CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

DEVANG PATEL INSTITUTE OF ADVANCE TECHNOLOGY & RESEARCH

Computer Science & Engineering

NAME: PARTH NITESHKUMAR PATEL

ID: 19DCS098

SUBJECT: DESIGN AND ANALYSIS OF ALGORITHM

CODE: CS 351

STRING MATCHING ALGORITHM

PRACTICAL-8.1

AIM:

Suppose you are given a source string S[0 ..n − 1] of length n, consisting of symbols a and b. Suppose that you are given a pattern string P[0 ..m − 1] of length m < n, consisting of symbols a, b, and *, representing a pattern to be found in string S. The symbol * is a “wild card” symbol, which matches a single symbol, either a or b. The other symbols must match exactly. The problem is to output a sorted list M of valid “match positions”, which are positions j in S such that pattern P matches the substring S [j..j + |P|− 1].

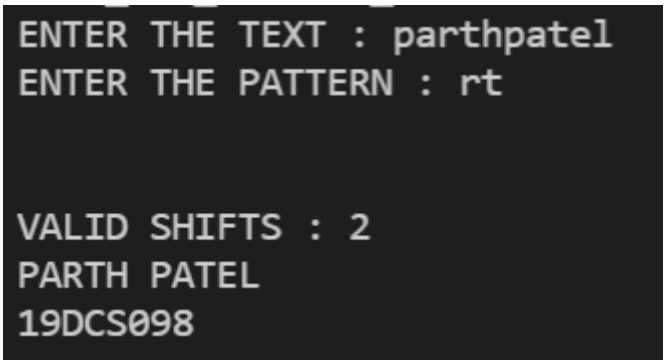
For example, if S = ababbab and P = ab*, then the output M should be [0, 2]. Implement a straightforward, naive algorithm to solve the problem.

PROGRAM CODE:

```
#include<iostream>
#include <string.h>

using namespace std;

int main()
{
    char t[100], p[100];
    int tn, pn, shift[20] = {0}, s = 0, i, j = 0, count = 0, m = 0;
    cout<<"ENTER THE TEXT : ";
    cin>>t;

    cout<<"ENTER THE PATTERN : ";
    cin>>p;

    tn = strlen(t);
    pn = strlen(p);

    while (s != (tn - pn + 1))
    {
        j = 0;
        for (i = s; i < pn + s; i++)
        {
            if (p[j] == t[i])
            {
                count++;
                if (count == pn)
                {
                    count = 0;
```

```
                    shift[m] = s;
                    m++;
                }
            }
            else
            {
                count = 0;
                break;
            }
            j++;
        }
        s++;
    }
    if (m > 0)
    {
        printf("\n\nVALID SHIFTS : ");
        for (i = 0; i < m; i++)
            printf("%d \n", shift[i]);
    }
    else
    {
        printf("\n\n NO VALID SHIFTS AVAILABLE");
    }

    cout<<"PARTH PATEL\n19DCS098"<<endl;
    return 0;
}
```

OUTPUT:



Conclusion:

- Naive pattern searching is the simplest method among other pattern searching algorithms.
- It checks for all character of the main string to the pattern.
- This algorithm is helpful for smaller texts.
- It does not need any pre-processing phases.
- The time complexity is **O(m*n)**. The m is the size of pattern and n is the size of the main string

PRACTICAL-8.2

AIM:

Implement Rabin karp algorithm and test it on the following test cases:

Test Case	String	Pattern
1	2359023141526739921	31415 q=13
2	ABAAABCDBBABCDDEBCABC	ABC q=101

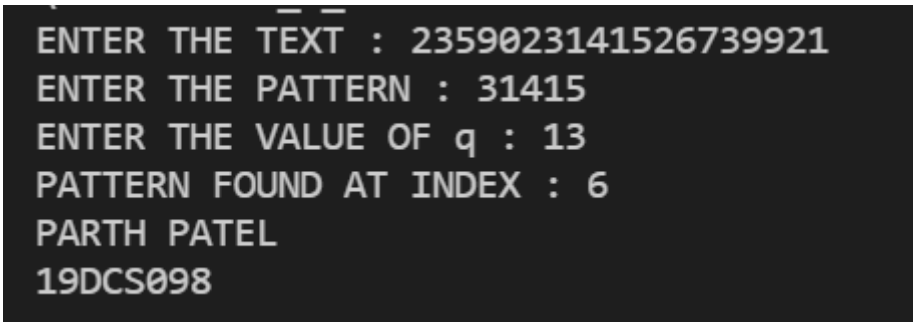
PROGRAM CODE:

```
#include <iostream>
#include <string.h>
#define d 256
using namespace std;
void search(char pattern[], char text[], int q)
{
    int M = strlen(pattern);
    int N = strlen(text);
    int i, j;
    int p = 0;
    int t = 0;
    int h = 1;
    for (i = 0; i < M - 1; i++)
        h = (h * d) % q;
    for (i = 0; i < M; i++)
    {
        p = (d * p + pattern[i]) % q;
        t = (d * t + text[i]) % q;
    }
    for (i = 0; i <= N - M; i++)
    {
        if (p == t)

        {
            for (j = 0; j < M; j++)
            {
                if (text[i + j] != pattern[j])
                    break;
            }
```

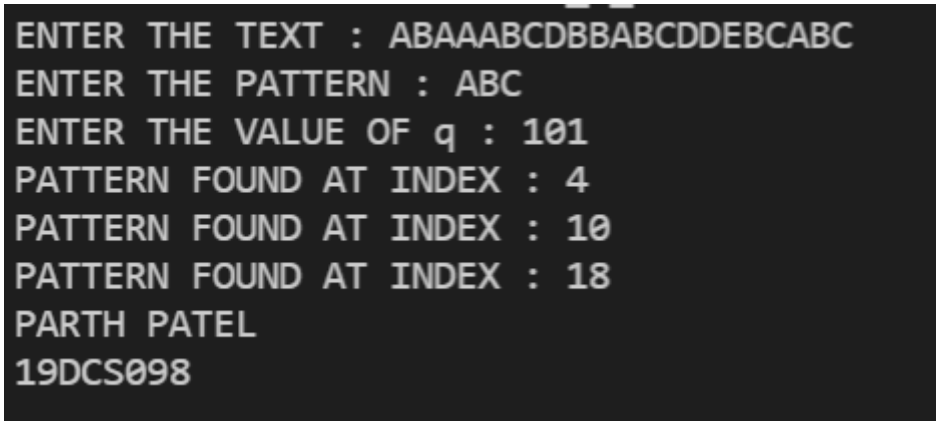
```
            if (j == M)

                cout<<"PATTERN FOUND AT INDEX : "<<i<<endl;
        }
        if (i < N - M)
        {
            t = (d * (t - text[i] * h) + text[i + M]) % q;
            if (t < 0)
                t = (t + q);
        }
    }
}
int main()
{


    char text[100];
    char patterntern[100];
    int q;

    cout<<"ENTER THE TEXT : ";
    cin>>text;
    cout<<"ENTER THE PATTERN : ";
    cin>>patterntern;

    cout<<"ENTER THE VALUE OF q : ";
    cin>>q;
    search(patterntern, text, q);

    cout<<"PARTH PATEL\n19DCS098"<<endl;
    return 0;
}
```

OUTPUT:

Test Case-1:



Test Case-2:



CONCLUSION:

- For text of length n and p patterns of combined length m, its average and best case time complexity is **O(n+m)** , but its worst-case time complexity is **O(nm)**