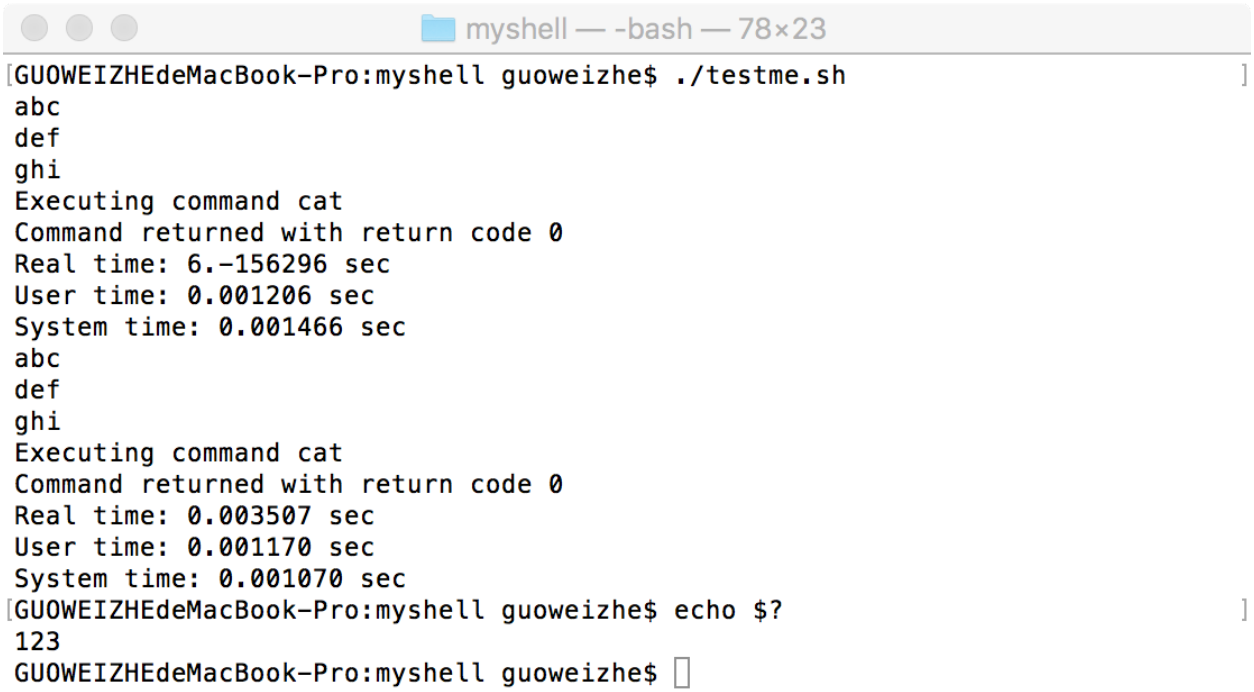
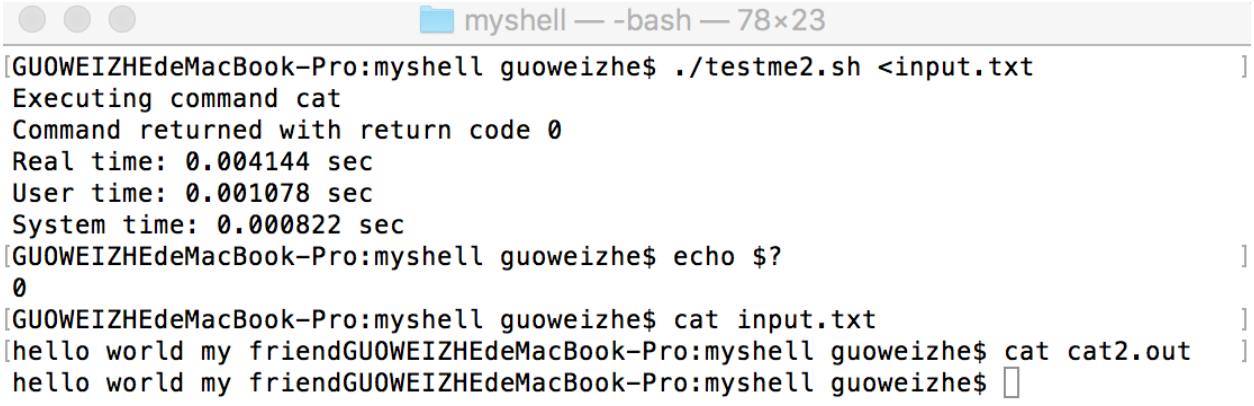
Weizhe Guo
Assignment 3

Sample Run

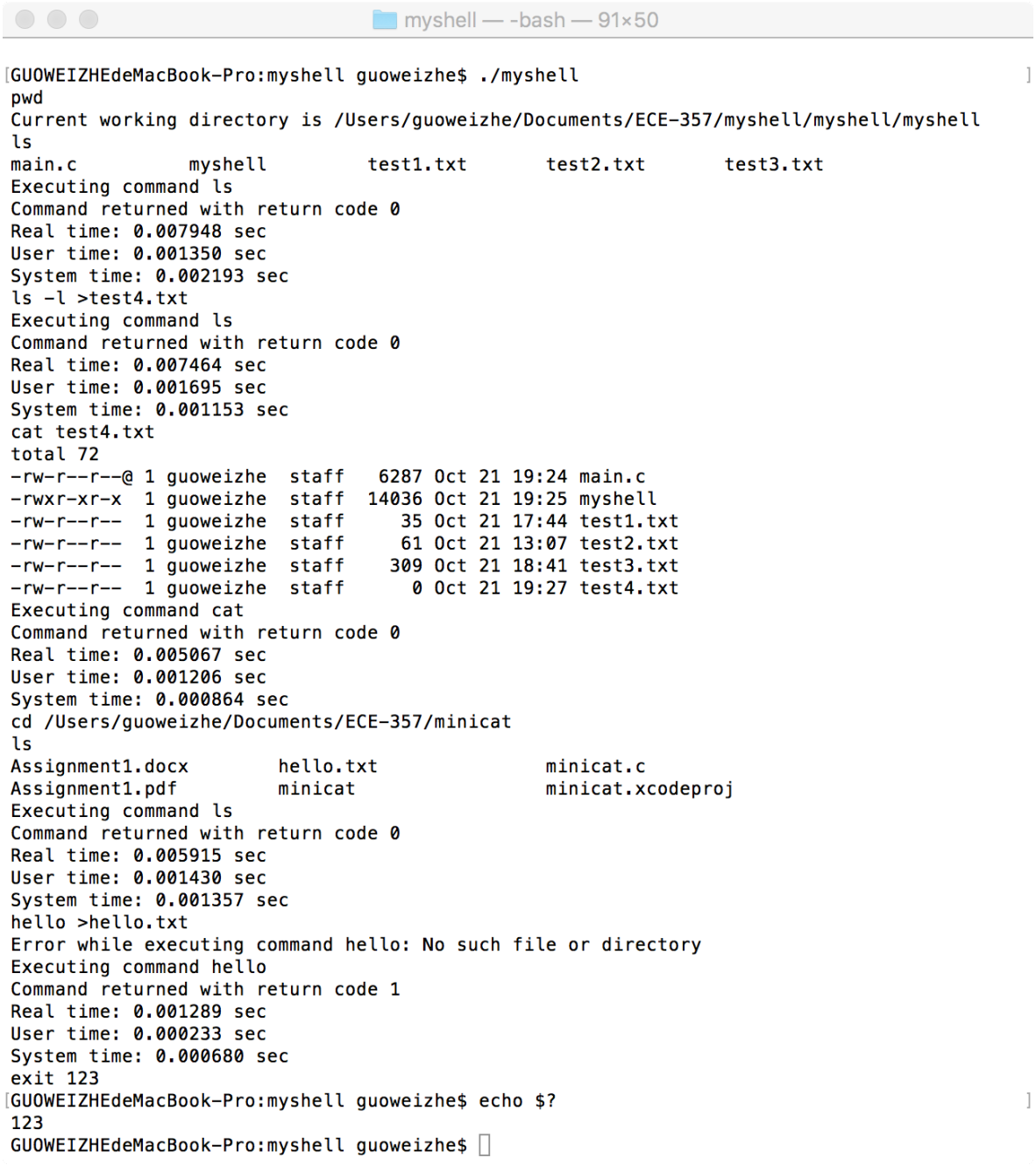
testme.sh



testme2.sh



Commands running from myshell



```c
//
//  main.c
//  myshell
//
//  Created by GUOWEIZHE on 10/20/18.
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//

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <sys/wait.h>
#include <fcntl.h>
#include <errno.h>
#include <sys/time.h>
#include <sys/resource.h>
#include <time.h>
#define DELIM " \n"

void parse_read(FILE *input);
char *readline(FILE *input);
int exec_line(char **arg, char **redir);
int run_line(char **arg, char **redir);
int redirect(char *path, int init_fd, int options, mode_t mode);

int main(int argc, char **argv){
    FILE *infile;
    if(argc > 1){
        if((infile = fopen(argv[1], "r")) == NULL){
            fprintf(stderr, "Error while opening input file %s: %s\n", argv[1],
             strerror(errno));
            return -1;
        }
        else{
            parse_read(infile);
        }

    }
    else if(argc == 1){
        infile = stdin;
        parse_read(infile);
    }
    return 0;
}

void parse_read(FILE *input){
    char *line;
    char **line_arg;
    char **line_dir;
    int status;
    do{
        //printf("> ");
        line = readline(input);
```

```
        int i = 0, j = 0;
        char *token;
        char *temp = malloc(BUFSIZ);
        char **arg = malloc(BUFSIZ);
        char **redir = malloc(BUFSIZ);
        if(temp == NULL || arg == NULL || redir == NULL){
            fprintf(stderr, "Error while allocating memory using malloc: %s\n",
             strerror(errno));
            exit(EXIT_FAILURE);
        }

        strcpy(temp, line);
        token = strtok(temp, DELIM);
        while (token != NULL) {
            // check whether current token contains I/O redirection info
            if((token[0] == '>') || (token[0] == '<') || ((token[0] == '2') &&
             token[1] == '>')){
                redir[i] = token;
                i++;
            }
            else{
                arg[j] = token;
                j++;
            }
            token = strtok(NULL, DELIM);
        }
        redir[i] = NULL;
        arg[j] = NULL;

        line_arg = arg;
        line_dir = redir;

        status = exec_line(line_arg, line_dir);

        free(temp);
        free(arg);
        free(redir);
    }while(status);
}

char *readline(FILE *input){
    size_t len = 0;
    ssize_t nread;
    char *line = NULL;
    if((nread = getline(&line, &len, input)) == -1){
        fprintf(stderr, "Error while reading commands using getline: %s\n",
         strerror(errno));
        free(line);
        exit(EXIT_FAILURE);
    }
    return line;
}
```

```
int exec_line(char **arg, char **redir){
    if((arg[0] == NULL) || (strchr(arg[0], '#')!=NULL)){
        return 1;
    }
    else if((strcmp(arg[0], "cd")) == 0){
        if(arg[1] == NULL) {
            fprintf(stderr, "Error: Incorrect usage of cd command\n");
        }
        else {
            if(chdir(arg[1]) != 0){
                fprintf(stderr, "Error while doing cd command: %s\n",
                 strerror(errno));
            }
        }
        return 1;
    }
    else if((strcmp(arg[0], "pwd")) == 0){
        char cwd[BUFSIZ];
        if((getcwd(cwd, sizeof(cwd))) == NULL) {
            fprintf(stderr, "Error while doing pwd command: %s\n", strerror(errno));
        } else {
            printf("Current working directory is %s\n", cwd);
        }
        return 1;
    }
    else if((strcmp(arg[0], "exit")) == 0){
        if(arg[1] == NULL) {
            exit(0);
        } else {
            exit(atoi(arg[1]));
        }
    }
    return run_line(arg, redir);
}

int run_line(char **arg, char **redir){
    pid_t pid, wpid;
    int status;
    struct rusage stats;
    struct timeval start, end;
    gettimeofday(&start, NULL);
    pid = fork();
    if(pid == 0){
        // in children
        char *dir;

        for(int i = 0; redir[i] != NULL; i++){
            dir = redir[i];
            if(strstr(dir, "2>>")){
                dir = dir + 3;
                if (redirect(dir, 2, O_RDWR|O_APPEND|O_CREAT, 0666))
                    exit(1);
            }
            else if(strstr(dir, ">>")){
```

```
                dir = dir + 2;
                if(redirect(dir, 1, O_RDWR|O_APPEND|O_CREAT, 0666))
                    exit(1);
            }
            else if(strstr(dir, "2>")){
                dir = dir + 2;
                if(redirect(dir, 2, O_RDWR|O_TRUNC|O_CREAT, 0666))
                    exit(1);
            }
            else if(strstr(dir, "<")){
                dir = dir + 1;
                if(redirect(dir, 0, O_RDONLY, 0666))
                    exit(1);
            }
            else if(strstr(dir, ">")){
                dir = dir + 1;
                if(redirect(dir, 1, O_RDWR|O_TRUNC|O_CREAT, 0666))
                    exit(1);
            }
        }

        if(execvp(*arg, arg) == -1){
            fprintf(stderr, "Error while executing command %s: %s\n", arg[0],
             strerror(errno));
            exit(EXIT_FAILURE);
        }
        exit(EXIT_FAILURE);
    }
    else if(pid < 0){
        fprintf(stderr, "Error while forking the process %s: %s\n", arg[0], strerror
         (errno));
        return -1;
    }
    else{
        wpid = wait3(&status, WUNTRACED, &stats);
        gettimeofday(&end, NULL);
        fprintf(stderr, "Executing command %s\n", arg[0]);
        fprintf(stderr, "Command returned with return code %d\n",
         WEXITSTATUS(status));
        fprintf(stderr, "Real time: %ld.%06d sec\n", (end.tv_sec-start.tv_sec),
         (end.tv_usec-start.tv_usec));
        fprintf(stderr, "User time: %ld.%06d sec\n", stats.ru_utime.tv_sec,
         stats.ru_utime.tv_usec);
        fprintf(stderr, "System time: %ld.%06d sec\n", stats.ru_stime.tv_sec,
         stats.ru_stime.tv_usec);
    }
    return 1;
}

int redirect(char *path, int init_fd, int options, mode_t mode) {
    int red_fd;
    if((red_fd=open(path, options, mode))<0){
        fprintf(stderr, "Error while opening file %s for redirection: %s\n", path,
         strerror(errno));
```

```
        return 1;
    }
    if(dup2(red_fd, init_fd)<0){
        fprintf(stderr, "Error while duplicating file %s for redirection: %s\n",
         path, strerror(errno));
        return 1;
    }
    if(close(red_fd)<0){
        fprintf(stderr, "Error while closing file %s for redirection: %s\n", path,
         strerror(errno));
        return 1;
    }
    return 0;
}
```

```
#!/Users/guoweizhe/Documents/ECE-357/myshell/myshell/myshell/myshell

#This is an example of a shell script that your shell must execute correctly
#notice that lines starting with a # sign are ignored as comments!
#let's say this here file is called testme.sh.  you created it with say
#vi testme.sh ; chmod +x testme.sh
#you invoked it with
#./testme.sh
cat >cat.out
#at this point, type some lines at the keyboard, then create an EOF (Ctrl-D)
#your shell invoked the system cat command with output redirected to cat.out
cat cat.out
#you better see the lines that you just typed!
exit 123
#after your shell script exits, type echo $? from the UNIX system shell
#the value should be 123.  Since your shell just exited, the following
#bogus command should never be seen
```

```
#!/Users/guoweizhe/Documents/ECE-357/myshell/myshell/myshell/myshell

# another example, say it is called test2.sh
#you invoked it with
#./test2.sh <input.txt
cat >cat2.out
#since you invoked the shell script (via the system shell such as bash)
#with stdin redirected, your shell runs cat which gets stdin from input.txt
exit
#the above exit had no specified return value, so your shell exited with 0
#because the last child spawned, cat, would have returned 0
#again, test this with echo $?
```