

Inspire Create Transform

DATA STRUCTURE FOR EFFICIENT INDEXING OF FILES AND DIRECTORIES

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Designed Data Structure

1. Designed Data Structure: NashTable

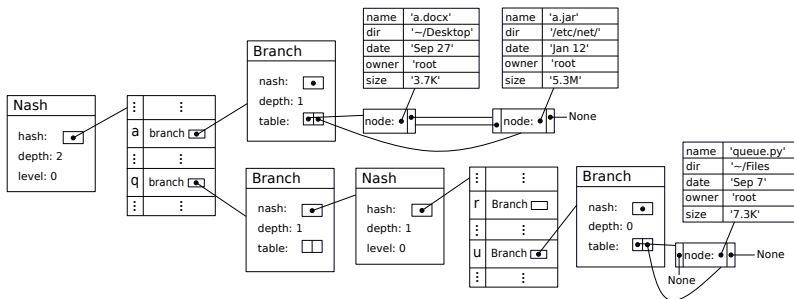


Figure 1. Example of a NashTable. Each Nash has a hash table of Branch objects. Each Branch object has another Nash and a LinkedList of dictionaries. Files are indexed according to each character of their names.

Data Structure Operations

2. Data Structure Operations

2.1 Insertion $O(n)$

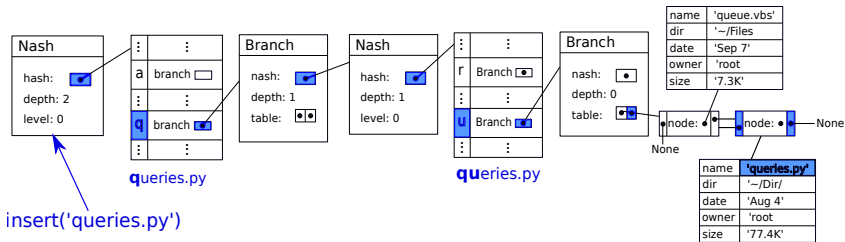


Figure 2. Insertion in NashTables.

2. Data Structure Operations

2.2 Deletion $O(n)$

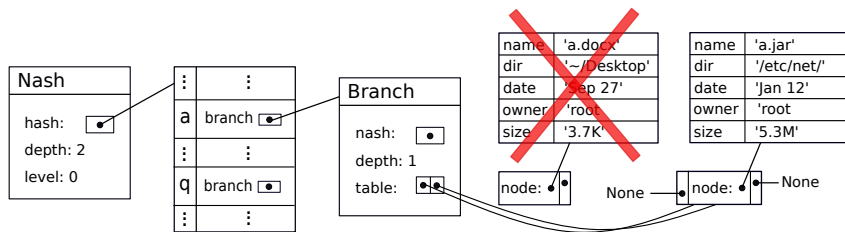


Figure 3. Deletion in NashTables.

2. Data Structure Operation

2.3 Search $O(n + k)$

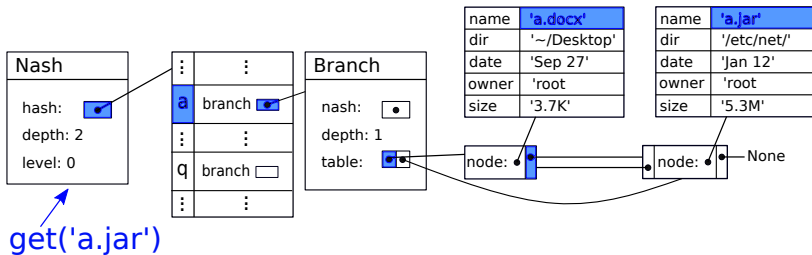


Figure 4. Search in NashTables.

Design Criteria of the Data Structure

3. Design Criteria of the Data Structure

- ▶ The NashTable is based on hash tables and doubly linked lists; searching files is the priority.
- ▶ Although this first approach to solve the problem is not optimized for low memory consumption, it has been developed for optimize searching with different options.
- ▶ Hash tables were used since they are able to search for files in constant time.
- ▶ Double linked lists because insertion in the last position is achieved in constant time and also because they do not have a fixed size (unlike arrays), allowing the NashTable to add objects depending on the files indexed.
- ▶ Searching for files is independent from the amount of files indexed inside the structure. It just depends on the number of characters on the name.

Time and Memory Consumption

4. Time and Memory Consumption

Table 1. Execution time for each operation

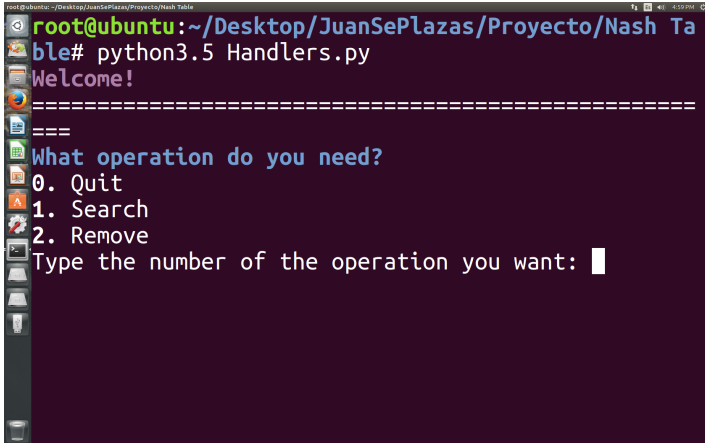
Operation	Average Time		
	DataSet 1	DataSet 2	DataSet 3
Create	213.355ms	5453.520ms	29177.054ms
Insert	0.623ms	0.046ms	0.050ms
Search	0.026ms	0.022ms	0.023ms
Remove	0.018ms	0.020ms	0.020ms

Table 2. Memory consumption.

Memory Consumption	DataSet1	DataSet2	DataSet3
Memory	96.72MB	475.136MB	1638.4MB

Implementation

5. Implementation



A terminal window on an Ubuntu desktop. The window title is 'root@ubuntu: ~/Desktop/JuanSePlazas/Proyecto/Nash Table'. The prompt is 'root@ubuntu:~/Desktop/JuanSePlazas/Proyecto/Nash Table#'. The user has entered 'python3.5 Handlers.py'. The output shows a 'Welcome!' message, a separator line of equals signs, and a menu titled 'What operation do you need?'. The menu options are: 0. Quit, 1. Search, and 2. Remove. Below the menu, it says 'Type the number of the operation you want:' followed by a cursor.

```
root@ubuntu:~/Desktop/JuanSePlazas/Proyecto/Nash Table# python3.5 Handlers.py
Welcome!
=====
What operation do you need?
0. Quit
1. Search
2. Remove
Type the number of the operation you want: █
```

Figure 5. Example of GUI.

5. Implementation

```
root@ubuntu: ~/Desktop/JuanSePlazas/Proyecto/Nash Table# python3.5 Handlers.py
Welcome!
=====
What operation do you need?
0. Quit
1. Search
2. Remove
Type the number of the operation you want: 1
Write the name or the initials of the file you want to search; if you need it
to be case sensitive write (c) at the start and then write the name of the file you need
to search.
tex
1.[root 360 ] TeX
2.[root 380 ] TeX
3.[root 380 ] TeX
4.[root 320 ] TeX
5.[root 320 ] TeX
Found 5 files!
Did you find the file you wanted?[Y/N] y
Do you want to know the address of a file? [Y/N] y
Type the index of the file that you want to know the address(Enter 0 to cancel) 2
Address: /home/ubuntu/Desktop/JuanSePlazas/Laboratorios/Lab2
Type the index of the file that you want to know the address(Enter 0 to cancel) █
```

Figure 6. Example when searching for “tex”.

5. Implementation

```
root@ubuntu: ~/Desktop/JuanSePlazas/Projects/Neuh Table
Address: /home/ubuntu/Desktop/JuanSePlazas/Laboratorios/Lab2

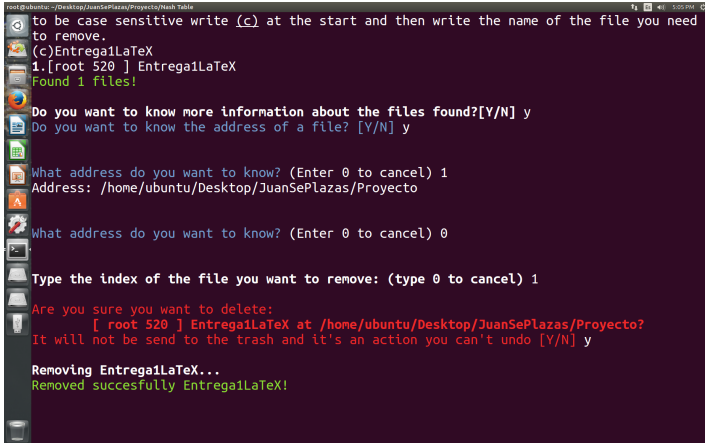
Type the index of the file that you want to know the address(Enter 0 to cancel) 0
Do you want to know the content of a folder? [Y/N] y

Type the index of the file that you want to know it's subdirectories (Type 0 to cancel) 1
1.[root 20K ] ArrayMax.pdf
2.[root 19K ] ArraySum.pdf
3.[root 6.0K ] .DS_Store
4.[root 16K ] Fibonaccl.pdf
5.[root 3.2K ] Lab.aux
6.[root 686 ] Lab.bbl
7.[root 740 ] Lab.bib
8.[root 867 ] Lab.blg
9.[root 12K ] Lab.fdb_latexmk
10.[root 12K ] Lab.fls
11.[root 37K ] Lab.log
12.[root 1.1K ] Lab.out
13.[root 233K ] Lab.pdf
14.[root 72K ] Lab.synctex.gz
15.[root 21K ] Lab.tex
16.[root 6.8K ] logo.pdf
Found 16 files!

Did you find the file you wanted?[Y/N] █
```

Figure 7. Example when searching inside the first folder.

5. Implementation

A terminal window titled 'root@ubuntu: ~/Desktop/JuanSePlazas/Proyecto/ Nash Table' with a dark purple background and a sidebar of application icons on the left. The terminal text shows a sequence of commands and prompts for removing a file. The user enters 'c' for case sensitivity, 'Entrega1LaTeX' for the filename, and '1' for the index. The system finds the file and asks for confirmation to know more information, which is answered 'y'. It then asks for the address of the file, which is '/home/ubuntu/Desktop/JuanSePlazas/Proyecto'. After another confirmation, it asks for the index of the file to remove, which is '1'. A final confirmation to delete is given with 'y'. The process concludes with 'Removing Entrega1LaTeX...' and 'Removed succesfully Entrega1LaTeX!'.

```
root@ubuntu: ~/Desktop/JuanSePlazas/Proyecto/ Nash Table
to be case sensitive write (c) at the start and then write the name of the file you need
to remove.
(c)Entrega1LaTeX
1.[root 520 ] Entrega1LaTeX
Found 1 files!

Do you want to know more information about the files found?[Y/N] y
Do you want to know the address of a file? [Y/N] y

What address do you want to know? (Enter 0 to cancel) 1
Address: /home/ubuntu/Desktop/JuanSePlazas/Proyecto

What address do you want to know? (Enter 0 to cancel) 0

Type the index of the file you want to remove: (type 0 to cancel) 1

Are you sure you want to delete:
[ root 520 ] Entrega1LaTeX at /home/ubuntu/Desktop/JuanSePlazas/Proyecto?
It will not be send to the trash and it's an action you can't undo [Y/N] y

Removing Entrega1LaTeX...
Removed succesfully Entrega1LaTeX!
```

Figure 8. Example of removal.

Thank you