

Knuth: Morris Pratt

string

pattern

	1	2	3	4	5	6	7	8	9
		↓			↓				
	a	b	c	d	a	b	c	d	e
→	a	b	c	d	e				
	1	2	3	4	5				

string

pattern

1	2	3	4	5	6
01	01	a	a	a	b

Diagram illustrating a string pattern matching process. The string is "0101a a a b" and the pattern is "01 a b". The string is divided into segments: "01", "01", "a", "a", "a", "b". A bracket under the first two "01" segments indicates a match with the pattern's "01". An arrow points from the third segment "a" to the pattern's "a". A horizontal line under the last three segments "a a b" indicates a match with the pattern's "a b".

01	a	b
1	2	3

Diagram illustrating a pattern matching process. The pattern is "01 a b" and the string is "0101a a a b". The pattern is divided into segments: "01", "a", "b". A horizontal line under the first three segments "01 a b" indicates a match with the string's "0101a".

pattern

1	2	3	4	5	6	7
d	b	c	d	a	b	c
<u> </u>				<u> </u>		

prefixes : d, ab, abc, abc.d,

suffixes : c, bc, abc, dabc,

longest prefix suffix

lps

Prefix function

s:

a	b	c	d	a	b	c	a	b	f
<hr/>				<hr/>					
0	0	0	0	1	2	3	1	2	0

a b c d

prefixes: a, ab, abc, abcd

suffixes:

$S,$

a	b	c	d	e	a	b	f	a	b	c
→ 0	0	0	0	0	1	2	0	1	2	3

Prefix function

$$\text{len(string)} \gg \text{len(pattern)}$$

n
 \gg
 m^2

string

pattern

Handwritten notes illustrating a sequence of characters and a corresponding grid structure.

Top row: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Sequence of characters: a b a b c a b c a b a b a b d

Grid structure (5 columns, 2 rows):

a	b	d	b	d
b	0	1	(2)	0

1) Compute Prefix function
for pattern

$$2) \quad O(n + m^2)$$

[Rabin - Karp
KMP
Naive