

Assignment 3 By: Dinesh, Junaid, and Shahzan

The primary data structure we used is a Trie. This is a special data structure that stores strings with the properties of a tree. Our code consists of the RWayTrieCode class which implements the following: Insert, Search, StartsWith, and FindWords.

RWayTrieCode Class:

Description: Represents a node in R-Way Trie, containing an array of child nodes and a boolean flag indicating the end of a word.

Constructor: Initializes a new node with an array of 126 child nodes (RWayTrieNode[126]) and sets the end-of-word flag to false.

Time Complexity: $O(1)$ for initialization.

Constructor:

Methods for RWayTrie:

1. **Insert:** This method inserts a word into the trie
Input: string word, string value
Operation: Iterates through the trie and creates nodes to accommodate the insertion of the word
Time Complexity: $O(n)$
2. **Search(string word):** Searches for a word in the trie
Input: string word
Operation: Traverses the trie to find the input word, returning the associated value if found.
Time Complexity: $O(n)$
3. **StartsWith(string prefix):** Find all words in a trie with a given prefix
Input: string prefix
Operation: Traverses the trie to find all words that start with the given prefix.
Time Complexity: $O(p + m)$ for prefix match

Testing:

Case 1:

Input: Cock

Expected Output: A lot of Words

Actual Output:

```
C:\Users\laksh\source\repos\Assignment3DSAIR\Assignment3DSAIR\bin\Debug\net6.0\Assignment3DSAIR.exe
Enter a prefix to search for matching words (Enter 'exit' to quit):
cock

Words matching the prefix:
cock's-comb
cock's-foot
cock's-head
cock-a
cock-a-doodle
cock-a-doodle--doed
cock-a-doodle--dooding
cock-a-doodle--doo
cock-a-doodle--doos
cock-a-hoop
cock-a-hooping
cock-a-hoopish
cock-a-hoopness
cock-a-leekle
cock-a-whoop
cock-and-bull
cock-and-bull-story
cock-and-pinch
cock-as-hoop
cock-awhoop
cock-bill
cock-boat
cock-brain
cock-brained
cock-crow
cock-crowing
cock-eye
cock-eyed
cock-feathered
cock-feathering
cock-fight
cock-fighting
cock-horse
cock-laid
cock-left
cock-master
cock-match
cock-nest
cock-of-the-rock
cock-paddle
cock-penny
cock-road
cock-shut
cock-shy
cock-sparrowish
cock-stride

cockneyish
cockneyishly
cockneyism
cockneyize
cockneyland
cockneylike
cockneys
cockneyship
cockpaddle
cockpitt
cockpits
cockroach
cockroaches
cocks-of-the-rock
cockscumb
cockscumbed
cockscombs
cocksoot
cockshad
cockshies
cockshoot
cockshot
cockshut
cockshuts
cockshy
cockshying
cocksparrow
cockspur
cockspurs
cockstone
cocksure
cocksuredom
cocksureism
cocksurely
cocksureness
cocksurety
cockswain
cocksy
cocktail
cocktail's
cocktailed
cocktailing
cocktails
cockthrowing
cockup
cockups
cockweed
cocky
cocky-leaky
cockyolly
```

Case 2:

Input: Ui

Expected Output: 8 words

Actual Output:

```
Enter a prefix to search for matching words (Enter 'exit' to quit):  
ui  
  
Words matching the prefix:  
uily  
uinal  
uintahite  
uintaite  
uintaites  
uintathere  
uintjie  
uitspan
```

Case 3:

Input: Hw

Expected Output: 6 words

Actual Output:

```
Enter a prefix to search for matching words (Enter 'exit' to quit):  
hw  
  
Words matching the prefix:  
hw-  
hwa  
hwan  
hwt  
hwy  
hwy1
```