Gebze Technical University
Computer Engineering

CSE 312 - 2021 Spring

HOMEWORK 4 REPORT

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1 INTRODUCTION

1.1 Problem Definition

Designing and implementing a simplified FAT like file system.

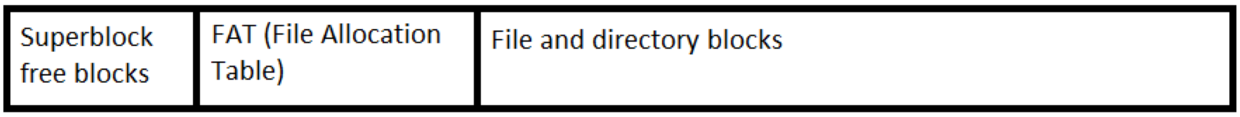
1.2 System Requirements

Any computer with Ubuntu 14.04 LTS 32-bit Operating System.

2 METHOD

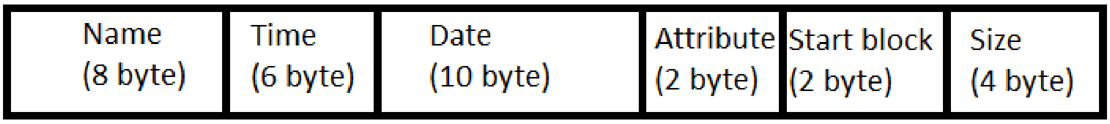
2.1 Problem Solution Approach

fileSystem.data



Superblock free blocks	FAT (File Allocation Table)	File and directory blocks

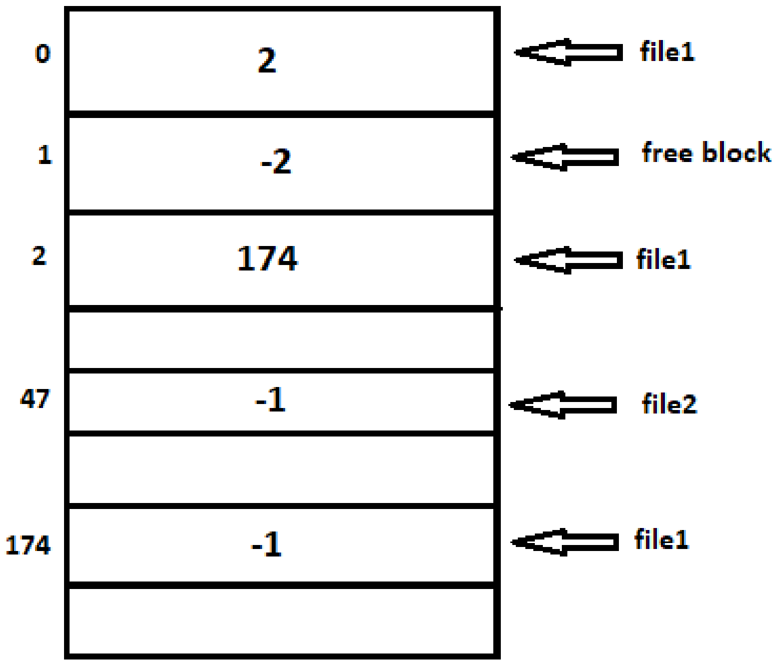
The file system is as above. Depending on the block size, the number of blocks occupied by superblock and FAT may vary.



Name (8 byte)	Time (6 byte)	Date (10 byte)	Attribute (2 byte)	Start block (2 byte)	Size (4 byte)

Directory entry

Directory entry is as above. If there is a directory entry in a block, that block is a directory block. If there is no directory entry, that block is a file block. Directory and file blocks can be multiple and FAT is used to access these blocks.



FAT (File Allocation Table)

FAT(File Allocation Table) is as above. The value -1 means the EOF(End of file) and value -2 means the block is free. The other values are the next block of current file.

Filesystem.h:

This library contains the equivalent of the file system in the form of c++ code. The file system is defined as a class and includes superblock, FAT and other blocks. Blocks can be directory entries or files.

makeFileSystem.cpp:

This program creates an empty file system. The size of this file system is determined by the given block size. Superblock and FAT are added to the beginning of this file system. Root directory block is also added after FAT.If the file system is already created, it prints error message and terminate.

fileSystemOper.cpp:

NOTE:The root directory must be entered as “\\”. For example: “\\usr\dir\file” or “\\”.

This program loads the file system before starting any operation and saves the file system back after the operation is finished.

load_file_system():

This function reads the file system file and loads into the filesystem(FS) class.

save_file_system():

This function saves the current filesystem(class FS) into file system file.

traverse_recursive():

This function traverses all the file system. If the command parameter is 0, loads the file system file to the file system class. If the parameter is 1, saves the file system class into the file system file.

traverse_path():

This function traverses the given path and returns the first block number of file/directory.

dir():

This operation prints the entries in the given path. If the inputs are more than 1 block, it prints using FAT.

mkdir():

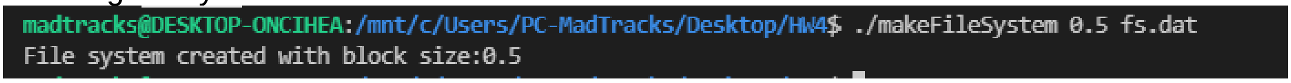
This operation adds a new directory to the specified path. To do this, it takes one of the free blocks, saves it to the FAT table, and creates a new entry in the directory it is in.

rmdir():
This operation deletes the entry in the specified path and removes it from the FAT table, and saves the block it is in as a free block. If the directory has more than one block, it converts all blocks to free blocks.
Dumpe2fs():
This operation prints the information in the superblock and prints the root directory.
Write():
This operation adds a new directory entry to the specified path. According to the size of the given file, it takes as many free blocks as necessary and saves them in the FAT table, depending on each other.After that, saves the given file into the these blocks.
Read():
This operation reads the file at the specified path and writes it to the given file. If the file is larger than 1 block, it is reading the file using FAT.
Del():
This operation deletes the entry in the specified path and removes it from the FAT table, and saves the block it is in as a free block. If the file has more than one block, it converts all blocks to free blocks.

3 RESULT

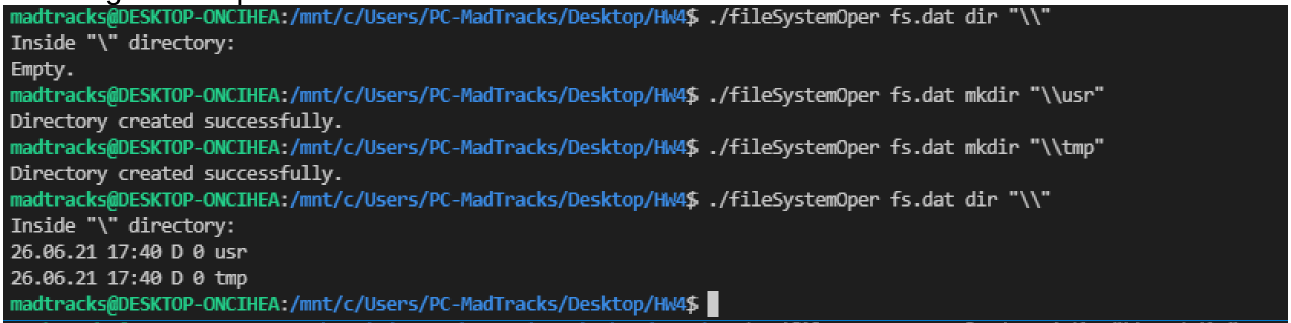
3.1 Test Cases

Creating file system:

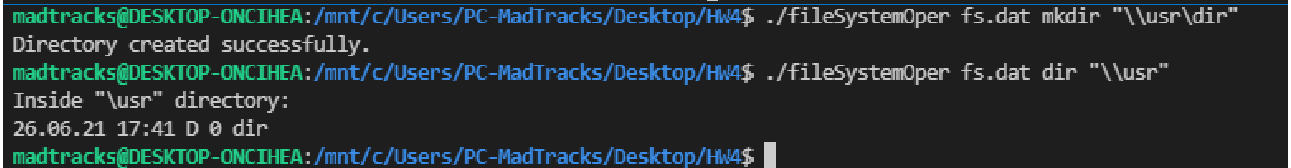


```
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./makeFileSystem 0.5 fs.dat
File system created with block size:0.5
```

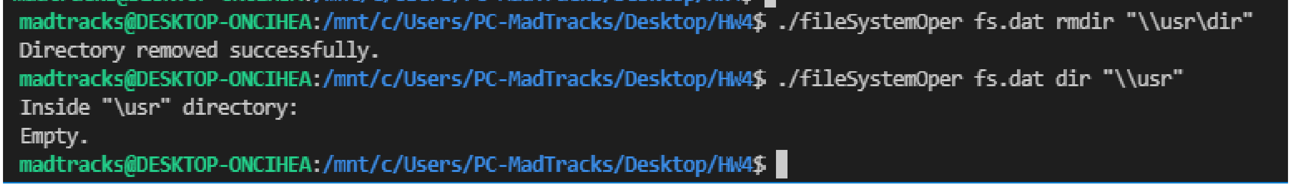
Running some operations:



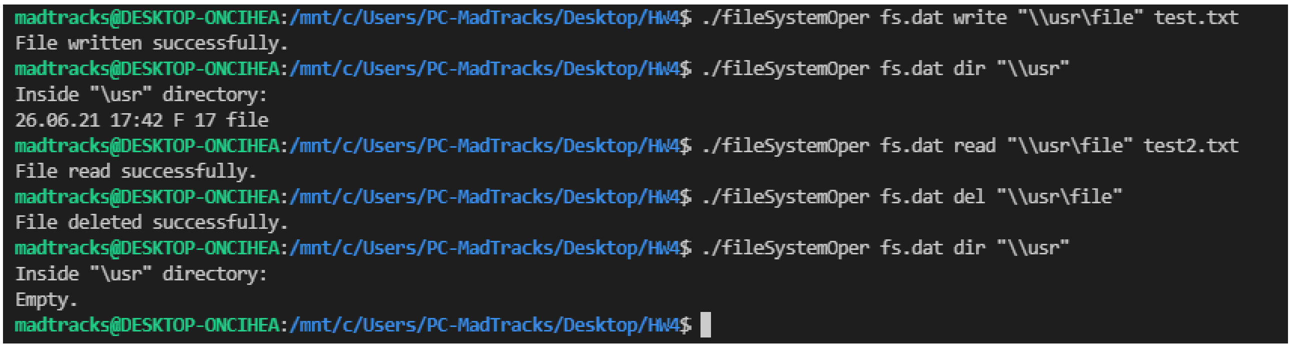
```
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat dir "\\"
Inside "\" directory:
Empty.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat mkdir "\\usr"
Directory created successfully.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat mkdir "\\tmp"
Directory created successfully.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat dir "\\"
Inside "\" directory:
26.06.21 17:40 D 0 usr
26.06.21 17:40 D 0 tmp
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$
```



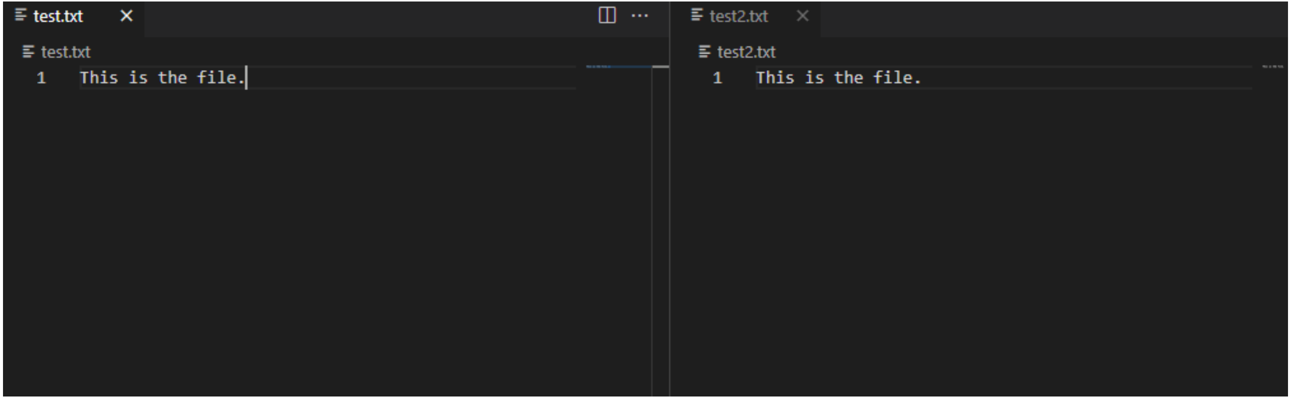
```
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat mkdir "\\usr\dir"
Directory created successfully.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat dir "\\usr"
Inside "\usr" directory:
26.06.21 17:41 D 0 dir
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$
```



```
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat rmdir "\\usr\dir"
Directory removed successfully.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat dir "\\usr"
Inside "\usr" directory:
Empty.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$
```

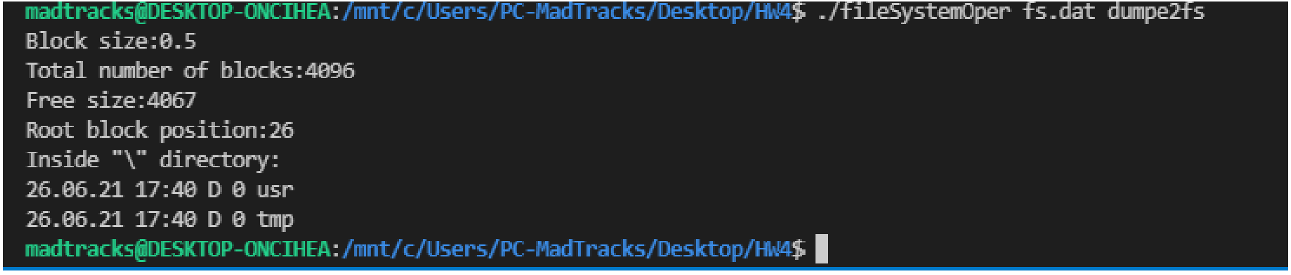


```
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat write "\\usr\file" test.txt
File written successfully.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat dir "\\usr"
Inside "\usr" directory:
26.06.21 17:42 F 17 file
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat read "\\usr\file" test2.txt
File read successfully.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat del "\\usr\file"
File deleted successfully.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat dir "\\usr"
Inside "\usr" directory:
Empty.
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$
```



```
This is the file.
```

```
This is the file.
```



```
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$ ./fileSystemOper fs.dat dumpe2fs
Block size:0.5
Total number of blocks:4096
Free size:4067
Root block position:26
Inside "\" directory:
26.06.21 17:40 D 0 usr
26.06.21 17:40 D 0 tmp
madtracks@DESKTOP-ONCIHEA:/mnt/c/Users/PC-MadTracks/Desktop/HW4$
```