



Data Structures & Algorithms

Project Title: Dictionary Implementation Using TRIE

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Problem Statement

- Through our project we intend to help our user to find the meaning, synonyms, antonyms and examples of an entered word and if the user enters invalid word then we help them to explore more words similar to the entered word.
- User can find translation of the entered word, also view the search history and also know 'word of the day' which enables the user to learn a new word every day.

Algorithm Description

- **getnode()**

Description: This function returns the address of the newnode.

Method: Allocate space to temporary variable temp and set all its alphabet node to NULL. Return temp.

- **printHistory()**

Description: This function prints the history of searched words.

Method: Open the history file in read mode and read all the words one by one and display it

- **addHistory(key)**

Description: This function adds a word in the history file.

Method: Open the history file in write mode and write the contents of key to it.

- **insert(root,key)**

Description: This function inserts a word in TRIE.

Method: Access the TRIE from the root and set all the nodes (which come in the key) to TRUE and when the end of the word is reached then store the key in the fname field.

- **search(root,key)**

Description: This function searches for a key in TRIE.

Method: Search each character level by level and if a specific character at a certain level does not exist then return false which means that the word does not exist. If all the characters exist then return TRUE.

- **insert_word(key)**

Description: This function inserts a new word in the Dictionary.

Method: Store the word in TRIE. Store the meaning and description of the word in a file whose name is the word stored in key.

- **printData(key)**

Description: This function prints data from file name stored in key variable.

Method: Open the file (whose name is stored in key field) and access all the characters and print them.

- **search_similar(root, key)**

Description: This function prints word similar to the word stored in key variable.

Method: Access the TRIE from the root and if even if one of the letter in key variable doesn't exist then the corresponding existing variable is accessed and the similar word is found. If none of the corresponding variable exist then print "The word doesn't exist."

- **wordRead(filename, choice)**

Description: This function prints the French word or Spanish word of a given word.

Method: Ask the user to enter a word. Open the file (filename contains the name of the file) and search all the records one by one if the word entered by the user is found then the corresponding French or Spanish word is printed based on the choice of the user.

- **wordOfTheDay(root)**

Description: This function prints the word of the day.

Method: Randomly generate any number and fetch the word from that location of the file (words.txt) and store it in file t_date and print the description of the word.

Why did we use TRIE?

- A Dictionary can also be implemented using other concepts (e.g. HASH TABLES).
- Searching for data in a TRIE is faster.
- free from collision.
- no need to choose a hash function.
- predetermined alphabetical ordering.
- find words with common prefix.

- **Time Complexity:**
 - We can search the key in $O(M)$ time; M is length of the string.
- **Space Complexity:**
 - Memory requirements of TRIE is $O(\text{ALPHABET_SIZE} * \text{key length} * N)$ where N is number of keys in TRIE.

Features of Project

1. Find meaning, description, synonyms, antonyms and examples of the entered word.
2. Insert new word in dictionary.
3. Find Similar words of the entered word.
4. Know 'word of the day'.
5. Find translation of the entered word (English) in French & Spanish.
6. View search history.

Input Output Screen Shots

- Searching for a word

```
***WELCOME TO THE 'MACD' DICTIONARY***

---MENU---
1. Search Meaning
2. Add new Word in the Dictionary
3. View Search History
4. Word of the day
5. Translation of word
0. Exit

Enter your Choice: 1

ENTER THE WORD YOU WANT TO SEARCH: apple

MEANING:
a round fruit with red, yellow, or green skin and firm white flesh
This ia a Noun.

FULL DEFINITION:
1: the fleshy usually rounded red, yellow, or green edible pome fruit of a
usually cultivated tree (genus Malus) of the rose family;
also : an apple tree ù compare crab apple.
2: a fruit (as a star apple) or other vegetative growth (as an oak apple)
suggestive of an apple.

IDIOM:
apple of one's eye
one that is highly cherished <his daughter is the apple of his eye>
```

- Similar words

```
---MENU---
1. Search Meaning
2. Add new Word in the Dictionary
3. View Search History
4. Word of the day
5. Translation of word
0. Exit

Enter your Choice: 1

ENTER THE WORD YOU WANT TO SEARCH: coo

***WORD NOT FOUND***

SOME SUGGESTIONS FOR SIMILAR WORDS ARE:
comb
cow
```

- Inserting a word & then searching for it

```
Enter your Choice: 2
    Enter Password to add New Word into Dictionary: 12345
Enter a new Word:hello
Enter Meaning of the Word: it is a greeting
Enter which Part of Speech it belongs to: ---
Enter Full Definition of the Word: ---
Enter Example of the Word: hello, how are you?
Enter Synonyms of the Word: hii, wass up
Enter Antonyms of the Word: ---
Enter French Translation of Word: Bonjour
Enter Spanish Translation of Word: hola

~~~MENU~~~
1. Search Meaning
2. Add new Word in the Dictionary
3. View Search History
4. Word of the day
5. Translation of word
0. Exit

Enter your Choice: 1

    ENTER THE WORD YOU WANT TO SEARCH: hello

MEANING:
it is a greeting
This is ---.

FULL DEFINITION:
---

EXAMPLE:
hello, how are you?

SYNONYMS:
hii, wass up
```


- Finding translation

```
~~~MENU~~~

1. Search Meaning
2. Add new Word in the Dictionary
3. View Search History
4. Word of the day
5. Translation of word
0. Exit

Enter your Choice: 5

Choice Menu:
1. French Translation
2. Spanish Translation
Enter Your choice: 1

Enter Word: apple

Given word: apple
French Meaning: pomme
```

- Word of the day

```
~~~MENU~~~

1. Search Meaning
2. Add new Word in the Dictionary
3. View Search History
4. Word of the day
5. Translation of word
0. Exit

Enter your Choice: 4

THE WORD OF THE DAY IS:dairy

MEANING:
a company that sells milk and foods made from milk (such as butter and cheese)
this is a noun

FULL DEFINITION:
1) a room, building, or establishment where milk is kept and butter or cheese is made

2) a : the department of farming or of a farm that is concerned with the production of milk, butter, and cheese
   b : a farm devoted to such production

3) an establishment for the sale or distribution chiefly of milk and milk products

EXAMPLE:
Tom's family has been involved in dairy farming for years.
```

Advantages

- **All in One!!**
- We have made an application which not only a simple dictionary which tells you the **meaning** of the entered word but also it tells you the whole **description, synonyms, antonyms** and practical use of that word in a **sentence**.
- Even this is not the only feature but we created another application of **Word Translation** in this only which gives us the translation of entered word in either French or in Spanish
- It provides **Word of the Day** which means every day our code will generate a random word from its memory and will give all the data related to it. One can learn at least a new word in a day and can increase his/her vocabulary using our application.
- Our application **can correct a wrong word** as well. So in spite of displaying “Word not Found” like in case of many other dictionaries ,ours gives you **Suggestions**
- Currently we have just 50-55 words in our dictionary but at any point of time one can **Add a new Words** in the Dictionary by first entering **Password** for the Safety.
- We are also providing **List of Frequently Searched Words**. So to **decrease the time complexity** if the searched word is one of the Frequently searched word then our code will directly print the data of that file and if not than first traverse the TRIE than print the data.

Disadvantages

- **Add New Word:** While we do provide the functionality to add new words into the dictionary, though there is an inherent flaw in it - the person might enter any arbitrary sequence of characters (which the 'Trie ' identifies as a word).
- For example - the person might enter 'asdfg' as a word into the file. **Our program cannot distinguish between an arbitrary sequence of characters and a valid English word.**
- This basically implies that the software can be easily corrupted.
- **Deletion of a word:** It can only be done by explicitly opening the text file containing the data and then deleting it.
- **Memory Consumption:** Due to our lack of knowledge and time as well we have not implemented **Word Scraping**. So currently we are storing each data in Text File which consumes more memory but if we had used word scraping then our code might not be using any amount of memory.
- **Less Words :** Though at any point of time one can Add new Words in our Dictionary but currently we have just 50-55 words in our dictionary
- **Search Incorrectly Spelled Word:** We do have implemented an algorithm in which similar words to the incorrect word entered are shown to the user, but have not implemented anything which corrects the words which are spelled incorrectly.

Real World Application of TRIE

- Auto complete in web searching
- Spell checker (Auto correct)
- Word game
- Dictionary
- Longest prefix matching
- Translator
- Criminology
- Phone book search

Thank You...!! 😊😊😊