

**5.3.39** Timings. Write a program that times the four methods for the task of searching for the substring

**“it is a far far better thing that i do than i have ever done”**

in the text of Tale of Two Cities (tale.txt). Discuss the extent to which your results validate the hypotheses about performance that are stated in the text.

**Intro:**

This question asks us to search for a substring in a file titled Tale of Two Cities using all the four algorithms of substring searching. I.e; brute force, KMP, Boyer Moore and Rabin Karp methods. And also asked to compare the performances of all the four methods.

**Expectation:**

As per the performances taught by Bob sedwick, the Brute Force method will take  $MN$  complexity

KMP method will take  $2M$  complexity

Boye Moore will take  $3M$  complexity

and Rabin Karp will take  $7M$  complexity.

By the above data, by using KMP method for searching a substring in a text file will take lesser time compared to other searching methods

**Observation:**

**Git Link:**

[https://github.com/tezasrivishnu/6032\\_ADS2/blob/master/assignments/m24/Solution.java](https://github.com/tezasrivishnu/6032_ADS2/blob/master/assignments/m24/Solution.java)

The string pattern we are searching in the text file is almost at the last.

KMP method took 16.0 ms

Boyer Moore method took 15.0 ms

Rabin Karp method took 79.0ms

Brute Force method took 47.0ms to search the given substring in the text file.

C:\Windows\System32\cmd.exe

```
Microsoft Windows [Version 10.0.17134.407]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\itsvi\Desktop\MSIT\IT\ADS 2\6032_ADS2\assignments\m24>java Solution
found pattern at index: 584990
time taken for Rabin Karp: 79.0 milliseconds

found pattern at index: 584990
time taken for Boyer Moore: 15.0 milliseconds

found pattern at index: 584990
time taken for KMP: 16.0 milliseconds

found pattern at index: 584990
time taken for bruteforce: 47.0 milliseconds

C:\Users\itsvi\Desktop\MSIT\IT\ADS 2\6032_ADS2\assignments\m24>
```

If the pattern we are searching is in the middle of the file,

KMP method took 16.0ms

Boyer Moore method took 0.0ms(might be in nanoseconds)

Rabin Karp method took 22.0ms

Brute Force method took 31ms to search the given substring in the text file.

```
C:\Users\itsvi\Desktop\MSIT\IT\ADS 2\6032_ADS2\assignments\m24>java Solution
found pattern at index: 155771
time taken for Rabin Karp: 22.0 milliseconds

found pattern at index: 155771
time taken for Boyer Moore: 0.0 milliseconds

found pattern at index: 155771
time taken for KMP: 16.0 milliseconds

found pattern at index: 155771
time taken for bruteforce: 31.0 milliseconds
```

## Conclusion:

In the above experiment, I have tested all the four methods of substring search algorithms. I got the fastest subsearch string by using Boye Moore method in lesser time compared to the other three substring search methods.