

CSE-344 ASSIGNMENT-I

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Algorithm Design:

When the program is executed, initially, a main process runs in an infinite loop, continuously receiving input from the user. Without verifying the correctness of the input, this process creates a child process using the fork operation and sends the input to the CommandManager function. This input, after being parsed into segments using the helper method StringParser, is then forwarded to the relevant functions within the CommandManager.

ex: `addStudentGrade "Haci Hasan" "BB" "grades.txt" :`

```
[  
    addStudentGrade  
    Haci Hasan  
    BB  
    grades.txt  
]
```

In summary, upon program execution, the main process continuously receives input, passes it to the CommandManager function, which further parses and dispatches it to corresponding functions for execution.

File Lock System:

In the program, more than one processes can work on a same file. Without a protection it would not be safe because of race condition. To avoid race condition, I used filelock. So that when a writer process opened the file, the readers will wait it to finish (unluck). Among readers, no need for file lock. In same file, while reader-reader okay, reader-writer , writer - writer wil have possible race condition. With file lock no problem.

Log System:

A log function will be run just before start of the functions and also after end of the function and will be added to LOG file.

Also there is another log function which is LogErr. This function will puts errors to LOG file.

Function Implementations:

Log: Logs information about a process or function call to a file, including details such as process ID, function name, and start/end time.

LogErr: Logs error messages along with relevant information to a file.

CommandManager: Manages commands received by a child process, executes corresponding actions based on the command type, and logs errors if the command is invalid.

GtuStudentGrades: Opens a file for writing student grades, logs any errors encountered during file opening.

LowerCase: Converts a given string to lowercase characters.

StringParser: Parses a string into tokens based on spaces and quotes, returning an array of parsed strings.

AddStudentGrade: Adds a new student's name and grade to a file, locking the file during write operations and logging errors if encountered.

SearchStudent: Searches for a student's grade by name in a file, locking the file during read operations and logging errors if encountered.

ShowAll: Displays all student entries stored in a file.

List: Displays a specific number of entries from a file, starting from a specified index.

Usage: Displays usage information for the available commands.

SortAll: (Not implemented) intended to sort student entries in a file based on specified criteria.

free1d: Frees memory allocated for a one-dimensional array.

free2d: Frees memory allocated for a two-dimensional array.

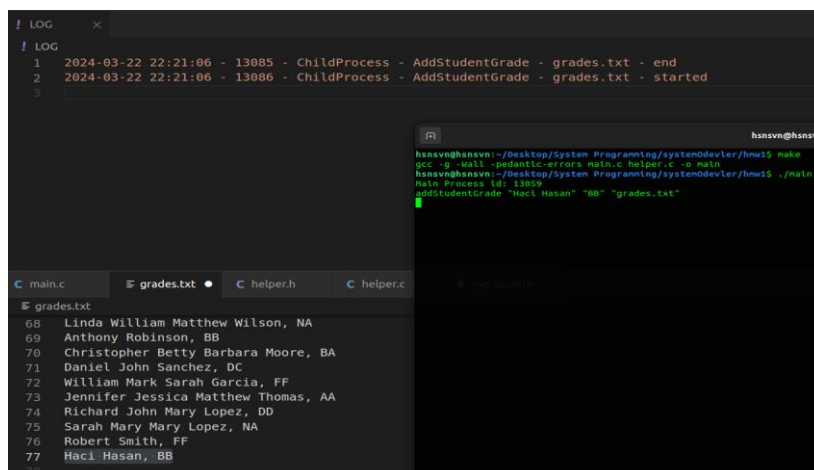
print: Prints a string to standard output.

print2d: Prints a two-dimensional array of strings to standard output.

printStruct: Prints entries stored in a structure array to standard output

Example Runs:

addStudentGrade Function:



```
! LOG
! LOG
1 2024-03-22 22:21:06 - 13085 - ChildProcess - AddStudentGrade - grades.txt - end
2 2024-03-22 22:21:06 - 13086 - ChildProcess - AddStudentGrade - grades.txt - started
3
hsnsyn@hsnsyn:~/Desktop/System Programming/systemodevler/hmw1$ make
gcc -g -Wall -std=c11 -c main.c helper.c -o main
hsnsyn@hsnsyn:~/Desktop/System Programming/systemodevler/hmw1$ ./main
Main Process Id: 13089
addStudentGrade "Haci Hasan" "BB" "grades.txt"

C main.c  grades.txt  helper.h  helper.c
grades.txt
68 Linda William Matthew Wilson, NA
69 Anthony Robinson, BB
70 Christopher Betty Barbara Moore, BA
71 Daniel John Sanchez, DC
72 William Mark Sarah Garcia, FF
73 Jennifer Jessica Matthew Thomas, AA
74 Richard John Mary Lopez, DD
75 Sarah Mary Mary Lopez, NA
76 Robert Smith, FF
77 Haci Hasan, BB
```

searchStudent Function:

main.cgrades.txthelper.hhelper.cyapilacaklarLOG

LOG
1 2024-03-22 22:38:56 - 13940 - ChildProcess - SearchStudent - grades.txt - end
2 2024-03-22 22:38:56 - 13941 - ChildProcess - AddStudentGrade - grades.txt - started
3

hsnsvn@hsnsvn: ~/Desktop/System Programming/system0devler/hmw1\$./main

hsnsvn@hsnsvn:~/Desktop/System Programming/system0devler/hmw1\$./main
Main Process id: 13921
searchStudent "Haci Hasan" "grades.txt"
FileName: grades.txt

Student found: Haci Hasan, BB
█

showAll Function:

main.cgrades.txthelper.hhelper.cyapilacaklarLOG

LOG
1 2024-03-22 22:46:26 - 14314 - ChildProcess - ShowAll - grades.txt - started
2 2024-03-22 22:46:26 - 14315 - ChildProcess - ShowAll - grades.txt - end
3

hsnsvn@hsnsvn: ~/Desktop/System Programming/system0devler/hmw1\$./main

hsnsvn@hsnsvn:~/Desktop/System Programming/system0devler/hmw1\$./main
Main Process id: 14312
ShowAll "grades.txt"
Mary Margaret Garcia, NA
Linda Harris, FF
Patricia Hernandez, DC
Christopher Daniel Sarah Martin, CC
Margaret Richard Hernandez, VF
Lisa Margaret Hernandez, FF
Margaret Clark, DC
Mary Hernandez, VF
John Robert Clark, CB
Robert Betty William Garcia, NA
Jennifer Barbara Garcia, DC
Joseph Barbara Williams, NA
Richard Linda John Miller, BB
Elizabeth Lee, CC
James Ramirez, BB
Mary Lopez, BB
David Matthew Garcia, CC
Anthony Michael Nancy Jackson, FF
James Anthony Johnson, VF

listSome Function:

```
main.c  grades.txt x  helper.h  helper.c  yapılacaklar  LOG
grades.txt
1  Mary Margaret Garcia, NA
2  Linda Harris, FF
3  Patricia Hernandez, DC
4  Christopher Daniel Sarah Martin, CC
5  Margaret Richard Hernandez, VF
6  Lisa Margaret Hernandez, FF
7  Margaret Clark, DC
8  Mary Hernandez, VF
9  John Robert Clark, CB
10 Robert Betty William Garcia, NA
11 Jennifer Barbara Garcia, DC
12 Joseph Barbara Williams, NA
13 Richard Linda John Miller, BB
14 Elizabeth Lee, CC
15 James Ramirez, BB
16 Mary Lopez, BB
17 David Matthew Garcia, CC
18 Anthony Michael Nancy Jackson, FF
```

```
hsnsvn@hsnsvn: ~/Desktop/System Programming/system0devler/hmw1$ make
gcc -g -Wall -pedantic-errors main.c helper.c -o main
hsnsvn@hsnsvn:~/Desktop/System Programming/system0devler/hmw1$ ./main
Main Process id: 15767
listSome 5 2 "grades.txt"
Lisa Margaret Hernandez, FF
Margaret Clark, DC
Mary Hernandez, VF
John Robert Clark, CB
Robert Betty William Garcia, NA
```

S

gtuStudentGrades Function:

```
hsnsvn@hsnsvn:~/Desktop/System Programming/system0devler/hmw1$ ./main
Main Process id: 16122
essin |gtuStudentGrades "grades2.txt" zombie olmaz
File is Open:grades2.txt
```

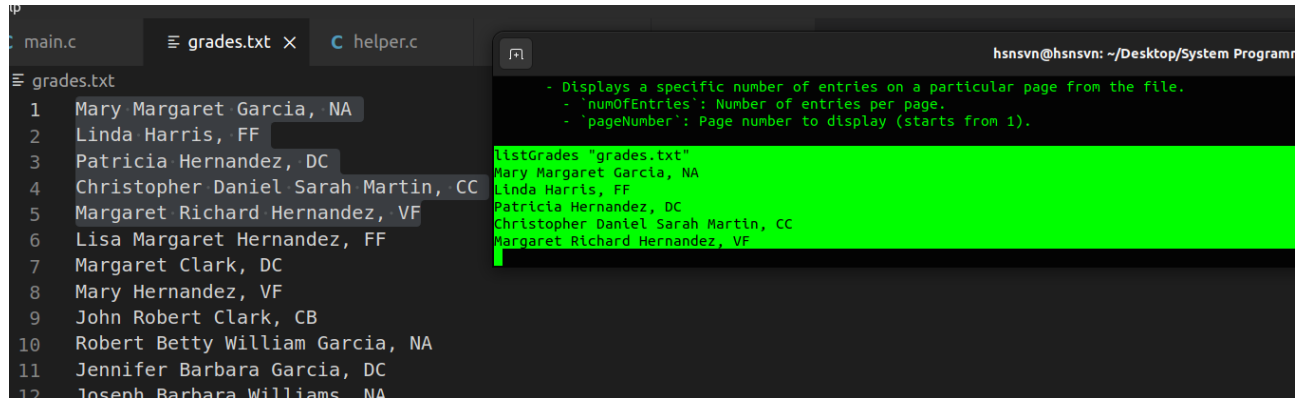
Usage Function:

```
gcc -g -Wall -pedantic-errors main.c helper.c -o main
hsnsvn@hsnsvn:~/Desktop/System Programming/system0devler/hmw1$ ./main
Main Process id: 16370
usage

GTU Student Grade Management System
Available commands:

* 'gtuStudentGrades <"fileName">'
  - Creates a new file for student grades.
* 'addStudentGrade <"Name Surname"> <"Grade"> <"fileName">'
  - Adds a new student's name, grade, and saves it to the specified file.
* 'searchStudent <"Name Surname"> <"fileName">'
  - Searches for a student's grade by their full name in the specified file.
* 'sortAll <"sortBy"> <"sortOrder"> <"fileName">'
  - Sorts all entries in the file based on a field (name or grade).
  - 'sortBy': '0' for name, '1' for grade.
  - 'sortOrder': '0' for ascending order, '1' for descending order.
* 'showAll <"fileName">'
  - Displays all student entries stored in the specified file.
* 'listGrades <"fileName">'
  - Displays the first 5 student entries from the specified file.
* 'listSome <"numOfEntries"> <"pageNumber"> <"fileName">'
  - Displays a specific number of entries on a particular page from the file.
çalıştır "numOfEntries": Number of entries per page.
B "grade" "pageNumber": Page number to display (starts from 1).
s.txt" çalışıyor
```

listGrades Function:



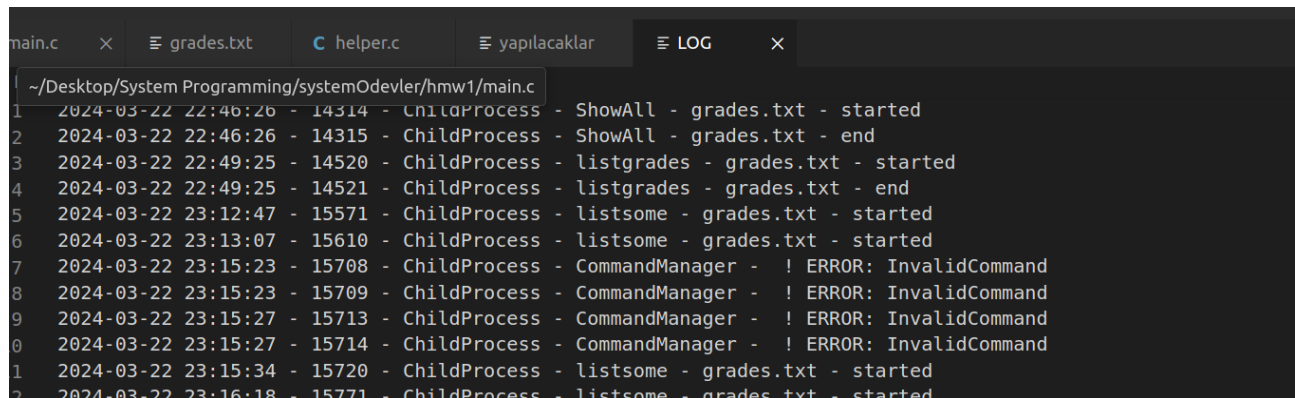
The screenshot shows a code editor with three tabs: main.c, grades.txt, and helper.c. The grades.txt tab is active, displaying a list of names and IDs. A green box highlights the output of the listGrades function, which shows the first five entries: Mary Margaret Garcia, NA; Linda Harris, FF; Patricia Hernandez, DC; Christopher Daniel Sarah Martin, CC; and Margaret Richard Hernandez, VF. A tooltip for the listGrades function is also visible, showing its signature and parameters: listGrades "grades.txt", numEntries: Number of entries per page, and pageNumber: Page number to display (starts from 1).

```
1 Mary Margaret Garcia, NA
2 Linda Harris, FF
3 Patricia Hernandez, DC
4 Christopher Daniel Sarah Martin, CC
5 Margaret Richard Hernandez, VF
6 Lisa Margaret Hernandez, FF
7 Margaret Clark, DC
8 Mary Hernandez, VF
9 John Robert Clark, CB
10 Robert Betty William Garcia, NA
11 Jennifer Barbara Garcia, DC
12 Joseph Barbara Williams, NA
```

```
listGrades "grades.txt"
Mary Margaret Garcia, NA
Linda Harris, FF
Patricia Hernandez, DC
Christopher Daniel Sarah Martin, CC
Margaret Richard Hernandez, VF
```

```
- Displays a specific number of entries on a particular page from the file.
- 'numOfEntries': Number of entries per page.
- 'pageNumber': Page number to display (starts from 1).
```

Log Function:



The screenshot shows a log window with a title bar containing tabs for main.c, grades.txt, helper.c, yapılacaklar, and LOG. The LOG tab is active, displaying a list of system events. The events include ShowAll, listgrades, listsome, and CommandManager, with timestamps, process IDs, and status messages. Some events show errors like 'ERROR: InvalidCommand'.

```
1 2024-03-22 22:46:26 - 14314 - ChildProcess - ShowAll - grades.txt - started
2 2024-03-22 22:46:26 - 14315 - ChildProcess - ShowAll - grades.txt - end
3 2024-03-22 22:49:25 - 14520 - ChildProcess - listgrades - grades.txt - started
4 2024-03-22 22:49:25 - 14521 - ChildProcess - listgrades - grades.txt - end
5 2024-03-22 23:12:47 - 15571 - ChildProcess - listsome - grades.txt - started
6 2024-03-22 23:13:07 - 15610 - ChildProcess - listsome - grades.txt - started
7 2024-03-22 23:15:23 - 15708 - ChildProcess - CommandManager - ! ERROR: InvalidCommand
8 2024-03-22 23:15:23 - 15709 - ChildProcess - CommandManager - ! ERROR: InvalidCommand
9 2024-03-22 23:15:27 - 15713 - ChildProcess - CommandManager - ! ERROR: InvalidCommand
10 2024-03-22 23:15:27 - 15714 - ChildProcess - CommandManager - ! ERROR: InvalidCommand
11 2024-03-22 23:15:34 - 15720 - ChildProcess - listsome - grades.txt - started
12 2024-03-22 23:16:18 - 15771 - ChildProcess - listsome - grades.txt - started
```

Notes:

Please stick to usage rules. There are some protections but it is hard to implement all possible error.