



SNS COLLEGE OF TECHNOLOGY

Coimbatore-37.

An Autonomous Institution



COURSE NAME : 19ITB201 & DESIGN AND ANALYSIS OF ALGORITHMS

II YEAR/ IV SEMESTER

UNIT – 4 FLOW NETWORKS AND STRING MATCHING

Topic: String Matching - Knuth Morris Pratt Algorithm (KMP)

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String Matching Algorithm-KMP Algorithm

String Matching : Find the given Pattern is found in the given string or Not

Naïve String Matching : Pattern is existing in the string or not.If it is find the Index String n

Pattern m Complexity $O(m+n)$

Knuth Morris Pratt Algorithm(KMP)

Example 1: The input string is:
"Welcome to Scaler Topics"

The input pattern is:

"Scaler"

Output: The pattern was found at index: 11.



String Matching Algorithm-KMP Algorithm

KNUTH-MORRIES-PRATT ALGORITHM:

This algorithm works on proper prefix and proper suffix.

Eg. to find π -table/Longest Proper Prefix:

P_1 : a b a b

P_2 : a b c d a b c Y

P_3 : a b c d a b e a b f

P_4 : a b c d e a b f a b c

P_1 :	1	2	3	4
	a	b	a	b
	0	0	1	2

P_2 :	1	2	3	4	5	6	7	8
	a	b	c	d	a	b	c	Y
	0	0	0	0	1	2	3	0

P_3 :	1	2	3	4	5	6	7	8	9	10
	a	b	c	d	a	b	e	a	b	f
	0	0	0	0	1	2	0	1	2	0

P_4 :	1	2	3	4	5	6	7	8	9	10	11
	a	b	c	d	e	a	b	f	a	b	c
	0	0	0	0	0	1	2	0	1	2	3



String Matching Algorithm-KMP Algorithm



Eg on KMP Algorithm:

T: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

P:

a	b	a	b	d
0	0	1	2	0

$T[S] \neq P[S]$ } mismatch

- i) Take two variables i and j
i = String(T(1)), j = P[0]
- IMP ii) Compare T(i) with P(j+1)
 - ↳ i) if Match is found (Move both i and j to right)
 - ii) if Mismatch (move j to the locⁿ as per π table index)
 - iii) if j=0 } move i to the right

Time Complexity
 $O(mn)$

T: a b a b c a b c a b a b a b d
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



References

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 3rd Edition, 2012
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Galgotia Publications, 2nd edition, 2003