Final ls

System Software Laboratory
College of Software and Convergence
Kwangwoon Univ.

Contents

- **ls**

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ls

- **Data types**
  - DIR, struct dirent, struct passwd, struct stat, struct tm

- **System Calls & Functions**
  - opendir(), readdir(), closedir()
  - stat()
  - getgrgid(), getpwuid()
  - localtime()
  - getcwd()
  - getopt()
  - **fnmatch()**

Wild card matching

- **fnmatch()**

  ```
  #include <fnmatch.h>

  int fnmatch(const char *pattern, const char *string, int flags);
  ```

  - Description
    - Checks whether the <u>string</u> argument matches the <u>pattern</u> argument, which is a shell wildcard pattern ('*', '?', '[seq]').

  - Return value
    - If match, zero
    - If not match, nonzero(FNM_NOMATCH)

  - Shell wildcard pattern
    - '*': matches everything
    - '?': matches any single character
    - '[seq]': matches any character in seq

Wild card matching (cont'd)

- **fnmatch()**
  - Example: shell's wildcard pattern

```
~/spls$ ls
ls.c ls.h Makefile spls_final text1.txt text2.txt

~/spls$ ls *
ls.c ls.h Makefile spls_final text1.txt text2.txt

~/spls$ ls *.c
ls.c

~/spls$ ls ????
ls.c ls.h

~/spls$ ls *.?
ls.c ls.h

~/spls$ ls *.[a-z]
ls.c ls.h

~/spls$ ls text[12].txt
text1.txt text2.txt

~/spls$ ls *.[^t]
ls.c ls.h
```

Wild card matching (cont'd)

- **fnmatch()**
  - Bitwise OR of zero or more of the following flags
    - 0
      - No flags
      - Passing this value for our assignment
    - FNM_NOESCAPE
      - '\' 문자를 일반 문자로취 취급(e.g., \?)
    - FNM_PATHNAME
      - '/' 을 단순 문자가 아닌 패턴으로 인식
    - FNM_PERIOD
      - 문자열의 처음에 '' 문자가 나타나면 특별하게 취급

Lab.

- **Sample Code 1**

```c
#include <stdio.h>
#include <stdlib.h>
#include <fnmatch.h>

int main(int argc, char** argv){
        if(argc < 3){
                printf("argc != 3 \n");
                return 0;
        }
        printf("%s and %s is ", argv[2], argv[1]);
        if (!fnmatch(argv[2], argv[1], 0))
                printf("matching\n");
        else
                printf("not matching\n");

        return 0;
}
```

Lab. (cont'd)

- **Sample Code 1**


```
sp2018722000@ubuntu:~/sslab$ ./fnmatch
argc != 3
sp2018722000@ubuntu:~/sslab$ ./fnmatch 2 '?'
? and 2 is matching
sp2018722000@ubuntu:~/sslab$ ./fnmatch 123 '?2?'
?2? and 123 is matching
sp2018722000@ubuntu:~/sslab$ ./fnmatch kkk '*'
* and kkk is matching
sp2018722000@ubuntu:~/sslab$ ./fnmatch a.txt '*.txt'
*.txt and a.txt is matching
sp2018722000@ubuntu:~/sslab$ ./fnmatch text1 'text[1-9]'
text[1-9] and text1 is matching
sp2018722000@ubuntu:~/sslab$ ./fnmatch text10 'text[1-9]'
text[1-9] and text10 is not matching
sp2018722000@ubuntu:~/sslab$ ./fnmatch aabbccdd 'a?b?c?dc'
a?b?c?dc and aabbccdd is not matching
```

Lab. (cont'd)

- **Sample Code 2**

Set flag

```
if (!fnmatch(argv[2], argv[1], FNM_PATHNAME))
        printf("matching\n");
else
        printf("not matching\n");
```

① ```
sp2018722000@ubuntu:~/sslab$ ./fnmatch make/dir make*
make* and make/dir is not matching
FNM_PATHNAME : 1
sp2018722000@ubuntu:~/sslab$ vim fnmatch.c
sp2018722000@ubuntu:~/sslab$ make
gcc -o fnmatch fnmatch.c
```
② ```
sp2018722000@ubuntu:~/sslab$ ./fnmatch make/dir make*
make* and make/dir is matching
FNM_PATHNAME : 1
sp2018722000@ubuntu:~/sslab$
```

① Use 'FNM_PATHNAME' flag → Not Matching

② Same as Sample Code 1   → Matching

Assignment 2-3

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Assignment 2-3

- **Final ls**

  - Assignment 2-2 ("Advanced ls")

    + Wild card matching ('*', '?', '[seq]')

    + Passing arguments with quotes (e.g., ./spls_final '*')

    + implements -h, -r, -S option

- **Makefile Requirements**

  - 실행 파일이 "요일_학번_ls"로 생성되도록 Makefile 작성
  - 컴파일 도중 warning 발생 시 감점
  - "$ make" 를 통해 실행 파일이 생성 되지 않거나 문제가 발생하는 경우, 0점

Assignment 2-3

- **Code Requirements**
  - Assignment 2-1, 2-2 과제 부분에 문제가 있는 경우 감점
  - Wildcard를 이용해 두 개 이상의 디렉토리를 찾을 경우 디렉토리 내용 출력
  - Wildcard는 인자의 끝에만 사용한다고 가정
    - Examples
      - $ ./spls_final '/home/2017000083/*'
      - $ ./spls_final '/home/[0-9]*'
      - $ ./spls_final 'src.?'
  - ls –h, -S, -r **옵션 추가 구현**
  - 출력 형식에 맞지 않으면 감점
  - 소스코드의 50% 이상 주석을 달지 않은 경우 감점

Assignment 2-3 (cont'd)
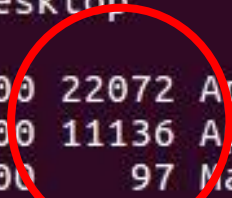
- **Final ls**
  - -h
    - Print sizes in human readable format (e.g., 1K 234M 2G)

```
sp2018722000@ubuntu:~/Desktop$ ./spls_final -lh
Directory path: /home/sp2018722000/Desktop
total 36
-rwxrw-rw- 1 sp2018722000 sp2018722000     11K Apr 2 04:08 final_ls.c
-rw-rw-r-- 1 sp2018722000 sp2018722000     97 Mar 29 22:35 Makefile
-rwxrwxr-x 1 sp2018722000 sp2018722000     22K Apr 2 04:08 spls_final
```

Assignment 2-3 (cont'd)

- **Final ls**
  - -S
    - sort by file size

```
sp2018722000@ubuntu:~/Desktop$ ./spls_final -lS
Directory path: /home/sp2018722000/Desktop
total 36
-rwxrwxr-x 1 sp2018722000 sp2018722000 22072 Apr 2 04:08 spls_final
-rwxrw-rw- 1 sp2018722000 sp2018722000 11136 Apr 2 04:08 final_ls.c
-rw-rw-r-- 1 sp2018722000 sp2018722000    97 Mar 29 22:35 Makefile
```

Assignment 2-3 (cont'd)

- **Final ls**

  - -r

    - Print reverse sort by string

    - **With –S option, sort files in reverse order of size.**

      - **For files with the same size, sort by string in reverse order.**

```
sp2018722000@ubuntu:~/Desktop$ ./spls_final -lr
Directory path: /home/sp2018722000/Desktop
total 36
-rwxrwxr-x 1 sp2018722000 sp2018722000 22072 Apr  2 04:08 spls_final
-rw-rw-r-- 1 sp2018722000 sp2018722000    97 Mar 29 22:35 Makefile
-rwxrw-rw- 1 sp2018722000 sp2018722000 11136 Apr  2 04:08 final_ls.c
```

< Using –r option >

```
sp2018722000@ubuntu:~/Desktop$ ./spls_final -larS
Directory path: /home/sp2018722000/Desktop
total 48
-rw-rw-r--  1 sp2018722000 sp2018722000     0 Mar 29 23:01 .zzz
-rw-rw-r--  1 sp2018722000 sp2018722000     0 Mar 29 23:01 .bbb
-rw-rw-r--  1 sp2018722000 sp2018722000     0 Mar 29 23:01 .aaa
-rw-rw-r--  1 sp2018722000 sp2018722000    97 Mar 29 22:35 Makefile
drwxr-xr-x 16 sp2018722000 sp2018722000  4096 Apr  2 03:58 ..
drwxr-xr-x  2 sp2018722000 sp2018722000  4096 Apr  2 04:08 .
-rwxrw-rw-  1 sp2018722000 sp2018722000 11136 Apr  2 04:08 final_ls.c
-rwxrwxr-x  1 sp2018722000 sp2018722000 22072 Apr  2 04:08 spls_final
```

< Using –r option with –S option >

Same size : String upside down

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Assignment 2-3 (cont'd)

- **Final ls**

  - Results

Assignment 2-3 (cont'd)

- **Final ls**
  - Results

Assignment 2-3 (cont'd)

- **Final ls**
  - Results

Assignment 2-3 (cont'd)

- **Final ls**

  - Results

```
sp2018722000@ubuntu:~/Desktop$ ./spls_final '/home/sp2018722000/*'
Directory path: /home/sp2018722000/Desktop
final_ls.c
Makefile
spls_final

Directory path: /home/sp2018722000/Documents

Directory path: /home/sp2018722000/Downloads

Directory path: /home/sp2018722000/Music

Directory path: /home/sp2018722000/Pictures

Directory path: /home/sp2018722000/Public

Directory path: /home/sp2018722000/sslab
fnmatch
fnmatch.c
ls.c
ls.h
Makefile

Directory path: /home/sp2018722000/Templates

Directory path: /home/sp2018722000/Videos
```

Assignment 2-3 (cont'd)

- **Softcopy Upload**
  - 제출 파일
    - 보고서
    - 요일_학번_ls.c , 요일 _학번_ls(Makefile)
      - e.g. fri_20190000_ls.c, fri_20190000_ls(Makefile)
    - Soruce code copy 적발 시 예외 없이 0점 처리
  - 위 파일들을 압축해서 제출 (파일명: 실습 요일_2-3_학번.tar.gz)
    - e.g. 월1,2 ➔ **mon**_2-3_2017202000.**tar.gz**
    - e.g. 화3,4 ➔ **tue**_2-3_2017202000.**tar.gz**
    - e.g. 금5,6 ➔ **fri**_2-3_2017202000.**tar.gz**
  - U-Campus의 과제 제출에 4월 26일(금) 23:59:59까지 제출
    - U-Campus에 올린 후 다시 다운로드 받아서 파일이 정확한지 확인
  - 미리 공지한 바와 같이, delay 받지 않음 (예외 없음)
  - Ubuntu 16.04 64bits 환경에서 채점

- **과제 질문 관련**
  - 해당 과제 출제 담당 조교에게 이메일로 문의 ➔ **김태현 조교 (taehyun9203@gmail.com)**
  - 과제 제출 마감 당일에는 오후 4시까지 도착한 질문 메일에만 답변

Assignment 2-3 (cont'd)

- **표지**
  - 다음의 내용은 필히 기록
    - 과제 이름 (e.g. Assignment#2-3)
    - 분반 (요일, 담당 교수님)
    - 본인 인적 사항 (학번, 이름)

- **과제 내용**
  - Introduction : 5줄 이하
  - Flow chart : 4주차 자료의 Appendix 참고
  - Pseudo code : 4주차 자료의 Appendix 참고
  - Result : 수행한 내용을 캡쳐 이미지와 함께 설명
  - Conclusion : 결론 및 고찰

- **보고서 이름은 "실습 요일_과제명_학번"으로 수정**
  - e.g. 월1,2 ➔ **mon**_2-3_2017202000.**pdf**
  - e.g. 화3,4 ➔ **tue**_2-3_2017202000.**pdf**
  - e.g. 금5,6 ➔ **fri**_2-3_2017202000.**pdf**