

CSE 344

HOMEWORK #4

Arife Yurtseven

210104004294

Introduction:

The fundamental working principle of the program is built upon a manager thread that scans files and directories in a source directory and adds them to a buffer structure, while worker threads retrieve file information from this buffer to perform the copying process. The main components and the sequence of operations of the program are as follows:

Manager Thread: Scans files and directories in the source directory, adding file information to be copied into the buffer structure.

Worker Threads: Use the file information retrieved from the buffer to copy the files.

Cleanup and Reporting: Once all processes are completed, the program releases resources and prints operation statistics on the screen.

Pseudocode

Global Constants and Structures

```
1  Define constants:
2      PATH_MAX_LENGTH = 1024
3      HASH_SIZE = 65536
4
5  Define structures:
6      file_info_t:
7          src_path: string[PATH_MAX_LENGTH]
8          dest_path: string[PATH_MAX_LENGTH]
9
10     buffer_t:
11         buffer: array of file_info_t[BUFFER_CAPACITY]
12         start: size_t
13         end: size_t
14         done: int
15         mutex: pthread_mutex_t
16         not_empty: pthread_cond_t
17         not_full: pthread_cond_t
18
```

Global Variables

```
19  ▾ Declare global variables:
20      file_buffer: buffer_t
21      workers: array of pthread_t
22      num_workers: size_t
23      src_dir: string
24      dest_dir: string
25      copied_files_hash: array of unsigned long[HASH_SIZE]
26
27      regular_file_count: int
28      fifo_file_count: int
29      directory_count: int
30      total_bytes_copied: size_t
31      start_time: timeval
32      end_time: timeval
33      buffer_size: size_t
```

Helper Functions

```
35  ▾ Define function calculate_path_hash(path: string) -> unsigned long:
36      Initialize hash to 5381
37  ▾ For each character in path:
38      |   hash = (hash << 5) + hash + character  # hash * 33 + c
39      |   Return hash % HASH_SIZE
40
41  ▾ Define function add_path_to_hash(path: string) -> bool:
42      Calculate hash_index = hash_path(path)
43  ▾ If copied_files_hash[hash_index] == 0:
44      |   Set copied_files_hash[hash_index] = 1
45      |   Return true
46      |   Return false
47
48  ▾ Define function initialize_copied_hash():
49  ▾ For each index from 0 to HASH_SIZE-1:
50      |   Set copied_files_hash[index] = 0
51
52  ▾ Define function signal_handler(signal: int):
53  ▾ If signal == SIGINT:
54      |   Print "SIGINT received. Exiting..."
55      |   Call cleanup()
56      |   Exit program
```

Manager and Worker Threads

```
60 ▾ Define function managerThreadStart(arg: void*):
61     Call copy_directory(src_dir, dest_dir)
62     Lock file_buffer.mutex
63     Set file_buffer.done = 1
64     Broadcast file_buffer.not_empty
65     Unlock file_buffer.mutex
66     Return NULL
67
68 ▾ Define function workerThreadStart(arg: void*):
69 ▾     While true:
70         Lock file_buffer.mutex
71 ▾         While file_buffer.start == file_buffer.end and file_buffer.done == 0:
72             Wait on file_buffer.not_empty with file_buffer.mutex
73 ▾         If file_buffer.start == file_buffer.end and file_buffer.done == 1:
74             Unlock file_buffer.mutex
75             Break loop
76         Dequeue file from file_buffer
77         file_buffer.start = (file_buffer.start + 1) % buffer_size
78         Signal file_buffer.not_full
79         Unlock file_buffer.mutex
80         Print "Copying file from src_path to dest_path"
81         Call copy_file(file.src_path, file.dest_path)
82     Return NULL
```

File and Directory Copying

```
86 Define function copy_file(src_path: string, dest_path: string):
87     Open src_path for reading
88     If failed, print error and return
89     Get file status of src_fd
90     Open dest_path for writing, create if necessary, truncate if exists
91     If failed, print error, close src_fd and return
92     While reading bytes from src_fd:
93         Write bytes to dest_fd
94         Increment total_bytes_copied by bytes_read
95     Close src_fd and dest_fd
96     If file is regular:
97         Increment regular_file_count
98     Else if file is FIFO:
99         Increment fifo_file_count
100
101 Define function copy_directory(src_dir: string, dest_dir: string):
102     Open src_dir
103     If failed, print error and return
104     For each entry in src_dir:
105         If entry is "." or "..", continue
106         Construct src_path and dest_path
107         If entry is directory:
108             Create directory dest_path
109             Increment directory_count
110             Recursively call copy_directory(src_path, dest_path)
111         Else:
112             Lock file_buffer.mutex
113             While buffer is full:
114                 Wait on file_buffer.not_full with file_buffer.mutex
115             Enqueue file into file_buffer with src_path and dest_path
116             file_buffer.end = (file_buffer.end + 1) % buffer_size
117             Signal file_buffer.not_empty
118             Unlock file_buffer.mutex
119     Close src_dir
```

Print and Cleanup

```
123  ▾ Define function printOutputs():
124      Calculate elapsed time in minutes, seconds, and milliseconds
125  ▾   Print statistics:
126      Number of workers
127      Buffer size
128      Number of regular files
129      Number of FIFO files
130      Number of directories
131      Total bytes copied
132      Total time taken
133
134  ▾ Define function cleanup():
135      Destroy file_buffer.mutex
136      Destroy file_buffer.not_empty
137      Destroy file_buffer.not_full
138      Free workers array
```

Main Function

```
142  ▾ Main function:
143  ▾   If argument count != 5:
144      Print usage message and exit
145      Setup SIGINT signal handler
146      Parse arguments for buffer_size, num_workers, src_dir, dest_dir
147      Initialize file_buffer and copied_files_hash
148      Get current time as start_time
149      Create destination root directory
150      Create manager thread
151      Create num_workers worker threads
152      Join manager and worker threads
153      Get current time as end_time
154      Call print_statistics()
155      Call cleanup()
156      Return 0
157
158
```

calculate_hash_path :

This function generates a unique hash value for a given file path. Each character in the file path is processed, thus influencing the hash value. As a result, this hash value can be used as a unique identifier for the file

add_path_to_hash :

After calculating the hash value of a given file path, this value is stored in a hash table. If this file path has not been added to the hash table before, the function successfully indicates that a new entry has been made.

initialize_copied_hash :

At the start of the program, all hash values are reset, clearing the hash table. This ensures that old data is cleaned out before the copying process begins.

manager ThreadStart :

Functions as the manager thread. This thread initiates the file and directory copying process from the specified source directory to the destination directory. Once all copying tasks are completed, it wakes up all worker threads to signal the end of the process.

workerThreadStart:

Worker threads take the files designated by the manager thread to be copied and transfer them to the target location. If there are no more files to be copied and all tasks are completed, the thread terminates itself.

copy_file:

This function opens a specific source file, reads its content, and writes this content to the target file. Error checking is performed during the file copying process, and a counter for successful copies is updated.

copy_directory :

Scans all subdirectories and files in the source directory. If a sub-item is a directory, the same structure is created in the target directory, and the copying process continues recursively for this new directory. For files, they are added to the queue to be processed by worker threads.

printOutputs:

After the completion of the copying process, various statistics are printed on the screen. These statistics include the number of files copied, the total bytes copied, and the total duration of the process.

signal_handler :

Ensures the program terminates safely when it encounters an external interrupt signal (e.g., being stopped with CTRL+C).

cleanup :

At the end of the program, all used resources are released. Mutexes are destroyed and memory allocated for thread arrays is reclaimed.

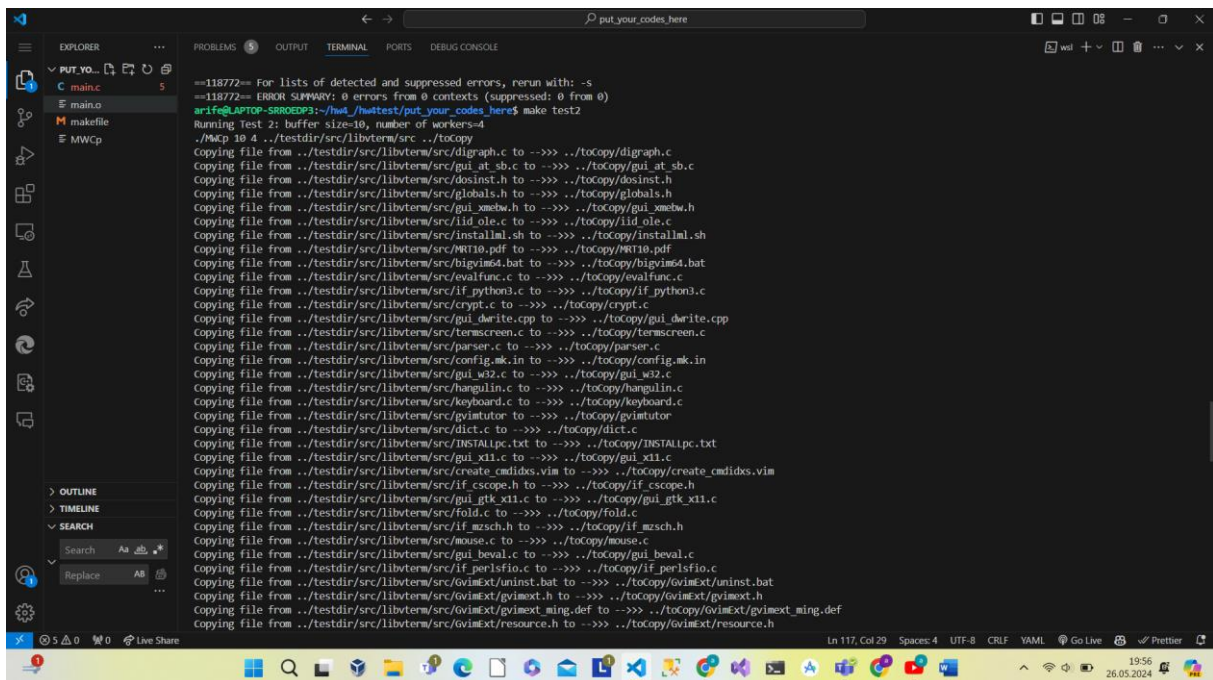
Test1 // also works as make test1

```
arife@LAPTOP-SRROEDP3:~/hw4/hwtest/put_your_codes_here$ make
gcc -pthread -Wall -c main.c
gcc -pthread -Wall -o MWcP main.o
arife@LAPTOP-SRROEDP3:~/hw4/hwtest/put_your_codes_here$ valgrind ./MWcP 10 10 ../testdir/src/libvterm ../tocopy
==118772== Memcheck, a memory error detector
==118772== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==118772== Using Valgrind-3.18.1 and LibVEX; rerun with -h for copyright info
==118772== Command: ./MWcP 10 10 ../testdir/src/libvterm ../tocopy
==118772==
Copying file from ../testdir/src/libvterm/src/digraph.c to --> ../tocopy/src/digraph.c
Copying file from ../testdir/src/libvterm/src/gui_at_sh.c to --> ../tocopy/src/gui_at_sh.c
Copying file from ../testdir/src/libvterm/src/globals.h to --> ../tocopy/src/globals.h
Copying file from ../testdir/src/libvterm/src/dosinst.h to --> ../tocopy/src/dosinst.h
Copying file from ../testdir/src/libvterm/src/gui_xmew.h to --> ../tocopy/src/gui_xmew.h
Copying file from ../testdir/src/libvterm/src/iid_ole.c to --> ../tocopy/src/iid_ole.c
Copying file from ../testdir/src/libvterm/src/install.sh to --> ../tocopy/src/install.sh
Copying file from ../testdir/src/libvterm/src/MWT10.pdf to --> ../tocopy/src/MWT10.pdf
Copying file from ../testdir/src/libvterm/src/evalfunc.c to --> ../tocopy/src/evalfunc.c
Copying file from ../testdir/src/libvterm/src/if_python3.c to --> ../tocopy/src/if_python3.c
Copying file from ../testdir/src/libvterm/src/crypt.c to --> ../tocopy/src/crypt.c
Copying file from ../testdir/src/libvterm/src/parser.c to --> ../tocopy/src/parser.c
Copying file from ../testdir/src/libvterm/src/bigvim64.bat to --> ../tocopy/src/bigvim64.bat
Copying file from ../testdir/src/libvterm/src/gui_dwrite.cpp to --> ../tocopy/src/gui_dwrite.cpp
Copying file from ../testdir/src/libvterm/src/termScreen.c to --> ../tocopy/src/termScreen.c
Copying file from ../testdir/src/libvterm/src/config.mk.in to --> ../tocopy/src/config.mk.in
Copying file from ../testdir/src/libvterm/src/hangulinc.c to --> ../tocopy/src/hangulinc.c
Copying file from ../testdir/src/libvterm/src/gui_w32.c to --> ../tocopy/src/gui_w32.c
Copying file from ../testdir/src/libvterm/src/keyboard.c to --> ../tocopy/src/keyboard.c
Copying file from ../testdir/src/libvterm/src/gvintutor to --> ../tocopy/src/gvintutor
Copying file from ../testdir/src/libvterm/src/INSTALLpc.txt to --> ../tocopy/src/INSTALLpc.txt
Copying file from ../testdir/src/libvterm/src/create_cmdids.vim to --> ../tocopy/src/create_cmdids.vim
Copying file from ../testdir/src/libvterm/src/gui_x11.c to --> ../tocopy/src/gui_x11.c
Copying file from ../testdir/src/libvterm/src/dict.c to --> ../tocopy/src/dict.c
Copying file from ../testdir/src/libvterm/src/gui_gtk_x11.c to --> ../tocopy/src/gui_gtk_x11.c
Copying file from ../testdir/src/libvterm/src/fold.c to --> ../tocopy/src/fold.c
Copying file from ../testdir/src/libvterm/src/if_mzsch.h to --> ../tocopy/src/if_mzsch.h
Copying file from ../testdir/src/libvterm/src/mouse.c to --> ../tocopy/src/mouse.c
Copying file from ../testdir/src/libvterm/src/if_escpoe.h to --> ../tocopy/src/if_escpoe.h
Copying file from ../testdir/src/libvterm/src/gui_beval.c to --> ../tocopy/src/gui_beval.c
Copying file from ../testdir/src/libvterm/src/if_perlinfo.c to --> ../tocopy/src/if_perlinfo.c
```

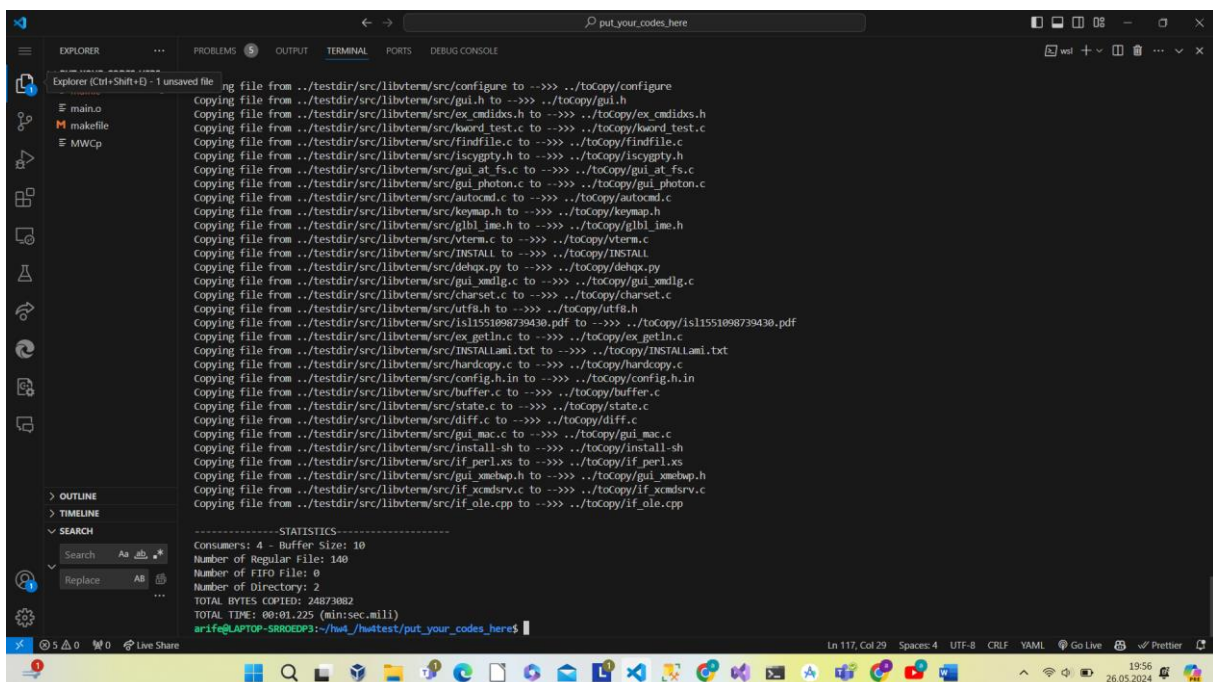
```
Copying file from ../testdir/src/libvterm/t/15state.mode.test to --> ../tocopy/t/15state.mode.test
Copying file from ../testdir/src/libvterm/t/11state.movecursor.test to --> ../tocopy/t/11state.movecursor.test
Copying file from ../testdir/src/libvterm/t/90vtttest_02-screen-3.test to --> ../tocopy/t/90vtttest_02-screen-3.test
Copying file from ../testdir/src/libvterm/t/47screen.dbl.wh.test to --> ../tocopy/t/47screen.dbl.wh.test
Copying file from ../testdir/src/libvterm/t/25state.input.test to --> ../tocopy/t/25state.input.test
Copying file from ../testdir/src/libvterm/t/tblzinc.c.pl to --> ../tocopy/t/tblzinc.c.pl
Copying file from ../testdir/src/libvterm/t/90vtttest_02-screen-2.test to --> ../tocopy/t/90vtttest_02-screen-2.test
Copying file from ../testdir/src/libvterm/t/bzignore to --> ../tocopy/t/bzignore
Copying file from ../testdir/src/libvterm/t/vterm.pc.in to --> ../tocopy/t/vterm.pc.in
Copying file from ../testdir/src/libvterm/README to --> ../tocopy/README
Copying file from ../testdir/src/libvterm/Makefile to --> ../tocopy/Makefile
Copying file from ../testdir/src/libvterm/bin/unterm.c to --> ../tocopy/bin/unterm.c
Copying file from ../testdir/src/libvterm/bin/vterm-ctrl.c to --> ../tocopy/bin/vterm-ctrl.c
Copying file from ../testdir/src/libvterm/bin/vterm-dump.c to --> ../tocopy/bin/vterm-dump.c

-----STATISTICS-----
Consumers: 10 - Buffer Size: 10
Number of Regular File: 194
Number of FIFO File: 0
Number of Directory: 7
TOTAL BYTES COPIED: 25009680
TOTAL TIME: 00:01.873 (min:sec.mill)
==118772==
==118772== HEAP SUMMARY:
==118772==   in use at exit: 0 bytes in 0 blocks
==118772==   total heap usage: 21 allocs, 21 frees, 266,624 bytes allocated
==118772==
==118772== All heap blocks were freed -- no leaks are possible
==118772==
==118772== For lists of detected and suppressed errors, rerun with: -s
==118772== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
arife@LAPTOP-SRROEDP3:~/hw4/hwtest/put_your_codes_here$
```


Test2 // ./MWCp 10 4 ../testdir/src/libvterm/src ../toCopy



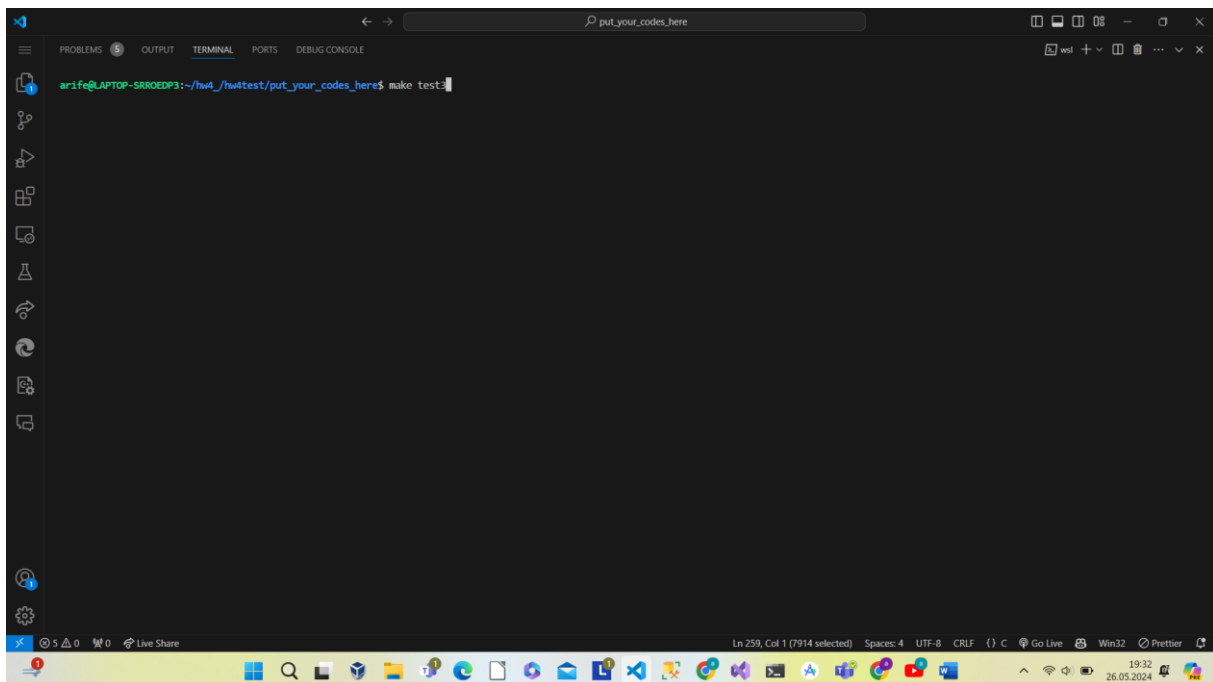
```
==118772== For lists of detected and suppressed errors, rerun with: -s
--118772-- ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
arife@LAPTOP-SRROEDP31:~/hw4_hwtest/put_your_codes_here$ make test2
Running Test 2: buffer size=10, number of workers=4
./MWCp 10 4 ../testdir/src/libvterm/src ../toCopy
Copying file from ../testdir/src/libvterm/src/digraph.c to --> ../toCopy/digraph.c
Copying file from ../testdir/src/libvterm/src/gui_at_sb.c to --> ../toCopy/gui_at_sb.c
Copying file from ../testdir/src/libvterm/src/dosinst.h to --> ../toCopy/dosinst.h
Copying file from ../testdir/src/libvterm/src/globals.h to --> ../toCopy/globals.h
Copying file from ../testdir/src/libvterm/src/gui_xmehw.h to --> ../toCopy/gui_xmehw.h
Copying file from ../testdir/src/libvterm/src/iid_ole.c to --> ../toCopy/iid_ole.c
Copying file from ../testdir/src/libvterm/src/installml.sh to --> ../toCopy/installml.sh
Copying file from ../testdir/src/libvterm/src/MRT10.pdf to --> ../toCopy/MRT10.pdf
Copying file from ../testdir/src/libvterm/src/bigvim64.bat to --> ../toCopy/bigvim64.bat
Copying file from ../testdir/src/libvterm/src/evalfunc.c to --> ../toCopy/evalfunc.c
Copying file from ../testdir/src/libvterm/src/if_python3.c to --> ../toCopy/if_python3.c
Copying file from ../testdir/src/libvterm/src/keyboard.c to --> ../toCopy/keyboard.c
Copying file from ../testdir/src/libvterm/src/gui_dwrite.cpp to --> ../toCopy/gui_dwrite.cpp
Copying file from ../testdir/src/libvterm/src/termstream.c to --> ../toCopy/termstream.c
Copying file from ../testdir/src/libvterm/src/parser.c to --> ../toCopy/parser.c
Copying file from ../testdir/src/libvterm/src/config.mk.in to --> ../toCopy/config.mk.in
Copying file from ../testdir/src/libvterm/src/gui_w32.c to --> ../toCopy/gui_w32.c
Copying file from ../testdir/src/libvterm/src/hangulin.c to --> ../toCopy/hangulin.c
Copying file from ../testdir/src/libvterm/src/keyboard.c to --> ../toCopy/keyboard.c
Copying file from ../testdir/src/libvterm/src/guitutor.c to --> ../toCopy/guitutor.c
Copying file from ../testdir/src/libvterm/src/dict.c to --> ../toCopy/dict.c
Copying file from ../testdir/src/libvterm/src/INSTALLpc.txt to --> ../toCopy/INSTALLpc.txt
Copying file from ../testdir/src/libvterm/src/gui_x11.c to --> ../toCopy/gui_x11.c
Copying file from ../testdir/src/libvterm/src/create_cmdidx.vim to --> ../toCopy/create_cmdidx.vim
Copying file from ../testdir/src/libvterm/src/if_cscope.h to --> ../toCopy/if_cscope.h
Copying file from ../testdir/src/libvterm/src/gui_gtk_x11.c to --> ../toCopy/gui_gtk_x11.c
Copying file from ../testdir/src/libvterm/src/foild.c to --> ../toCopy/foild.c
Copying file from ../testdir/src/libvterm/src/if_mzsch.h to --> ../toCopy/if_mzsch.h
Copying file from ../testdir/src/libvterm/src/mouse.c to --> ../toCopy/mouse.c
Copying file from ../testdir/src/libvterm/src/gui_beval.c to --> ../toCopy/gui_beval.c
Copying file from ../testdir/src/libvterm/src/if_perlsfio.c to --> ../toCopy/if_perlsfio.c
Copying file from ../testdir/src/libvterm/src/gvimext/uninst.bat to --> ../toCopy/gvimext/uninst.bat
Copying file from ../testdir/src/libvterm/src/gvimext/gvimext.h to --> ../toCopy/gvimext/gvimext.h
Copying file from ../testdir/src/libvterm/src/gvimext/gvimext_ming.def to --> ../toCopy/gvimext/gvimext_ming.def
Copying file from ../testdir/src/libvterm/src/gvimext/resource.h to --> ../toCopy/gvimext/resource.h
```



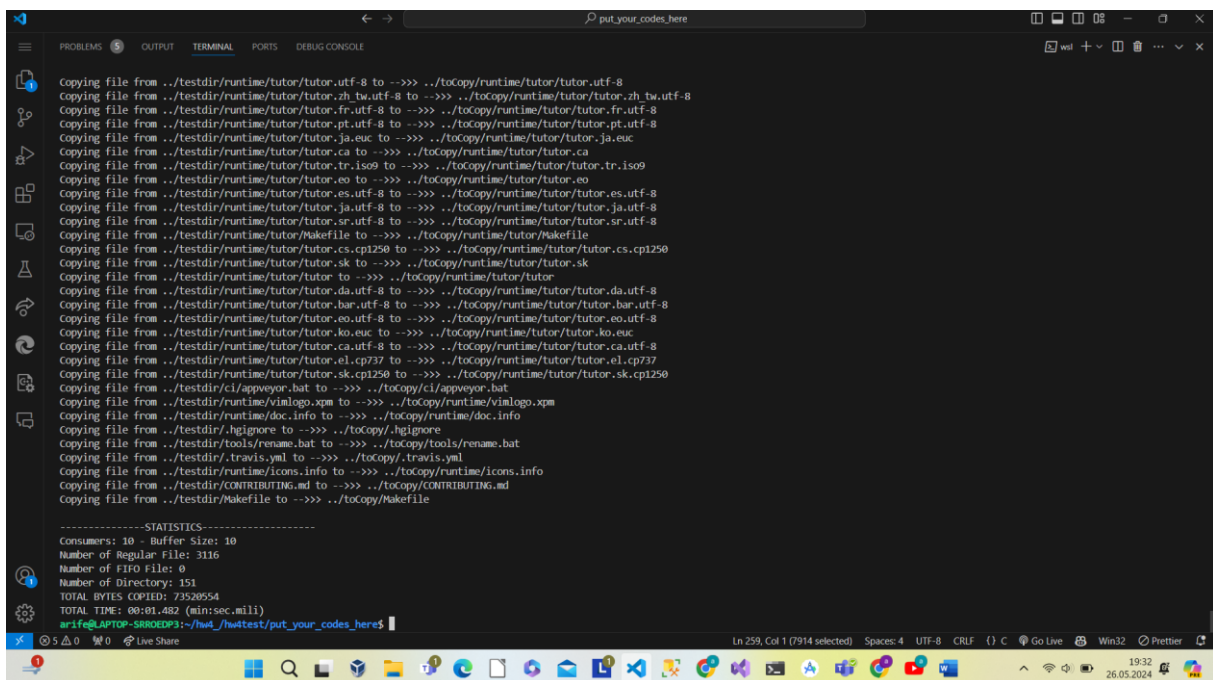
```
ng file from ../testdir/src/libvterm/src/configure to --> ../toCopy/configure
Copying file from ../testdir/src/libvterm/src/gui.h to --> ../toCopy/gui.h
Copying file from ../testdir/src/libvterm/src/ex_cmdidx.h to --> ../toCopy/ex_cmdidx.h
Copying file from ../testdir/src/libvterm/src/keyword_test.c to --> ../toCopy/keyword_test.c
Copying file from ../testdir/src/libvterm/src/findfile.c to --> ../toCopy/findfile.c
Copying file from ../testdir/src/libvterm/src/iscypty.h to --> ../toCopy/iscypty.h
Copying file from ../testdir/src/libvterm/src/gui_at_fs.c to --> ../toCopy/gui_at_fs.c
Copying file from ../testdir/src/libvterm/src/gui_photon.c to --> ../toCopy/gui_photon.c
Copying file from ../testdir/src/libvterm/src/autocmd.c to --> ../toCopy/autocmd.c
Copying file from ../testdir/src/libvterm/src/keywordmap.h to --> ../toCopy/keywordmap.h
Copying file from ../testdir/src/libvterm/src/glbl_ime.h to --> ../toCopy/glbl_ime.h
Copying file from ../testdir/src/libvterm/src/vterm.c to --> ../toCopy/vterm.c
Copying file from ../testdir/src/libvterm/src/INSTALL to --> ../toCopy/INSTALL
Copying file from ../testdir/src/libvterm/src/dehqx.py to --> ../toCopy/dehqx.py
Copying file from ../testdir/src/libvterm/src/gui_xmldg.c to --> ../toCopy/gui_xmldg.c
Copying file from ../testdir/src/libvterm/src/charset.c to --> ../toCopy/charset.c
Copying file from ../testdir/src/libvterm/src/utf8.h to --> ../toCopy/utf8.h
Copying file from ../testdir/src/libvterm/src/isl1551898739430.pdf to --> ../toCopy/isl1551898739430.pdf
Copying file from ../testdir/src/libvterm/src/ex_getln.c to --> ../toCopy/ex_getln.c
Copying file from ../testdir/src/libvterm/src/INSTALLami.txt to --> ../toCopy/INSTALLami.txt
Copying file from ../testdir/src/libvterm/src/hardcopy.c to --> ../toCopy/hardcopy.c
Copying file from ../testdir/src/libvterm/src/config.h.in to --> ../toCopy/config.h.in
Copying file from ../testdir/src/libvterm/src/buffer.c to --> ../toCopy/buffer.c
Copying file from ../testdir/src/libvterm/src/state.c to --> ../toCopy/state.c
Copying file from ../testdir/src/libvterm/src/diff.c to --> ../toCopy/diff.c
Copying file from ../testdir/src/libvterm/src/gui_mac.c to --> ../toCopy/gui_mac.c
Copying file from ../testdir/src/libvterm/src/install.sh to --> ../toCopy/install.sh
Copying file from ../testdir/src/libvterm/src/if_perl.xs to --> ../toCopy/if_perl.xs
Copying file from ../testdir/src/libvterm/src/gui_xmehw.h to --> ../toCopy/gui_xmehw.h
Copying file from ../testdir/src/libvterm/src/if_xcmdsrv.c to --> ../toCopy/if_xcmdsrv.c
Copying file from ../testdir/src/libvterm/src/if_ole.cpp to --> ../toCopy/if_ole.cpp

-----STATISTICS-----
Consumers: 4 - Buffer Size: 10
Number of Regular File: 140
Number of FIFO File: 0
Number of Directory: 2
TOTAL BYTES COPIED: 24873082
TOTAL TIME: 00:01:225 (min:sec.milli)
arife@LAPTOP-SRROEDP31:~/hw4_hwtest/put_your_codes_here$
```


Test3// ./MWCp 10 10 ../testdir ../toCopy



```
arife@LAPTOP-SAR0EDP3:~/hw4/hw4test/put_your_codes_here$ make test3
```



```
Copying file from ../testdir/runtime/tutor/tutor.utf-8 to --> ../toCopy/runtime/tutor/tutor.utf-8
Copying file from ../testdir/runtime/tutor/tutor.zh.tw.utf-8 to --> ../toCopy/runtime/tutor/tutor.zh.tw.utf-8
Copying file from ../testdir/runtime/tutor/tutor.fr.utf-8 to --> ../toCopy/runtime/tutor/tutor.fr.utf-8
Copying file from ../testdir/runtime/tutor/tutor.pt.utf-8 to --> ../toCopy/runtime/tutor/tutor.pt.utf-8
Copying file from ../testdir/runtime/tutor/tutor.ja.euc to --> ../toCopy/runtime/tutor/tutor.ja.euc
Copying file from ../testdir/runtime/tutor/tutor.ca to --> ../toCopy/runtime/tutor/tutor.ca
Copying file from ../testdir/runtime/tutor/tutor.tr.iso9 to --> ../toCopy/runtime/tutor/tutor.tr.iso9
Copying file from ../testdir/runtime/tutor/tutor.eo to --> ../toCopy/runtime/tutor/tutor.eo
Copying file from ../testdir/runtime/tutor/tutor.es.utf-8 to --> ../toCopy/runtime/tutor/tutor.es.utf-8
Copying file from ../testdir/runtime/tutor/tutor.ja.utf-8 to --> ../toCopy/runtime/tutor/tutor.ja.utf-8
Copying file from ../testdir/runtime/tutor/tutor.sr.utf-8 to --> ../toCopy/runtime/tutor/tutor.sr.utf-8
Copying file from ../testdir/runtime/tutor/Makefile to --> ../toCopy/runtime/tutor/Makefile
Copying file from ../testdir/runtime/tutor/tutor.cs.cp1250 to --> ../toCopy/runtime/tutor/tutor.cs.cp1250
Copying file from ../testdir/runtime/tutor/tutor.sk to --> ../toCopy/runtime/tutor/tutor.sk
Copying file from ../testdir/runtime/tutor/tutor to --> ../toCopy/runtime/tutor/tutor
Copying file from ../testdir/runtime/tutor/tutor.da.utf-8 to --> ../toCopy/runtime/tutor/tutor.da.utf-8
Copying file from ../testdir/runtime/tutor/tutor.bar.utf-8 to --> ../toCopy/runtime/tutor/tutor.bar.utf-8
Copying file from ../testdir/runtime/tutor/tutor.eo.utf-8 to --> ../toCopy/runtime/tutor/tutor.eo.utf-8
Copying file from ../testdir/runtime/tutor/tutor.ko.euc to --> ../toCopy/runtime/tutor/tutor.ko.euc
Copying file from ../testdir/runtime/tutor/tutor.ca.utf-8 to --> ../toCopy/runtime/tutor/tutor.ca.utf-8
Copying file from ../testdir/runtime/tutor/tutor.el.cp737 to --> ../toCopy/runtime/tutor/tutor.el.cp737
Copying file from ../testdir/runtime/tutor/tutor.sk.cp1250 to --> ../toCopy/runtime/tutor/tutor.sk.cp1250
Copying file from ../testdir/el/appveyor.bat to --> ../toCopy/el/appveyor.bat
Copying file from ../testdir/runtime/vimlogo.xpm to --> ../toCopy/runtime/vimlogo.xpm
Copying file from ../testdir/doc.info to --> ../toCopy/runtime/doc.info
Copying file from ../testdir/.hgignore to --> ../toCopy/.hgignore
Copying file from ../testdir/tools/rename.bat to --> ../toCopy/tools/rename.bat
Copying file from ../testdir/.travis.yml to --> ../toCopy/.travis.yml
Copying file from ../testdir/runtime/icons.info to --> ../toCopy/runtime/icons.info
Copying file from ../testdir/CONTRIBUTING.md to --> ../toCopy/CONTRIBUTING.md
Copying file from ../testdir/Makefile to --> ../toCopy/Makefile

-----STATISTICS-----
Consumers: 10 - Buffer Size: 10
Number of Regular File: 3116
Number of FIFO File: 0
Number of Directory: 151
TOTAL BYTES COPIED: 72520554
TOTAL TIME: 00:01.482 (min:sec.mili)
arife@LAPTOP-SAR0EDP3:~/hw4/hw4test/put_your_codes_here$
```