

## \* Rabin Karp

Ex 14  $T \rightarrow 3, 1, 4, 1, 5, 9, 2, 6, 5, 3, 5, 2, 6, 9, 1$   
 $Pattern (P) \rightarrow \underline{26}$   
 Given  $q = 11$

why?  $26 \bmod 11 = 4 \rightarrow$  hash value  
 : 2 values  
 $\underline{26}$

1.  $\therefore 31 \bmod 11 = 9 \rightarrow$  No match
2.  $14 \bmod 11 = 3 \rightarrow$  No match
3.  $41 \bmod 11 = 8 \rightarrow$  No match
4.  $15 \bmod 11 = 4 \rightarrow$  Match with hash value but  
not 26  $\therefore$  → spurious hit
5.  $59 \bmod 11 = 4 \rightarrow$  spurious hit
6.  $99 \bmod 11 = 4 \rightarrow$  spurious hit
- 7.  $26 \bmod 11 = 4 \rightarrow$  valid hit
8.  $65 \bmod 11 = 10 \rightarrow$  No match
9.  $53 \bmod 11 = 9 \rightarrow$  No match
10.  $35 \bmod 11 = 2 \rightarrow$  No match
11.  $52 \bmod 11 = 8 \rightarrow$  No match
- 12.  $26 \bmod 11 = 4 \rightarrow$  Valid hit
13.  $69 \bmod 11 = 3 \rightarrow$  No match
14.  $91 \bmod 11 = 3 \rightarrow$  No match

$$a = 1$$

$$b = 2$$

$$c = 3$$

$$d = 4$$

$$e = 5$$

$$f = 6$$

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$$28 \text{ CST} = a + c \times a + a \times b + a \times a - 025$$

$$P = a \oplus a \oplus b = 138$$

→ Perform hash addition

$$P = a \oplus a \oplus b \oplus \dots = 818$$

$$08 + 001 = 1 + 01 + 2 + 1 = 101 \times 4 \rightarrow \text{hash} = 320$$

abnormal add = 881

$$14 \text{ 08a} \oplus \text{008a} \rightarrow 1 \times 1 + 3 \times 1 + 1 = 0115 \rightarrow \text{No match}$$

$$28 \text{ ca a} \rightarrow 3 + 1 + 1 = 185 \rightarrow \text{No match}$$

$$34 \text{ a+a b} \rightarrow 1 \times 1 + 1 + 2 = 4 \times 8 \rightarrow \text{Valid hit}$$

$$48 \text{ ab a} \rightarrow 1 + 2 + 1 = 14 \rightarrow \text{spurious hit}$$

$$54 \text{ ba a} \rightarrow 1 \times 2 + 1 + 1 = 4 \times 8 \rightarrow \text{spurious hit}$$

abnormal add = 811

$$* 34 T \rightarrow \text{ca c a x} + \text{c x a} + \text{a x e} - \text{d b a} + \text{a}$$

$$P \rightarrow \text{d b a} \oplus \text{a} \oplus \dots = 131$$

$$\text{hash addition } 101 \times 1 + P = \text{dba} \rightarrow 14 + 2 + 1$$

abnormal add = 143 = 7 → hash

$$14 \text{ cca} \rightarrow 3 + 3 + 1 = 017 \rightarrow \text{spurious hit}$$

$$28 \text{ cac} \rightarrow 3 + 1 + 3 = 7 \rightarrow \text{spurious hit}$$

$$34 \text{ acc} \rightarrow 1 + 3 + 3 = 7 \rightarrow \text{spurious hit}$$

Final result: 14

To reduce the no. of spurious hit, we will make  $d \oplus b \oplus a \rightarrow 4 \times 10^2 + 2 \times 10^1 + 1 \times 10^0 = 421$  ∵ 10 elements

$$a=1, b=2, c=3, d=4, e=5, f=6, g=7, h=8, i=9 \\ j=10$$

No do with all.

17  $cca \rightarrow 3 \times 10^2 + 3 \times 10^1 + 1 \times 10^0 = 300 + 30 + 1 = 331 \rightarrow \text{No match}$

28  $cac \rightarrow 3 \times 10^2 + 1 \times 10^1 + 3 \times 10^0 = 300 + 10 + 3 = 313 \rightarrow \text{No match}$

38  $acc \rightarrow 1 \times 10^2 + 3 \times 10^1 + 3 \times 10^0 = 100 + 30 + 3 = 133 \rightarrow \text{No match}$

45  $cca \rightarrow 3 \times 10^2 + 3 \times 10^1 + 1 \times 10^0 = 300 + 30 + 1 = 331 \rightarrow \text{No match}$

58  $caa \rightarrow 3 \times 10^2 + 1 \times 10^1 + 1 \times 10^0 = 300 + 10 + 1 = 311 \rightarrow \text{No match}$

68  $aae \rightarrow 1 \times 10^2 + 1 \times 10^1 + 5 \times 10^0 = 100 + 10 + 5 = 115 \rightarrow \text{No match}$

78  $aedb \rightarrow 1 \times 10^2 + 5 \times 10^1 + 4 \times 10^0 = 100 + 50 + 4 = 154 \rightarrow \text{No match}$

88  $edb \rightarrow 5 \times 10^2 + 4 \times 10^1 + 2 \times 10^0 = 500 + 40 + 2 = 542 \rightarrow \text{No match}$

98  $dba \rightarrow 4 \times 10^2 + 2 \times 10^1 + 1 \times 10^0 = 400 + 20 + 1 = 421 \rightarrow \text{Valid hit}$

### 9<sup>th</sup> iteration