $ERROR_1 = 0 ]; then       #页面初始化
                        tput clear
                        tput cup 5 10
                        echo "UNIX library -${BOLD}Edit Menu ${NORMAL}"
                        tput cup 7 20
                        echo "0: ${BOLD}Return${NORMAL}to the Main Menu"
                        tput cup 9 20
                        echo "1: ${BOLD}Add${NORMAL}"
                        tput cup 11 20
                        echo "2: ${BOLD}Update Status${NORMAL}"
                        tput cup 13 20
                        echo "3: ${BOLD}Display${NORMAL}"
                        tput cup 15 20
                        echo "4: ${BOLD}Delete${NORMAL}"
                fi
                ERROR_1=0
                tput cup 17 20
                echo "Enter your choice>_\b\c"
                read CHOICE_1
                #choose a function
                case "$CHOICE_1" in
                        0) main;;               #主菜单页面
                        1) Add;;                #添加操作
                        2) Update;;             #更新状态
                        3) Display;;            #显示记录
                        4) Delete;;             #删除记录
                        *) errors 20 10;tput cup 20 1;tput ed;ERROR_1=1;;#错误执行
                esac
        done
}
```

```
UNIX library -Edit Menu

        0: Returnto the Main Menu

        1: Add

        2: Update Status

        3: Display

        4: Delete

        Enter your choice>
```

Add 添加记录函数：

```
#add
Add(){
        answer=y;
        while [ "$answer" = y ]
        do
                tput clear
                tput cup 5 10 ; echo "UNIX LIBRARY-${BOLD}ADD MODE"
                echo "$NORMAL"                  #添加记录，将输入写入寄存器后追加到文件ULIB_FILE
                tput cup 7 23;echo "Title:"
                tput cup 9 22; echo "Author:"
                tput cup 11 20;echo "Category:"
                tput cup 12 20;echo "sys: system, ref:reference, tb:textbook"
                tput cup 7 30;read title
                tput cup 9 30; read author
                tput cup 11 30; read category
                status=in
                echo "$title:$author:$category:$status:$bname:$date">>ULIB_FILE
                tput cup 14 10;echo "Any more to add? (Y)es or (N)o>_\b\c"
                read answer
                case $answer in
                        [Yy]*) answer=y;;
                            *) answer=n;;
                    esac
                done
}
```

Update 更新记录状态函数：

```
#update
Update(){
        Old_ifs_update="$IFS"   #将环境变量写入寄存器
        answer_update=y
        while [ "$answer_update" = y ]
        do
                #新寄存器
                new_status= ; new_bname= ; new_date=
                tput clear
                #查找要修改的文件重定向到TEMP中
                tput clear;tput cup 3 5;echo "Enter the Author/Title>_\b\c"
                read reponse_update
                grep -i "$reponse_update" ULIB_FILE > TEMP
                #TEMP文件非空，从TEMP中读出数据
                if [ -s TEMP ]
                then
                        #: 为分隔符
                        IFS=":"
                        read title author category status bname date < TEMP
                        tput cup 5 10
                        echo "UNIX Library-${BOLD}UpdateStatusMode${NORMAL}"
                        tput cup 7 23;echo "Title: $title"
                        tput cup 8 22;echo "Author: $author"
                        case "$category" in
                                [Tt][Bb])word_up=textbook;;
                                [Ss][Yy][Ss])word_up=system;;
                                [Rr][Ee][Ff])word_up=reference;;
                                *)word_up=undefined;;
                        esac
                        tput cup 9 20;echo "Category: $word_up"
                        tput cup 10 22;echo "Status: $status"
                #修改状态
                if [ "$status" = in ]
                then
                new_status=out
                tput cup 11 18;echo "New status: $new_status"
                tput cup 12 14;echo "Checked out by:_\b\c"
                read new_bname
                new_date=`date +%D`
                tput cup 13 24;echo "Date: $new_date"
                else
                new_status=in
                tput cup 11 14;echo "Checked out by: $bname"
                tput cup 12 24;echo "Date: $date"
                tput cup 15 18;echo "New Status: $new_status"
                fi


        #将未被改变的数据存入TEMP，让TEMP覆盖ULIB_FILE，表明图书已被借阅
        grep -iv "$title:$author:$category:$status:$bname:$date" ULIB_FILE > TEMP
        cp TEMP ULIB_FILE
        echo "$title:$author:$category:$new_status:$new_bname:$new_date" >> ULIB_FILE
        else
        tput cup 7 10;echo "$response_update not found"
        fi
        tput cup 16 10;echo "Any more to update? (Y)es or (N)o_\b\c"
        read answer_update
        case "$answer_update" in
                [Yy]*)answer_update=y;;
                *)answer_update=n;;
        esac
done
#环境变量覆盖
IFS="$Old_ifs_update"
rm TEMP TEMP

}
```

Display 显示记录函数：

```
#display
Display(){
        Old_ifs_1="$IFS"
        answer_dis=y
        while [ "$answer_dis" = y ]
        do
                tput clear
                tput cup 3 5;echo "Enter the Author/Title>_\b\c"
                read reponse_1
                grep -i "$reponse_1" ULIB_FILE > TEMP
                #TEMP非空，显示数据，TEMP输入重定向
                if [ -s TEMP ]
                then
                        IFS=":"
                        read title author category status bname date < TEMP
                        tput cup 5 10
                        echo "UNIX Library-${BOLD}DisplayMode${NORMAL}"
                        tput cup 7 23;echo "Title: $title"
                        tput cup 8 22;echo "Author:$author"
                        case "$category" in
                                [Tt][Bb])word=textbook;;
                                [Ss][Yy][Ss])word=system;;
                                [Rr][Ee][Ff])word=refernce;;
                                *)word=undefined;;
                        esac
                        tput cup 9 20;echo "Category: $word"
                        tput cup 10 22;echo "Status: $status"
                        if [ "$status" = "out" ]
                        then
                                tput cup 11 14;echo "Checked put by: $bname"
                                tput cup 12 24;echo "Date: $date"
                        fi
                else
                        tput cup 7 10;echo "$response_1 not found"
                fi
                tput cup 15 10;echo "Any more to look for? (Y)es or (N)o>_\b\c"
                read answer_dis
                case "$answer_dis" in
                        [Yy]*)answer_dis=y;;
                        *)answer_dis=n;;
                esac
        done
        IFS="$Old_ifs_1"

}
```

Delete 删除记录函数：

```
#delete
Delete(){
        Old_ifs_del="$IFS"
        answer_del=y
        while [ "$answer_del" = y ]
        do
                tput clear;tput cup 3 5;echo "Enter the Author/Title>_\b\c"
                read response_del
                grep -i "$response_del" ULIB_FILE >TEMP
                #TEMP非空，TEMP输入重定向
                if [ -s TEMP ]
                then
                        IFS=":"
                        read title author category status bname date < TEMP
                        tput cup 5 10
                        echo "UNIX Library-${BOLD}Delete Mode${NORMAL}"
                        tput cup 7 23;echo "Title: $title"
                        tput cup 8 22;echo "Author: $author"
                        case "$categoty" in
                                [Tt][Bb])word_del=textbook;;
                                [Ss][Yy][Ss])word_del=system;;
                                [Rr][Ee][Ff])word_del=reference;;
                                *)word_del=undefined;;
                        esac
                        tput cup 9 20;echo "Category: $word_del"
                        tput cup 10 22;echo "Status: $status"
                        if [ "$status" = "out" ]
                        then
                                tput cup 11 14;echo "Checked out by: $bname"
                                tput cup 12 24:echo "Date: $date"
                        fi
                        #删除记录
                        tput cup 13 20;echo "Delete this book? (Y)es or (N)o>_\b\c"I
                        read answer_del
                        if [ "$answer_del" = y -o "$answer_del" = Y ]
                        then
                        ##将操作的记录写入TEMP，将TEMP移至ULIB_FILE
                        grep -iv "$title:$author:$category:$status:$bname:$date" ULIB_FILE > TEMP
                        mv TEMP ULIB_FILE
                        fi
                else
                        tput cup 7 10;echo "$reponse_del not found"
                fi
                tput cup 15 10;echo "Any more to delete? (Y)es or (N)o>_\b\c"
                read answer_del
                case "$answer_del" in
                        [Yy]*)answer_del=y;;
                        *)answer_del=n;;
                esac
        done
        IFS="$Old_ifs_del"
        #删除TEMP
        rm TEMP

}
```

Reports 生成报表菜单：

```
#reports
reports(){
        ERROR_6=0

                if [ $ERROR_6 = 0 ];then
                        tput clear
                        tput cup 5 10
                        echo "UNIX library - ${BOLD}Resports${NORMAL}"
                        tput cup 7 20
                        echo "0: ${BOLD}Return${NORMAL}to the Main Menu"
                        tput cup 9 20
                        echo "1: Sorted by ${BOLD}TITLES${NORMAL} "
                        tput cup 11 20
                        echo "2: Sorted by ${BOLD}AUTHOR${NORMAL}"
                        tput cup 13 20
                        echo "3: Sorted by ${BOLD}CATEGORY${NORMAL}"
                fi
                ERROR_6=0
                tput cup 17 10
                echo "Enter your choice>_\b\c"
                read CHOICE_6
                #choose a function
                case "$CHOICE_6" in
                        0)main;;
                        1)reports_no 1;;        #选择排序字段Title，传递参数1；
                        2)reports_no 2;;        #选择排序字段Author，传递参数2；
                        3)reports_no 3;;        #选择排序字段Category，传递参数3；
                        *)errors 20 1;tput cup 20 1;tput ed;ERROR_6=1;;
                esac

}
```

```
UNIX library - Resports

          0: Returnto the Main Menu

          1: Sorted by TITLES

          2: Sorted by AUTHOR

          3: Sorted by CATEGORY


 Enter your choice>
```

Reports_no 生成对应报表函数：

```
##reports_no
reports_no(){
        #分隔符为:
        IFS=":"
        #选择排序字段
        case $1 in
                1)sort -f -d -t : ULIB_FILE > TEMP;;
                2)sort -f -d -t : +1 ULIB_FILE > TEMP;;
                3)sort -f -d -t : +2 ULIB_FILE > TEMP;;
        esac
        #TEMP为循环输入重定向
        while read title author category status bname date
        do
                #将读出的记录均追加到PTEMP
                echo "Title: $title" >> PTEMP
                echo "Author: $author" >> PTEMP
                case "$category" in
                        [Tt][Bb])word_rep=textbook;;
                        [Ss][Yy][Ss])word_rep=system;;
                        [Rr][Ee][Ff])word_rep=reference;;
                        *)word_rep=undefined;;
                esac
                echo "Category: $word_rep" >> PTEMP
                echo "Status: $status \n" >> PTEMP
                if [ "$status" = "out" ]
                then
                        echo "Checked out by: $bname" >> PTEMP
                        echo "Date: $date \n" >> PTEMP
                fi

        done < TEMP
        #显示PTEMP30s后继续执行
        cat PTEMP
        sleep 30
        rm TEMP PTEMP

}
```

针对程序进行测试：
添加 UNIX 这本书；

```
UNIX LIBRARY-ADD MODE

             Title: UNIX

            Author: Amir

          Category: sys
          sys: system, ref:reference, tb:textbook

Any more to add? (Y)es or (N)o>
```

更新记录的状态：被 David 借阅

```
Enter the Author/Title>UNIX

     UNIX Library-UpdateStatusMode

                  Title: UNIX
                 Author: Amir
               Category: system
                 Status: in
             New status: out
          Checked out by:David
                   Date: 06/21/22


     Any more to update? (Y)es or (N)o
```

显示搜索的书籍：

```
   Enter the Author/Title>UNIX

        UNIX Library-DisplayMode

                    Title: UNIX
                   Author:Amir
                 Category: system
                   Status: out
          Checked put by: David
                    Date: 06/21/22


        Any more to look for? (Y)es or (N)o>
```

删除记录：

```
   Enter the Author/Title>c

        UNIX Library-Delete Mode

                    Title: c
                   Author: c
                 Category: undefined
                   Status: out
          Checked out by: a

                Delete this book? (Y)es or (N)o>y

        Any more to delete? (Y)es or (N)o>
```

生成报表：
按 title 排序

```
UNIX library - Resports

          0: Returnto the Main Menu

          1: Sorted by TITLES

          2: Sorted by AUTHOR

          3: Sorted by CATEGORY


         Enter your choice>1
Title: java
Author: a
Category: system
Status: in

Title: UNIX
Author: Amir
Category: system
Status: out

Checked out by: David
Date: 06/21/22
```

按 author 排序

```
Title: UNIX
Author: Amir
Category: system
Status: out

Checked out by: David
Date: 06/21/22

Title: java
Author: a
Category: system
Status: in
```

按 category 排序

```
Title: java
Author: a
Category: system
Status: in

Title: UNIX
Author: Amir
Category: system
Status: out

Checked out by: David
Date: 06/21/22
```

系统中的 ULIB_FILE 文件，以：作为分隔符；

```
unix@unix:~/exam3$ cat ULIB_FILE
java:a:sys:in::
UNIX:Amir:sys:out:David:06/21/22
unix@unix:~/exam3$
```

十、实验结论：

此次实验对 grep 命令进行了验证分析，实现了正则表达式匹配；实现了一个 shell 编程的小程序，实现了 shell 中的函数调用、传参。

十一、总结及心得体会：

通过这次实验我了解正则表达式（BRE、ERE），对 grep 命令有了更深刻的认识；对 shell 编程有了基本的认识。

十二、对本实验过程及方法、手段的改进建议：

希望实现更多的 shell 编程。

报告评分：

指导教师签字：